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MAIN OFFICE

P.O. Box 20600
Rochester, NY 14602-0600
716 783-2000

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990 Washington Street
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617 329-6212

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Prudential Plaza
Chicago, IL 60601
312 467-1221

JACKSONVILLE

8657 Baypine Road
Suite 209
Jacksonville, FL 32256
904 739-1900

KANSAS CITY

Suite 456
10220 N. Executive Hills Blvd.
Kansas City, MO 64153
816 891-7211

MONTREAL

General Railway Signal Co. of Canada
Suite 320
Pointe-Claire Commerce Center
6600 TransCanada Highway
Pointe-Claire, Quebec H9R 4S2
514 694-7350

NEW YORK

Room 928
230 Park Ave.
New York, NY 10169
212 697-3681

OMAHA

Suite 209
8031 West Center Road
Omaha, NE 68124
402 399-9333

ROANOKE

Liberty Trust Bldg.
Suite 505
101 South Jefferson Street
Roanoke, VA 24011
703 343-8628

SAN RAMON

Crow Canyon Office Park
Suite 210
12 Crow Canyon Court
San Ramon, CA 94583
415 831-8775

WASHINGTON

Suite 613
8630 Fenton Street
Silver Spring, MD 20910
301 587-4770

6-88

Signed by Israel Jones, texasrails.org 7/16/2026

GRS

TERMS AND CONDITIONS OF SALE

1) GOVERNING TERMS AND CONDITIONS. This quotation is an offer by us to sell you the goods or services described herein or on the face hereof solely upon the terms and conditions set forth in this quotation. Any acceptance of this offer must be limited to the terms hereof. We shall not be deemed to have waived any of our terms and conditions or to have assented to any exception to or modification of such terms and conditions unless such waiver or assent is in writing and signed by an authorized officer. Your oral or written instructions to manufacture, ship or perform shall constitute acceptance of this offer. Any contract arising out of this offer shall be governed by and construed in accordance with the laws of the State of New York.

No representation of any kind has been made by us except as set forth herein. We will furnish only the quantities and goods and services specifically listed on the face hereof or the pages attached hereto; we assume no responsibility for furnishing other goods or services shown in any plans or specifications for a project to which the goods or services ordered herein pertain. Our published or quoted terms and conditions are subject to change without notice.

2) PRICES. Unless otherwise noted on the face hereof, published or quoted prices are net F.O.B. our plant and subject to change without notice. Service time of a factory-trained serviceman is not included and may be charged extra. In addition to the contract price you shall pay, together with any applicable interest or penalties thereon, the amount of any applicable present or future tax or other government charge upon the production, sale, shipment, export, import or use of goods or services ordered or sold, unless specifically agreed otherwise in writing by the parties.

3) CANCELLATION, DEFERRED DELIVERIES AND RETURNS. You may defer deliveries or cancel orders for goods only by written notice and only upon condition that you make full payment to us for all items which, upon receipt of such notice by us, are within thirty (30) calendar days of completion. All items within thirty (30) days of completion shall be completed within that time.

Partial payment for all items not within thirty (30) calendar days of completion shall be made by you on the basis of actual costs of labor, materials and supplies applied to the production of such items, plus overhead expenses, and plus fifteen percent (15%) of such costs and expenses, provided that such amount shall in no event exceed the purchase price of the items. In the case of hold orders or deferred deliveries, all payments made by you, as provided in this paragraph, will be credited to your account and will be reflected in our invoices upon any resumption of deliveries under your written order. Goods may be returned only when specifically authorized and you will be charged for placing returned goods in saleable condition, any sales expenses then incurred by us, plus a restocking charge and any outgoing and incoming transportation costs which we pay. You may defer or cancel orders for services only upon written notice and only upon condition that payment shall be made by you for our actual costs, plus overhead expenses and plus fifteen percent (15%) of such costs and expenses, provided that such amount shall in no event exceed the purchase price of the services. Any cancellation or rescission by you shall constitute a discharge of any claim by you relating to this transaction.

4) CREDIT AND PAYMENT. Unless otherwise noted on the face hereof, terms are net thirty (30) days in United States dollars. We may decline to furnish services or to complete and deliver goods except for cash, or stop goods in transit whenever for any reason doubt as to your financial responsibility develops. Prorata payments shall become due with partial shipments of goods.

5) DELIVERY AND SHIPPING. Dates for the furnishing of services or delivery, shipment and installation of goods are estimated dates only, and unless otherwise specified, are figured from the date of receipt of complete technical data and approved drawings as such may be necessary. In estimating such dates, no allowance has been made, nor shall we be liable directly or indirectly for, delays of carriers or delays from labor difficulties, energy or other shortages, strikes or stoppages of any sort, fires, accidents, failure or delay in obtaining materials or manufacturing facilities, acts of government affecting us directly or indirectly, bad weather, or any causes beyond our control or causes designated Acts of God or force majeure by any court of law and in the event such delays arise, the estimated delivery date shall be extended accordingly. We will not be liable for any damages or penalties whatsoever, whether direct, indirect, special or consequential, resulting from our failure to perform or delay in performing.

Delivery to common carrier, F.O.B. our plant or warehouse shall constitute delivery and passage of title to you, and risk of loss shall pass to you concurrently. If you or carrier refuse delivery or delay shipment or acceptance, the goods may be stored according to our direction, as your agent, at your risk and expense. During any such period of storage, you shall have title to the goods and bear the risk of loss. All costs subsequent to delivery, including but not limited to the costs of shipment and installation of the goods described herein, shall be borne by you unless otherwise specifically agreed in writing by the parties. Where you are responsible for any delay in shipment of goods, the date of completion of goods may be treated by us as the date of shipment for purposes of payment; completed goods shall be held at your cost and risk and we shall have the right to bill you for reasonable storage and insurance expenses.

Unless you specify in writing, (a) goods will be boxed or crated as we may deem proper for protection against normal handling, and extra charges will be made for preservation, waterproofing and similar added protection of goods, and (b) routing and manner of shipment will be at our discretion, and may be insured at your expense, value to be stated at offer price. A claim for loss or damage in transit must be entered with the carrier and prosecuted by you.

6) WARRANTY. Providing you notify us in writing promptly, if within one (1) year from date of shipment, goods manufactured by us fail to function properly under normal and proper use and service because of defects in material or workmanship demonstrated to our satisfaction to have existed at the time of delivery, we will, reserving the right to either inspect them in your hands or request their return to us, repair or replace at our expense F.O.B. our plant, or give you proper credit for, at our option, such goods determined by us to be defective, if all dismantling, reassembly, packaging and transportation costs are assumed by you. The foregoing shall not apply to goods that shall have been altered or repaired after shipment to you by anyone except our authorized employees, and we will not be liable in any event for alterations or repairs except those made with our written consent. You shall be solely responsible for determining suitability for use and we shall in no event be liable in this respect. Goods manufactured by others but furnished by us will be repaired or replaced, but only to the extent provided in the original manufacturer's warranty to us.

Providing you notify us promptly in writing within ninety (90) days of rendering service to you that the service rendered was incorrectly performed, at our option we will reperform the service or give you proper credit for such service as we determine was deficient.

Our obligations and liabilities hereunder shall not be enforceable until the goods or services have been fully paid for.

THE FOREGOING OBLIGATIONS ARE IN LIEU OF ALL OTHER OBLIGATIONS AND LIABILITIES INCLUDING ALL WARRANTIES OF FITNESS, MERCHANTABILITY OR OTHERWISE, WRITTEN OR ORAL, EXPRESS OR IMPLIED IN FACT OR BY LAW, and state our entire and exclusive liability and your exclusive remedy for any claim in connection with the sale or furnishing of services or goods, their design, suitability for use, installation or operation. You agree that if goods sold hereunder are resold by you, you will include in the contract for resale provisions which limit recoveries against us in accordance with this contract. In case of your failure to include in any such contract for resale terms providing for such limitations, you agree to indemnify and hold us harmless against any liability, loss, cost, damage, or expense (including reasonable attorney's fees) arising out of or resulting from such failure. No employee or agent of ours is authorized to make any warranty other than that which is specifically set forth herein. The provisions in any specification or other document issued by us or attached hereto are descriptive only and are not warranties.

7) LIMITATION OF LIABILITY. Our obligations in paragraph 6. constitute our entire and exclusive liability and your entire and exclusive remedy with respect to the goods or services which are the subject of this transaction and we will in no event be liable for any direct, indirect, special or consequential damages whatsoever, whether grounded in tort (including negligence), strict liability or contract, and our liability under no circumstances will exceed the contract price for the goods or services for which liability is claimed. Any action for breach of contract must be commenced within one (1) year after the cause of action has accrued.

8) REJECTION. If you reject any goods or services, you must notify us of such rejection within thirty (30) days of the delivery or furnishing thereof. Failure to make such notification constitutes acceptance.

9) PATENT INFRINGEMENT. We will not be liable for any claim of infringement by goods manufactured by us in the form in which we supply such goods to you and without regard to their use by you. If you notify us promptly in writing of any such claim of infringement and, if we so request, authorize and give reasonable assistance to us to defend or settle any suit or controversy involving such claim, we will indemnify you against the reasonable expenses of any such suit and will satisfy any judgment or settlement in which we acquiesce, but only to an amount not exceeding the price paid to us for the allegedly infringing goods. If an injunction is issued against the further use of allegedly infringing goods, we shall have the option of procuring for you the right to use the goods, or replacing them with non-infringing goods or of removing them and refunding the purchase price. The foregoing expresses our entire and exclusive warranty and liability as to patents, and we will not be liable for any damages whatsoever suffered by reason of any infringement claimed except as provided herein. You will hold us harmless and indemnified against any and all claims, demands, liabilities, damages, costs and expenses resulting from or connected with any claim of patent infringement arising out of the manufacture by us of goods in accordance with a design or specification which you furnish us. The sale of any goods hereunder does not carry with it any license to use such goods in combination with other goods not purchased from us or our license to use such goods in combination with other goods not purchased from us or our licensees and which combination is subject to any patent owned or controlled by us. Any invention made by us in the performance of a contract with you shall be our exclusive property.

10) SPECIAL JIGS, FIXTURES AND PATTERNS. Any jigs, fixtures, patterns and like items which may be included in an order will remain our property without credit to you. We will assume the maintenance and replacement expenses of such items, but shall have the right to discard and scrap them after they have been inactive for one year without credit to you.

11) INSPECTION. Inspection of goods in our plant by you or your representative will be permitted insofar as this does not unduly interfere with our production workflow, provided that complete details of the inspection you desire are submitted to us in writing in advance.

12) RECORDS, AUDITS AND PROPRIETARY DATA. Neither you nor any representative of yours, nor any other person, shall have any right to examine or audit our cost accounts, books or records of any kind or on any matter, or be entitled to, or have control over, any engineering or production prints, drawings or technical data which we, in our sole discretion, may consider in whole or in part proprietary to ourselves. Any drawings and other information delivered to you or your representative pursuant to this order shall be used solely for purposes of inspection, installation or maintenance. The information shall not be used or disclosed by you or your representative for any other purpose whatsoever.

13) ASSIGNMENT. Your rights and obligations hereunder may not be assigned without our prior written consent.

14) NON-WAIVER. Our failure at any time to require strict performance by you of any of the provisions herein shall not waive or diminish our right thereafter to demand strict compliance therewith or with any other provision. Waiver of any default shall not waive any other default.

15) INDEMNITY. You shall notify us in writing of any accident, injuries to person, damage to property, loss or other occurrence involving other goods or services supplied hereunder, if we might be liable therefor to persons other than you. If you shall fail to so notify us, you shall defend, indemnify and save us harmless from all claims against and liability of us arising out of such occurrence. You shall make full use of any and all safety devices on the goods supplied hereunder and shall follow all safety procedures recommended by us with respect thereto. You shall see to it that all employees and other persons handling such goods shall be fully aware of such safety devices and shall follow any such safety procedures. If any injury or damage is incurred by any person or his property due, in whole or in part, to your failure to comply with this paragraph, you shall defend, indemnify and save us harmless from all claims against and liability of us arising out of such injury or damage.

CHANGE NOTIFICATION

FROM

GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL
ROCHESTER NEW YORK 14602

Revision to Assemblies Catalog
Section 65 and Parts Catalog
Section 65 Type K Relays

Signed by Israel Jones, texasrails.org 7/16/2026

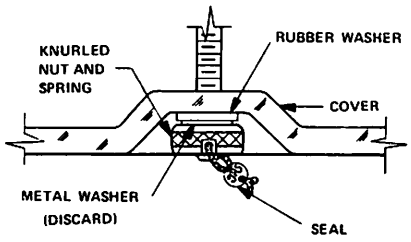
MODIFICATION KIT FOR SECURING POLYCARBONATE COVERS ON TYPE K4 RELAYS

A problem has been discovered with the new polycarbonate K4 relay cover. The cover, held on by Screw 43 (page 22, in GRS Parts Catalog Section 65) cannot be sufficiently tightened on the gasket thus, under severe vibration, the gasket may work out from under the cover. A design change is being made to the cover to correct this problem. For relays already installed with this cover, a modification kit is available (dwg. no. 17550-80 Gr. 1) which includes an additional rubber washer (same as ref. 45, page 22, Section P65, dwg. no. 1333-12) and a metal washer. For replacement covers ordered until the design change is made, a modification kit will be included.

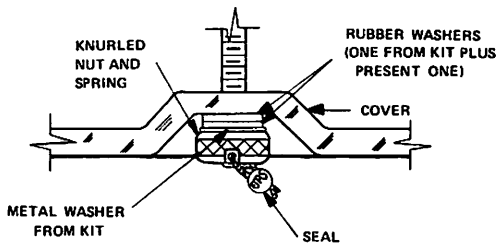
When replacing the cover, discard the present metal washer (ref. 41, page 22, Section P65) and place, in sequence on the screw, the present rubber washer, the rubber washer from the kit, the metal washer from the kit, the spring, and the knurled nut. Tighten the nut until the seal can be inserted in the second hole through the screw.

This modification kit is for use on all polycarbonate covers with Number 373 80-33X P or 37380-33XAP molded in the bottom. When the cover is redesigned, the kit will no longer be necessary. The new covers will have the Number 37380-33XBP molded in the bottom.

Place this sheet in your Catalog Section 65 until the problem has been corrected.



Present view of cover at screw.



View after modification kit installed.

A802-167
Rev: 8-80

GRS Catalog Check Form

Please check your GRS catalogs with the attached checking list to determine if they are current. Also check the address to be sure it is correct. If any changes are required, or you need new sections for your catalogs, just fill in the information on this form and send it to:

General Railway Signal Co.
Dept. AD
P.O. Box 600
Rochester, NY 14602

☐ Send me the following items

Assemblies Catalog

Sec.	Pages	No. Copies

Parts Catalog

Sec.	Pages	No. Copies

☐ Change mailing address

Old	New

☐ Remove from mailing list

Signed _____ Date _____

Form 1778

Signed by Israel Jones, texasrails.org 7/16/2026

CATALOG SECTION 3

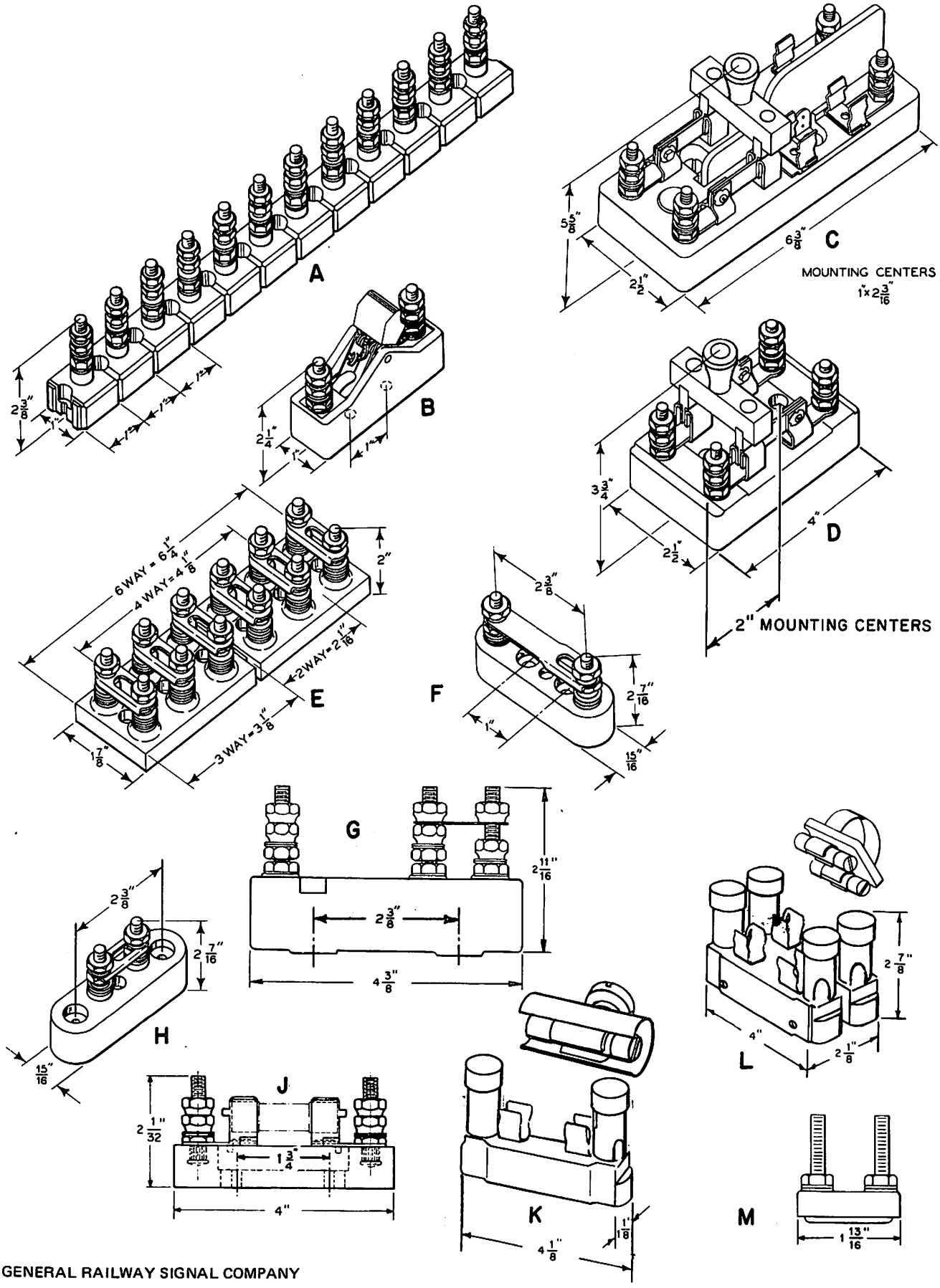
Accessories

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GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL
ROCHESTER NEW YORK 14602

PRINTED IN U.S.A.



Terminal blocks, fuse blocks, and switches.

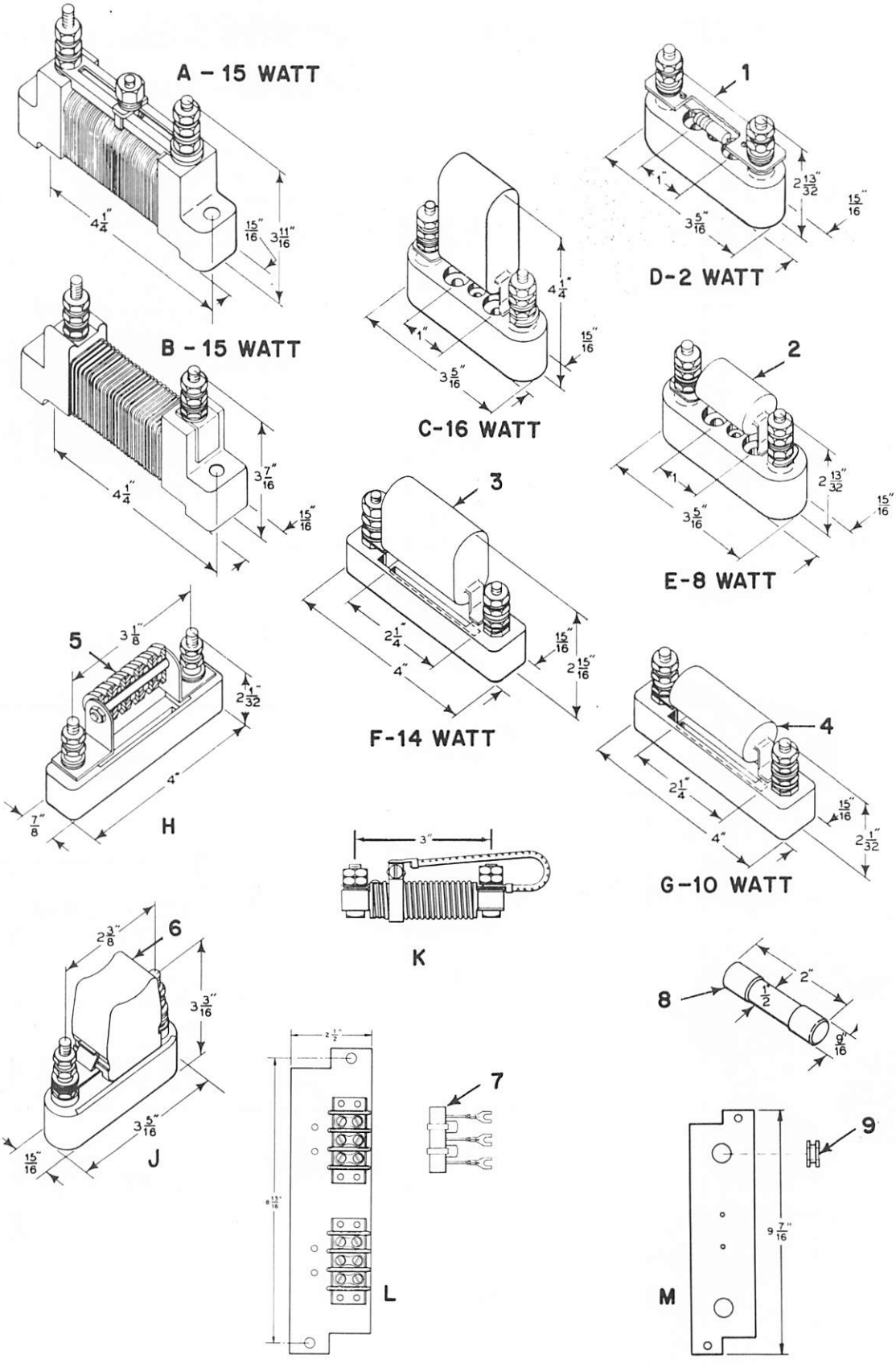
TERMINAL and FUSE BLOCKS, and SWITCHES

All have A. A. R. standard terminal posts

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
A	TERMINAL BLOCK, 12-way, may be separated into groups as required	A3-129
B	SWITCH, single pole, with spring return, used as test switch	A3-250
C	SWITCH, fused, with barrier, double pole, single throw, 30 ampere, 125 volt, does not include fuses	A3-203
D	SWITCH, double pole, single throw, 30 ampere, 125 volt	A3-202
E	TERMINAL BLOCK, 6-way, with connectors, may be separated into 3-way blocks	A3-127
E1	TERMINAL BLOCK, 4-way, with connectors, may be separated into 2-way blocks	A3-130
F	TERMINAL BLOCK, with connector	A3-125
G	TERMINAL BLOCK, with connector	A3-300
H	TERMINAL BLOCK, with connector	A3-123
J	FUSE BLOCK, for 0-30 ampere, 250 volt cartridge fuse	A3-185
K	DISCONNECT SWITCH, fuse type, for single circuit	A3-301
L	DISCONNECT SWITCH, for double circuit	A3-302
M	TERMINAL BLOCK, 2-way (1c - 1d)	P62-339

Signed by Israel Jones, texasrails.org 7/16/2026



Resistors, lightning arresters, and fuses.

RESISTORS, LIGHTNING ARRESTERS, and FUSES

All have A. A. R. standard terminal posts

To order specify "Resistor" and give catalog number

TYPE T ADJUSTABLE RESISTOR
15 WATTS CONTINUOUS CAPACITY FOR 75° CENTIGRADE RISE

REF.	MAXIMUM RESISTANCE OHMS	CATALOG NUMBER	REF.	MAXIMUM RESISTANCE OHMS	CATALOG NUMBER
A	0.70	A3-178	A8	10.0	A3-159
			A9	12.5	A3-160
			A10	16.0	A3-161
A1	1.5	A3-177	A11	17.0	A3-165
			A12	22.0	A3-166
A2	2.0	A3-148	A13	300.0	A3-303
A3	4.0	A3-155			
A4	5.0	A3-156			
A5	6.3	A3-157			
A6	7.0	A3-179			
A7	8.0	A3-158			

TYPE T FIXED RESISTOR
15 WATTS CONTINUOUS CAPACITY FOR 75° CENTIGRADE RISE

REF.	MAXIMUM RESISTANCE OHMS	CATALOG NUMBER
B	1.0	A3-136
B1	2.0	A3-141
B2	5.9	A3-135

Signed by Israel Jones, texasrails.org 7/16/2026

RESISTORS, LIGHTNING ARRESTERS, and FUSES

All have A. A. R. terminal posts

To order specify "Resistor" and give catalog number

RESISTOR COMPLETE				RESISTOR ONLY	
REF.	MAX. RESISTANCE OHMS	WATTS	CATALOG NUMBER	REF.	CATALOG NUMBER
C	500	16	A3-297	—	—
C1	1000	16	A3-298	—	—
D	510	2	A3-267	1	P3-259
D1	2000	2	A3-265	1A	P3-257
E	3	8	A3-214	2	P3-194
E1	50	8	A3-215	2A	P3-195
E2	100	8	A3-216	2B	P3-196
E3	2	8	A3-224	2C	P3-204
F	50	14	A3-236	3	P3-229
F1	1000	14	A3-235	3A	P3-228
G	1	10	A3-190	4	P3-159
F1	5	10	A3-191	4A	P3-160
G2	10	10	A3-192	4B	P3-161
G3	15	10	A3-198	4C	P3-167
G4	25	10	A3-193	4D	P3-162
G5	50	10	A3-195	4E	P3-164
G6	100	10	A3-196	4F	P3-165

Order by catalog number and name shown in bold type

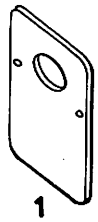
REF.	NAME	CATALOG NUMBER
H	LIGNTNING ARRESTER, 110-volts a-c, "Power Line Protector"	A3-259
J	LIGHTNING ARRESTER, "Clearview", low voltage for vital signal circuits	A3-256
J1	LIGHTNING ARRESTER, heavy-duty, for use on track circuit leads . .	A3-258
J2	LIGHTNING ARRESTER, "Clearcom" for communication circuits . .	A3-257
J3	LIGHTNING ARRESTER, "Equalizer"	A3-255
K	RESISTOR, adjustable, 1 ohm, 2.5 amp. max	A76-330
K1	Same as above except 2 ohm, 1.75 amp. max.	A76-331
K2	Same as K except 5 ohm, 1.0 amp. max	A76-332
L	MOUNTING ASSEMBLY, for 1 or 2 arresters ref. 7	A3-304
M	MOUNTING ASSEMBLY, for rectifier	A3-305

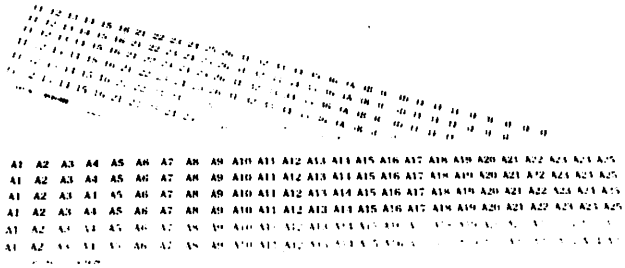
RESISTORS, LIGHTNING ARRESTERS, and FUSES

Order by catalog number and name shown in bold type

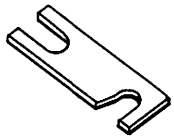
REF.	NAME	CATALOG NUMBER
5	ARRESTER, only, for Ref. H	P3-256
6	ARRESTER, only, for Ref. J	P3-253
6A	Same as above, except for Ref. J1	P3-255
6B	Same as above, except for Ref. J2	P3-254
6C	Same as above, except for Ref. J3	P3-252
7	LIGHTNING ARRESTER, for use with mounting assembly ref. L	P3-314
8	CARTRIDGE FUSE, N.E.C. Std., ferrule contact type, non-indicating, non-renewable, 250 volts A.C. or D.C., 1 ampere	P3-179
8A	As above, except 3 ampere	P3-180
8B	As above, except 6 ampere	P3-181
8C	As above, except 10 ampere	P3-182
8D	As above, except 15 ampere	P3-183
8E	As above, except 20 ampere	P3-184
8F	As above, except 1 ampere fusetron	P3-236
8G	As above, except 3.2 ampere fusetron	P3-241
8H	As above, except 6.25 ampere fusetron	P3-244
8J	As above, except 10 ampere fusetron	P3-246
8K	As above, except 15 ampere fusetron	P3-248
8L	As above, except 20 ampere fusetron	P3-249
9	GROMMET, rubber; for use with mounting plate ref M	P3-321

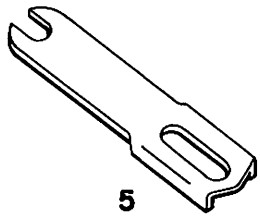
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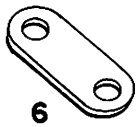

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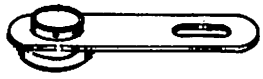

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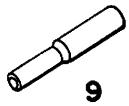

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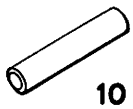

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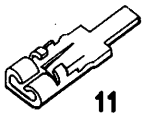

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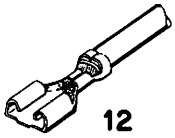

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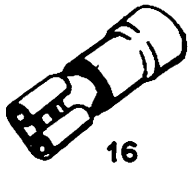

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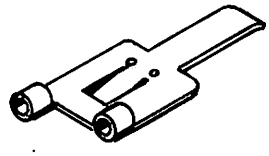

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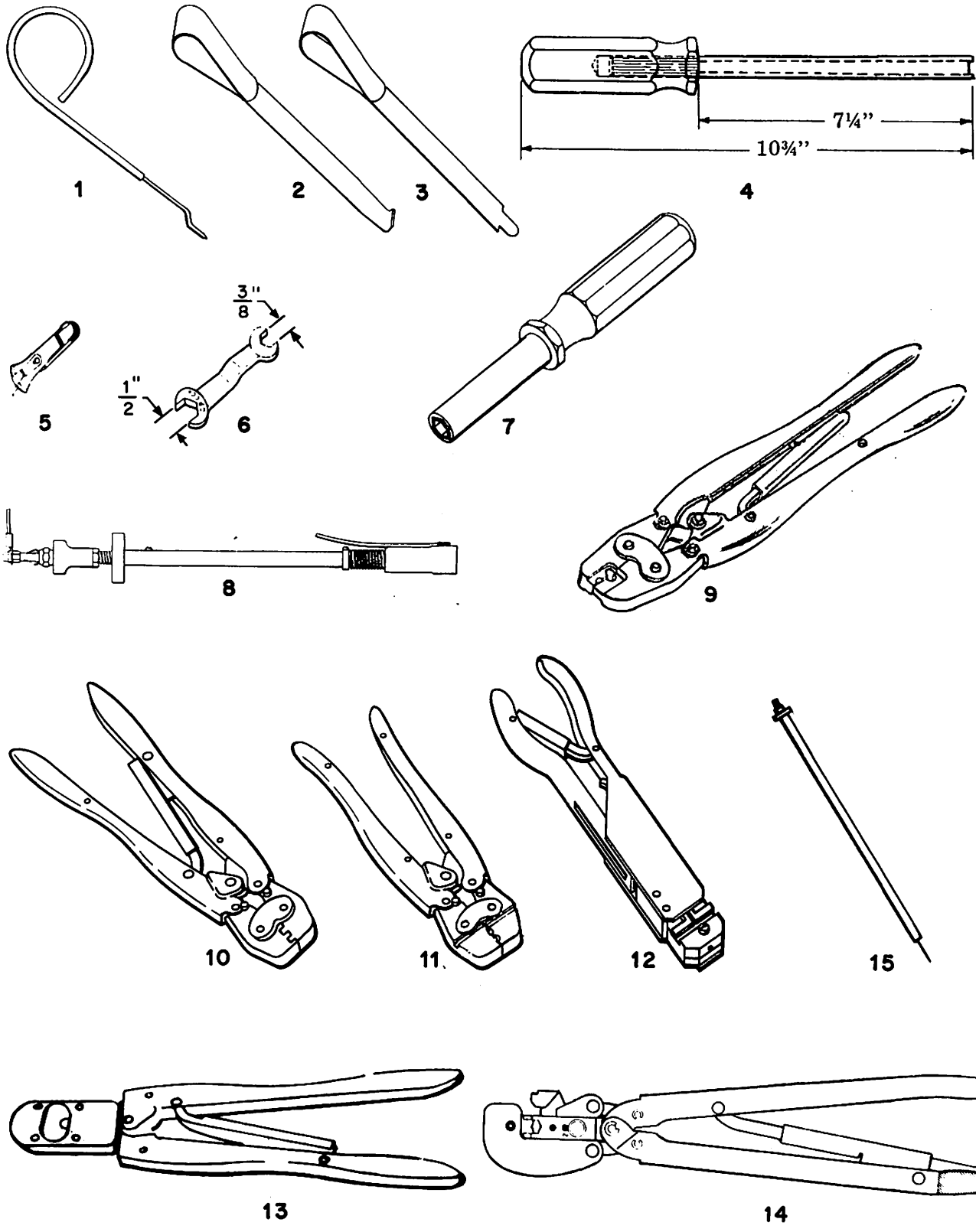
Tags, connectors, and terminals

TAGS, CONNECTORS AND TERMINALS

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
1	TAG, 1" x 1-1/2" with 1/2" dia. hole, black fibre	P3-136
2	WRAP-AROUND TAGS, for Type B1 relay coil and contact designations	P3-305
2A	TAGS, for Type B2 relay coil and contact designations	P3-306
3	CONNECTOR, 1-1/8" centers, for AAR terminal post	P3-109
4	CONNECTOR, 15/16" centers, for AAR terminal post	P3-126
5	CONNECTOR, 2-3/8" centers, for AAR terminal post	P3-148
6	CONNECTOR' 1-1/8" centers, for AAR terminal post	P3-108
7	CONNECTOR, 1-1/4" centers, for AAR terminal post	P3-107
8	CONNECTOR, 2-3/8" centers, test link	P3-324
8A	Same as above except 1" centers	P3-325
9	SLEEVE, moulded rubber, used with no. 10 wire on Type B relay plugboard	P62-298
10	SLEEVE, insulating approx. 13/64" I.D., for terminals in Type A1 relays	P62-450
11	TERMINAL, for Type B relays	P62-466
12	TERMINAL, "Faston" no. 250, for no.18 to 22 wire. (Furnished in lots of 100)	P3-312
12A	As above, except for no.14 to 18 wire.(Furnished in lots of 100)	P3-313
12B	Same as ref. 12, except "Faston" no. 110, for no. 22 to 24 wire. (Furnished in lots of 100)	P3-322
12C	Same as above except for no. 18 to 22 wire	P3-323
13	TERMINAL, "Amp" for 1/4" post, takes no. 10 or 12 wire, color coded black. (Furnished in lots of 100)	P3-310
13A	As above, except for no. 14 or 16 wire, heavy-duty color coded yellow (Furnished in lots of 100)	P3-309
13B	Same as Ref. 13 except for no. 16 to 20 wire, color coded green (Furnished in lots 100)	P3-311
14	TERMINAL, wire, for fingers and terminal coils on Type A1 relays	P3-187
15	TERMINAL, leaf, for J relays, for two no. 18 or 20 wires	P69-114
15A	Same as above except for one no. 18 to 22 or two no. 22 wires	P69-116
16	TERMINAL, a "Faston", for J relays, for two no. 12 or 14 wires	P69-118
17	TERMINAL, for J relays, for no. 14 to 18 wire	P69-119
18	TERMINAL, crimp, for B relays, for no. 16 to 20 wire	P3-326
18A	Same as above except for no. 10 to 14 wire	P3-327
19	BUTTON, black, insulation for AAR terminal post	P3-127
19A	As above, except red	P3-128
20	SHIELD, 1-1/16" long, insulation for AAR terminal post	P3-152
20A	As above, except 1-3/16" long	P3-154
20B	Same as Ref. 20, except 1 - 7/16" long	P3-153

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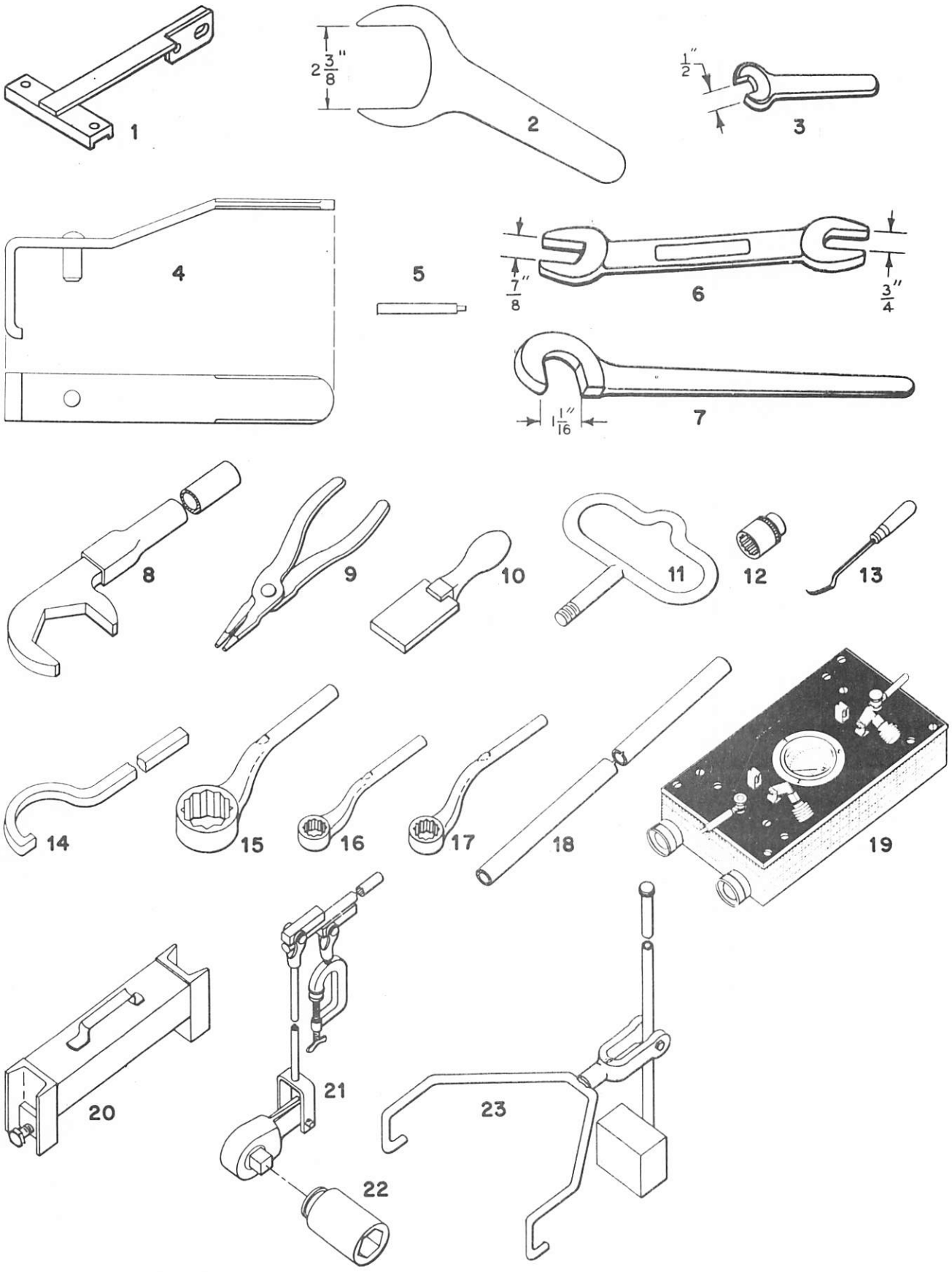
Relay tools

RELAY TOOLS

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
1	EXTRACTOR, steel wire, covered with insulating tubing, for removing terminal and clips from Type B relay plugboards	P3-308
2	TOOL, assembling, for holding insulator in plugboards while inserting clip	P3-121
3	TOOL, assembling, for inserting clips into engagement with insulators	P3-120
4	TOOL, B relay terminal nut wrench (E Post)	P3-320
5	GRAM GAUGE, scale 50-0-50	P65-931
6	WRENCH, for 3/8" and 1/2" nuts	P65-913
7	WRENCH, insulated, for AAR nuts	P65-901
8	TOOL, testing, relay current	P3-319
9	TOOL, crimping, for use with terminal ref. 18, page 8	A3-306
9A	Same as above except for use with ref. 18A, page 8	A3-307
10	TOOL, crimping, ratchet type, for use with "Faston" terminal refs. 12 and 12A on page 8	A3-100
11	TOOL, crimping, non-ratchet type, for use with terminals 12 and 12A on page 8	A3-105
12	TOOL, crimping, ratchet type, for use with terminals ref. 13B on page 8	A3-103
13	TOOL, crimping, for use with terminals ref 15 on page 8	P69-106
13A	Same as above except for use with terminals ref. 15A on page 8	P69-108
13B	Same as ref. 13 except for use with two no. 18 wires with terminal ref. 15 on page 8	P69-110
13C	Same as ref. 13 except for use with terminals ref. 17 on page 8	P69-107
14	TOOL, crimping, for use with terminal ref. 16 on page 8	A3-183
15	EXTRACTOR, for use with terminals ref. 15 and 15A on page 8	P69-121

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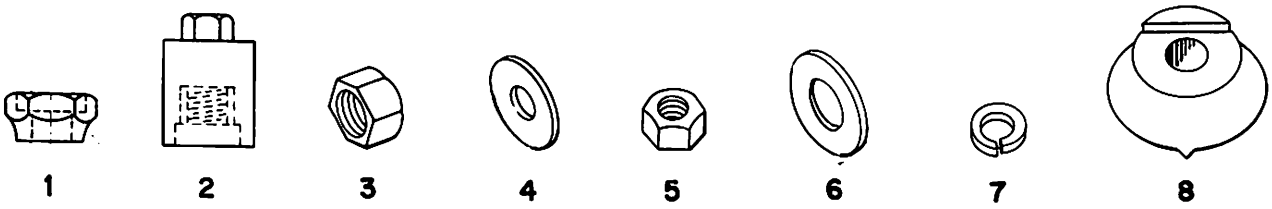

1
2 3/8"
2
1/2"
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4
5
7/8"
6
3/4"
1 1/16"
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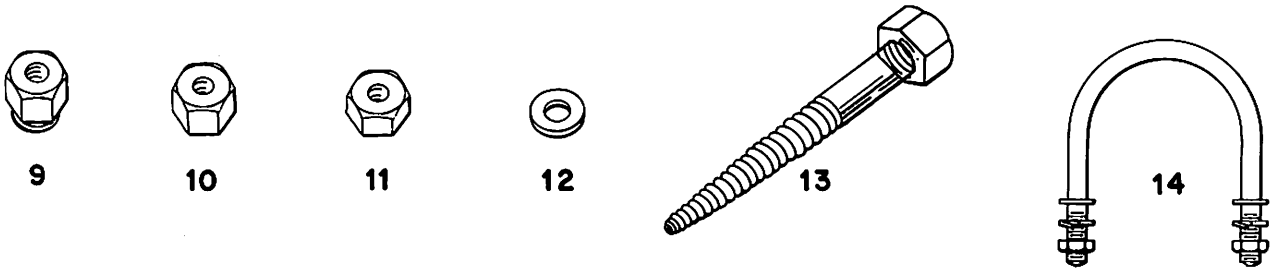
TOOLS FOR SWITCHES AND RETARDERS

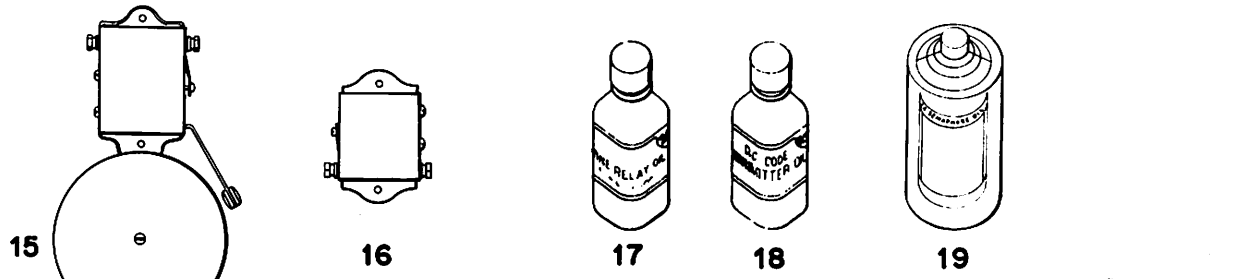
Order by catalog number and name shown in bold type

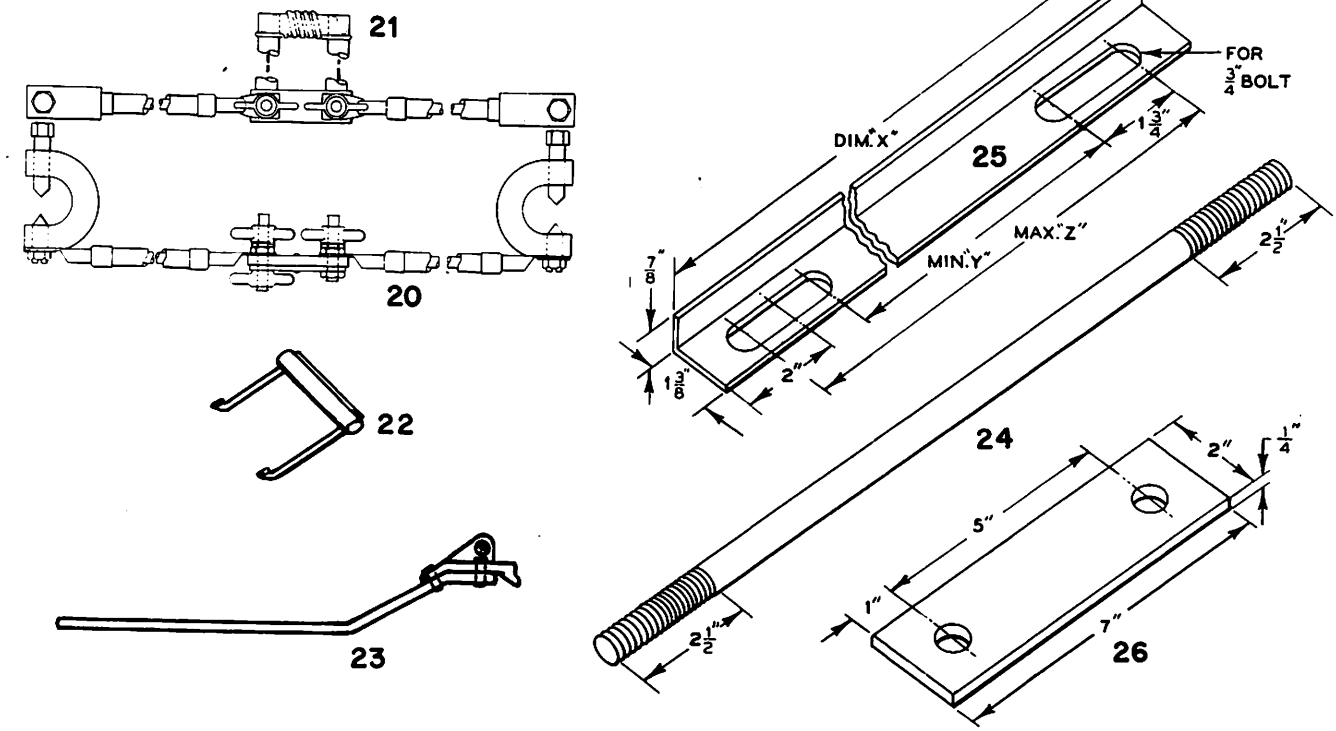
REF.	NAME	CATALOG NUMBER
1	TEST BAR, for testing switch machine	P85-1215
2	WRENCH, 2-3/8" open end, for adjusting switch machine clutch (Model 55 and Speed Frater)	P85-974
3	WRENCH, 1/2" open end	P85-410
3A	Same as above except 9/16"	P65-910
4	WRENCH, for adjusting switch machine clutch (Model 6)	P85-656
5	PIN, used with wrench, ref. 4	P85-655
6	WRENCH, for removing switch machine motor and gear bracket	P85-461
7	WRENCH, switch adjusting, for 5/8" detector rods	P85-408
7A	Same as above except for 3/4" lock and detector rods	P85-407
7B	Same as ref. 7 except for 1" lock rods	P85-406
7C	Same as ref. 7 except for 1-1/4" throw rods	P85-405
8	WRENCH, 34-1/2" long, for 3" hex. nuts (4-5/8" across flats)	P71-207
9	PLIERS, for applying retaining rings to crank pins	P71-372
10	STONE, for dressing motor commutator	P71-305
11	BAIL, for removing crank pin	P71-633
12	SOCKET, for 1-5/8" hex. nuts	P71-200
13	FILE, for undercutting slots in motor commutator	P71-307
14	WRENCH, spanner, 27-3/4" long, for cap	P71-312
15	WRENCH, 2-3/4" offset, for 2" hex. nuts, (3-1/8" across flats), requires handle Ref. 18, giving a total length of 42"	P71-605
16	WRENCH, 1-5/16" offset, for 1" nuts (1-1/2" across flats), requires handle Ref. 18B, giving a total length of 29-1/2"	P71-606
17	WRENCH, 1-3/8" offset, for 1" hex. nuts, (1-5/8" across flats) requires handle Ref. 18A, giving a total length of 29-1/2"	P71-670
18	HANDLE, 36" long, for wrench Ref. 15	P71-607
18A	HANDLE, 30" long, for wrench Ref. 17	P71-549
18B	HANDLE, 24" long for wrench Ref. 16	P71-608
19	RHEOMETER COMPLETE, for testing switch machine	P85-806
20	INSTALLER, for shims	P71-304
21	WRENCH COMPLETE, ratchet, for spring rod nuts, for use with wrench Ref. 22	P71-201
22	SOCKET, for 2-3/8" hex. spring rod nuts, for use with wrench Ref. 20	P71-199
23	INSTALLER, for retarder springs	P71-176

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Nuts, washers and misc.

NUTS, WASHERS AND MISC.

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
1	NUT, special, counterbored, for AAR posts (Furnished in lots of 100)	P3-328
2	NUT, insulated, for standard AAR terminal posts	P3-329
3	NUT, hex., 1" -8	P3-105
4	WASHER, for 1" bolts	P3-102
5	NUT, hex., 3/4 -10	P76-105
6	WASHER, for 3/4 bolts	P3-101
7	WASHER, lock, for 3/4" bolts	P85-105
8	WASHER, OG, for 3/4" bolt	P3-151
9	NUT, 5/16" tk. hex. ,for AAR posts (Furnished in lots of 100)	P76-131
10	NUT, 3/16" tk. hex., for AAR posts (Furnished in lots of 100)	P62-333
11	NUT, 1/8" tk. hex., for AAR posts (Furnished in lots of 100)	P65-585
12	WASHER, for standard AAR terminal posts. (Furnished in lots of 100.)	P76-108
13	SCREW, lag, 3/4" -6	P3-103
14	U BOLT COMPLETE, 5"	P76-277
15	BELL, 3" used on control machines	P3-330
15A	Same as above except 1-3/4"	P3-331
16	BUZZER	P3-332
17	OIL, fine relay, 1/2 ounce bottle, M.S. 2-186	P65-925
18	OIL, code transmitter, 1/2 ounce bottle, M.S. 2-21	P65-926
19	OIL, semaphore, MS 2-50, one quart	P85-772
20	CONNECTOR COMPLETE, track circuit test shunt	A3-308
21	RESISTOR, .06 ohm, used with connector ref. 20 (ordered separately)	A3-309
22	EXTRACTOR, key puller for P.C. boards	P3-317
23	EXTRACTOR, for P.C. boards	P3-318
24	ROD, 3/4" -10, threaded both ends, 11" long	P3-140
24A	Same as above, except 12" long	P3-144
24B	Same as ref. 24 except 13" long	P3-141
24C	Same as Ref. 24 except 14" long	P3-142
24D	Same as Ref. 24, except 15" long	P3-143
24E	Same as Ref. 24, except 17" long, 3" thread on each end	P3-145
25	WASHER, angle dim. X = 8-3/4", dim Y - 3", dim. Z = 6-1/2"	P3-112
25A	WASHER, angle, dim. X = 18, dim. Y = 12-1/4" dim. Z = 15-3/4 "	P3-110
26	WASHER, plate AAR dwg. 125511,5 spacing for 1"	P91-145
26A	WASHER, plate AAR dwg. 125512,5 spacing for 3/4" bolts	P91-146

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RECORDER PAPER AND INK

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
1	PAPER, for type D1 recorder, 125 ft. long, 1-5/16" wide roll	P3-333
2	PAPER, for type E1 recorder, 126 ft. long, 12-3/4" wide roll, 2" per hr.	P3-334
2A	Same as above except 16-1/2" wide roll	P3-335
2B	Same as 2 except 19-5/8" wide roll	P3-336
2C	Same as 2 except 23-3/8" wide roll	P3-337
2D	Same as 2 except 29-5/8" wide roll	P3-338
3	PAPER, for E1 recorder, 116 ft. long, 19-5/8" wide roll, 8" per hr.	P3-339
3A	Same as above except 29-5/8" wide roll and 4" per hr.	P3-340
4	PAPER, for E2 recorder, 242 ft. long, 29-5/8" wide roll, 4" per hr.	P3-341
4A	Same as above except 2" per hr.	P3-342
4B	Same as 4A except 16-1/2" wide	P3-343
5	PAPER, for wheel thermo-scanner recorder, 1000 ft. long, 4" wide, "Z" folded	P92-988
6	PAPER, for wheel thermo-scanner, 250 ft. long roll	P3-344
7	PAPER, for wheel thermo-scanner, 500 ft. long, 4" wide roll	P92-999
7A	Same as above except 4-15/16" wide roll	P92-1000
8	INK, green recording, pint bottle	P3-345
8A	Same as above except red	P3-346
8B	Same as 8A except 1/2 pint bottle	P92-985

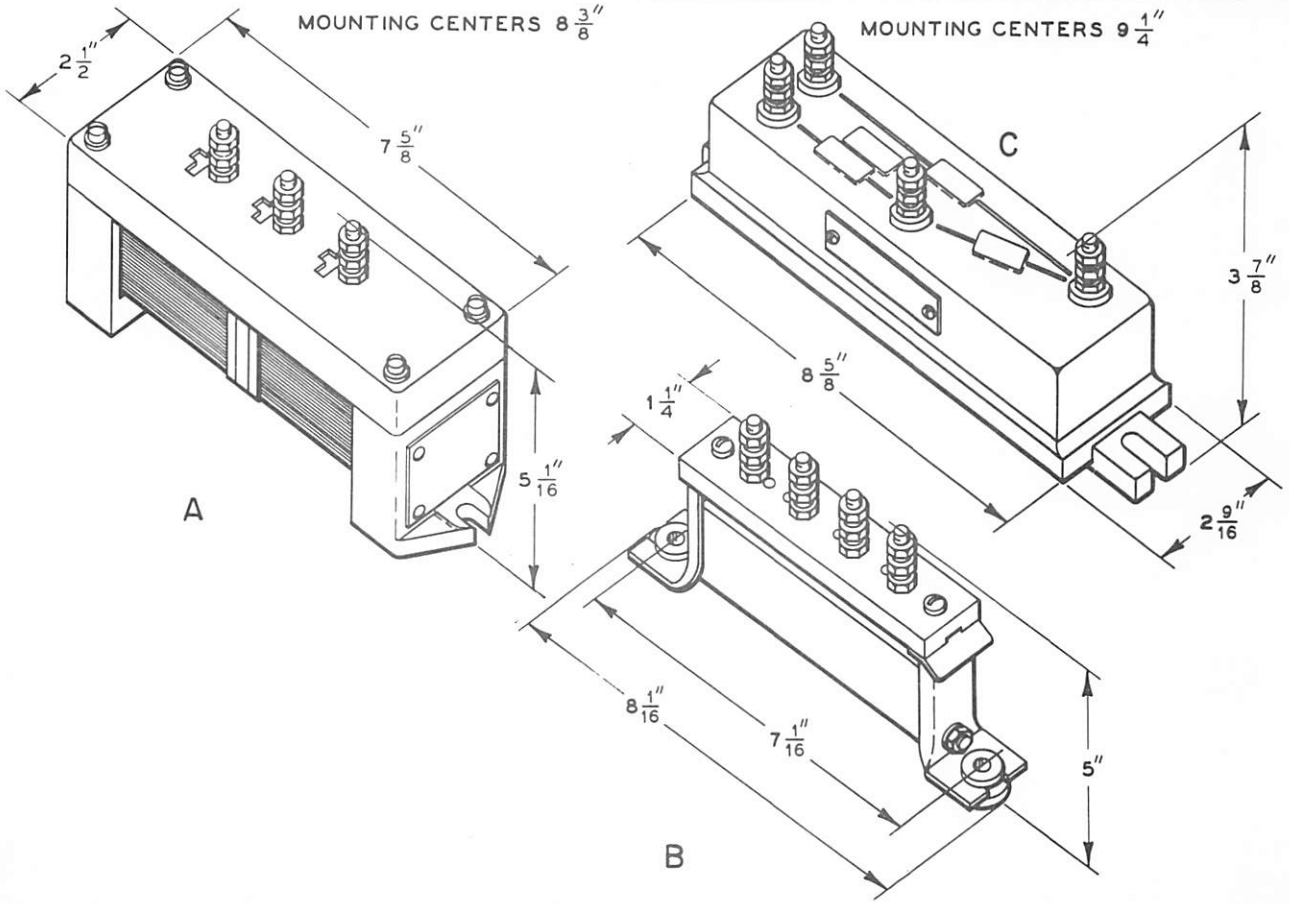
BALANCING IMPEDANCE and HEAVY-DUTY RESISTORS

The balancing impedance, Ref. A, is for use with a-c track relays on single-rail track circuits on electric traction lines employing direct-current for propulsion. The combination of this balancing impedance and the two track windings on the relay neutralizes the magnetic effect due to the direct current flowing through the track windings.

The heavy-duty resistor Ref. B is for use with single-rail track circuits using impedance bonds Capacity is 28 watts for 75° C. temperature rise.

Ref. C is for use with two-rail track circuits using impedance bonds. Capacity is 50 watts for 75° C. temperature rise.

REF.	NAME	CATALOG NUMBER
A	BALANCING IMPEDANCE, for 25 or 60 cycle	A3-117
B	RESISTOR, 2.5 ohms, with taps at 1.5; 0.5 and 0.5	A3-207
C	RESISTOR, 0.4 ohms, with taps at 0.1, 0.1 and 0.2	A3-113
C1	As above, except 0.8 ohms, with taps at 0.2, 0.2 and 0.4	A3-114
C2	Same as Ref. C, except 0.3 ohms, with taps at 0.1, and 0.2 (center tap omitted)	A3-115



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CATALOG SECTION A03

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ACCESSORIES

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A3-105	24745-14		TOOL	11
A3-113	32625-1		RESISTOR	12
A3-114	32625-2		RESISTOR	12
A3-115	32625-3		RESISTOR	12
A3-117	42960-1GR1		IMPEDANCE	12
A3-123	46048-21GR4		TERM BLOCK	3
A3-125	46048-22GR4		TERM BLOCK	3
A3-127			TERMINAL BLOCK COMP DWG 46048-23 GR5	
	01251-4	2	KIT-Z	
	5971-19GR1		BLOCK	
	43587-6	6	CONN TERM BLK	
A3-129			TERM. BLOCK	3
	56140-17		TERM. BLOCK	
	1225-2	36	WASHER	
	42843-1	24	NUT	
A3-130			BLOCK COMP 4 WAY DWG 46048-23 GR8	
	01251	2	KIT-Z	
	01251-3		KIT-Z	
	5971-19GR4		BLOCK	
	43587-6	4	CONN TERM BLK	
A3-135	46450-17GR1		RESISTOR	5
A3-136	46450-17GR4		RESISTOR	5
A3-141	46450-18GR3		RESISTOR	5
A3-148	46450-20GR6		RESISTOR	5
A3-155	46450-21GR1		RESISTOR	5
A3-156	46450-21GR2		RESISTOR	5
A3-157	46450-21GR3		RESISTOR	5
A3-158	46450-21GR4		RESISTOR	5
A3-159	46450-21GR5		RESISTOR	5
A3-160	46450-21GR6		RESISTOR	5
A3-161	46450-21GR7		RESISTOR	5
A3-165	46450-22GR1		RESISTOR	5
A3-166	46450-22GR2		RESISTOR	5
A3-177	46450-23GR1		RESISTOR	5
A3-178	46450-23GR2		RESISTOR	5
A3-179	46450-23GR3		RESISTOR	5
A3-183	24745-2		TOOL	11
A3-185	50037-4GR2		FUSE BLOCK	3
A3-190			RESISTOR	6
	53587-1		RESISTOR	
	46048-28GR2		TERM BLOCK	
A3-191			RESISTOR	6
	53587-2		RESISTOR	
	46048-28GR2		TERM BLOCK	
A3-192			RESISTOR	6
	53587-3		RESISTOR	
	46048-28GR2		TERM BLOCK	
A3-193			RESISTOR	6
	53587-4		RESISTOR	
	46048-28GR2		TERM BLOCK	
A3-195			RESISTOR	6
	53587-9		RESISTOR	
	46048-28GR2		TERM BLOCK	
A3-196			RESISTOR	6
	53587-10		RESISTOR	
	46048-28GR2		TERM BLOCK	
A3-198			RESISTOR	6
	53587-16		RESISTOR	
	46048-28GR2		TERM BLOCK	
A3-202	53615 GR1		SWITCH	3
A3-203	53615-3GR1		SWITCH	3
A3-207	55293		RESISTOR	3
A3-214			RESISTOR	6
	55592-5		RESISTOR	
	46048-22GR8		TERM BLOCK	
A3-215			RESISTOR	6
	55592-6		RESISTOR	
	46048-22GR8		TERM BLOCK	
A3-216			RESISTOR	6
	55592-7		RESISTOR	
	46048-22GR8		TERM BLOCK	
A3-235			RESISTOR	6
	56086-1		RESISTOR	
	46048-28GR2		TERM BLOCK	
A3-236			RESISTOR	6
	56086-4		RESISTOR	
	46048-28GR2		TERM BLOCK	
A3-250	56490 GR1		SWITCH	3
A3-255			ARRESTER	6
	56937-21		ARRESTER	
	46048-22GR8		TERM BLOCK	

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ACCESSORIES

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A3-256			ARRESTER	6
	56937-23		ARRESTER	
	46048-22GR8		TERM BLOCK	
A3-257			ARRESTER	6
	56937-28		ARRESTER	
	46048-22GR8		TERM BLOCK	
A3-258			ARRESTER	6
	56937-32		ARRESTER	
	46048-22GR8		TERM BLOCK	
A3-259			ARRESTER	6
	56937-36		ARRESTER	
	46048-28GR2		TERM BLOCK	
A3-265			RESISTOR	6
	57831-17GR1		RESISTOR	
	46048-22GR8		TERM BLOCK	
A3-267			RESISTOR	6
	57831-17GR3		RESISTOR	
	46048-22GR8		TERM BLOCK	
A3-297			RESISTOR	6
	58878-1		RESISTOR	
	46048-22GR8		TERM BLOCK	
A3-298			RESISTOR	6
	58878-2		RESISTOR	
	46048-22GR8		TERM BLOCK	
A3-300	5971-44		BLOCK	3
A3-301	58862-3		SWITCH	3
A3-302	58863		SWITCH	3
A3-303	46450-22GR10		RESISTOR	3
A3-304	42560-76GR1		MTG ASSEMBLY	6
A3-305	42812-30		MOUNTING PLATE	6
A3-306	24745-65		TOOL CRIMPING	11
A3-307	24745-104		TOOL CRIMPING	11
A3-308	57818 GR1		CONNECTOR	15
A3-309	18577 GR1		RESISTOR F/SHUNT CONN	15

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CATALOG SECTION A03

CROSS - INDEX

ACCESSORIES

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
P3-101	073-2		WASHER	15
P3-102	074-1		WASHER	15
P3-103	0231		SCREW	15
P3-105	0290-1		NUT	15
P3-107	4906-6		CONNECTOR	9
P3-108	4906-21		CONNECTOR	9
P3-109	4906-34		CONNECTOR	9
P3-110	5656-38		WASHER	15
P3-112	5656-67		WASHER	15
P3-126	29288-1		CONNECTOR	9
P3-127	29493-1		BUTTON	9
P3-128	29493-16		BUTTON	9
P3-136	46684-1		TAG	9
P3-140	38922-15		ROD	11
P3-141	38922-20		ROD	11
P3-142	38922-22		ROD	11
P3-143	38922-23		ROD	11
P3-144	38922-25		ROD	11
P3-148	43587-7		CONNECTOR	9
P3-151	46499		WASHER	11
P3-152	47474		SHIELD	9
P3-153	47474-9		SHIELD	9
P3-154	47474-10		SHIELD	9
P3-159	53587-1		RESISTOR	6
P3-160	53587-2		RESISTOR	6
P3-161	53587-3		RESISTOR	6
P3-162	53587-4		RESISTOR	6
P3-164	53587-9		RESISTOR	6
P3-165	53587-10		RESISTOR	6
P3-167	53587-16		RESISTOR	6
P3-179	54870-1		FUSE	7
P3-180	54870-3		FUSE	7
P3-181	54870-6		FUSE	7
P3-182	54870-10		FUSE	7
P3-183	54870-15		FUSE	7
P3-184	54870-20		FUSE	7
P3-187	55083		TERMINAL	9
P3-194	55592-5		RESISTOR	6
P3-195	55592-6		RESISTOR	6
P3-196	55592-7		RESISTOR	6
P3-228	56086-1		RESISTOR	6
P3-229	56086-4		RESISTOR	6
P3-235	56086-19 (SEE P85)		RESISTOR	127
P3-236	56449		FUSETRON	7
P3-241	56449-5		FUSETRON	7
P3-244	56449-8		FUSETRON	7
P3-246	56449-10		FUSETRON	7
P3-248	56449-12		FUSETRON	7
P3-249	56449-13		FUSETRON	7
P3-252	56937-21		ARRESTOR	7
P3-253	56937-23		ARRESTOR	7
P3-254	56937-28		ARRESTOR	7
P3-255	56937-32		ARRESTOR	7
P3-256	56937-36		ARRESTOR	7
P3-259	57831-17GR3		RESISTOR	6
P3-305	59539-405		TAG	9
P3-306	59539-406		TAG	9
	59539-405		TAG	
P3-308	59688		EXTRACTOR	11
P3-309	59825-30		TERMINAL	11
P3-310	59825-109		TERMINAL	11
P3-311	59825-52		TERMINAL	11
P3-312	59825-55		TERMINAL	11
P3-313	59825-120		TERMINAL	11
P3-314	56937-45		ARRESTER LINE	7
P3-316	59688-8		TOOL	
P3-317	59688-12GR1		EXTRACTOR	11
P3-318	59688-6		EXTRACTOR	11
P3-319	56622-1GR1		TOOL	11
P3-320	55393-3GR1		WRENCH	11
P3-321	55243-8		GROMMET	7
P3-322	59825-135		TERMINAL	9
P3-323	59825-136		TERMINAL	9
P3-324	44720-1GR1		CONNECTOR COMP	9
P3-325	44720-1GR2		CONNECTOR COMP	9
P3-326	55871-74		TERMINAL CRIMP #16-20	9
P3-327	55871-98		TERMINAL	15
P3-328	42843-14		NUT	15
P3-329	578-39		NUT	15
P3-330	53938-2		BELL	15
P3-331	53938-11		BELL	15
P3-332	31888-9		BUZZER	15
P3-333	55029-25	125	PAPER	16
P3-334	55029-26	126	PAPER	16

CATALOG SECTION A03

CROSS - INDEX

ACCESSORIES

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
P3-335			ROLL PAPER	16
	55029-27	126	ROLL PAPER	
P3-336			PAPER	
	55029-28	126	PAPER	
P3-337			ROLL PAPER	16
	55029-29	126	PAPER	
P3-338			ROLL PAPER	16
			P03-0338	
	55029-30	126	PAPER	
P3-339			ROLL PAPER	16
	55029-31	116	PAPER	
P3-340			PAPER	16
	55029-32	116	PAPER	
P3-341			ROLL PAPER	16
	55029-33	242	PAPER	
P3-342			ROLL PAPER	16
	55029-35	242	PAPER	
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P3-344			PAPER	16
	55029-37	250	PAPER	
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CATALOG SECTION 5

Modular Steel and Aluminum Instrument Cases with Adjustable Fixtures

CONTENTS

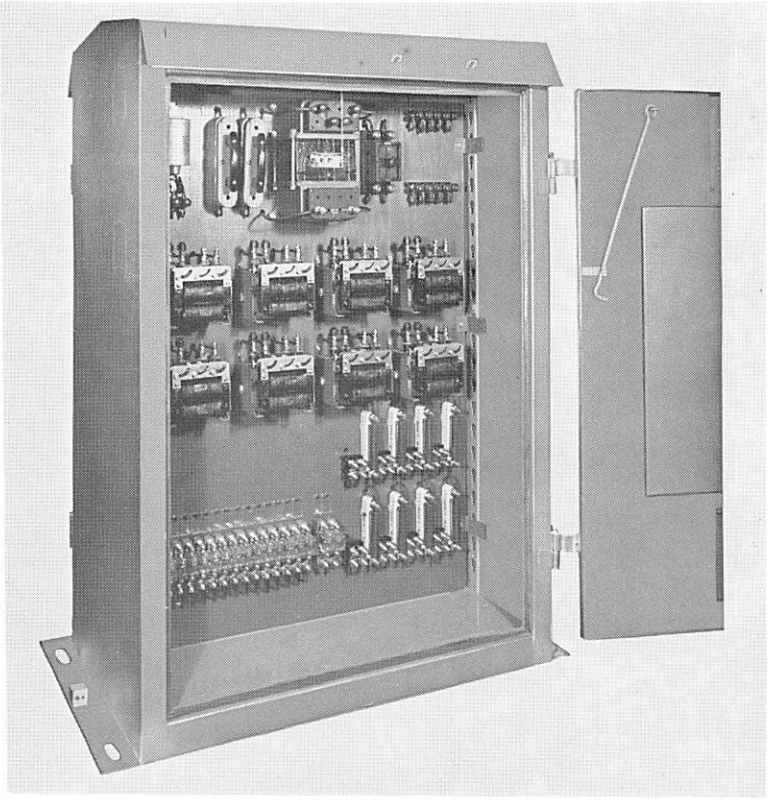
	Page
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Low-Single Case, Aluminum	6
High-Single Case, Steel	4
High-Single Case, Aluminum	6
Low-Double Case, Steel	4
Low-Double Case, Aluminum	7
High-Double Case, Steel	5
High-Double Case, Aluminum	7
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Half Case, Steel	8
Half Case, Aluminum	9
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Typical Arrangement for Type B Relays	17-18
Adjustable Fixtures	19-22
Replacement Parts	23

GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL
ROCHESTER NEW YORK 14602

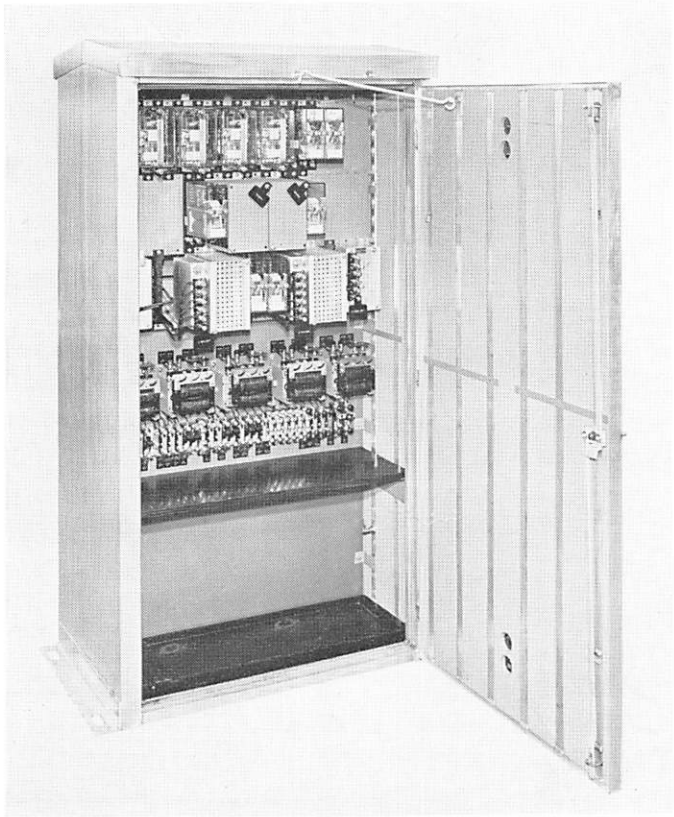
A-1394

PRINTED IN U.S.A.

October 1975



Low-single modular steel case.



High-single modular aluminum case.

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Modular Steel and Aluminum Instrument Cases with Adjustable Fixtures

GENERAL INFORMATION

These instrument cases have permanently installed keyhole channels to provide for flexibility in arranging fixtures, relay shelves, backboards, etc. (See pages 11-22 for ordering fixtures.)

Cases will be furnished lined with 1/2" thick insulating board.

Front and rear doors are equipped with handles for padlocking. Doors are replaceable, and are gasketed to ensure a tight seal between door and case. Door hooks are provided to hold the doors open at 90 and 160 degrees.

Grounding can be provided with a standard ground post, installed in the keyhole channel, to permit external connections where desired.

A mounting bracket for pull-chain light socket is provided in all cases, except in one-door steel cases.

All cases, except one-door steel cases, are available with hardware for mounting Type B relays. (See illustrations for case capacities.) The one-door cases may be used for any type of shelf - or wall-mounted apparatus.

STEEL INSTRUMENT CASES

Constructed of heavy-gauge steel, cases are strong, durable, and corrosion resistant.

Low- and high-single; low- and high-double; and high-triple cases are furnished with eight knockouts, four on each side, to which aerial couplings or maintainer-call lamp can be attached in the field. One-door cases have two knockouts, one on each side.

Reversible, louver-type ventilators are provided in each door. Ventilators can be opened or closed by inverting the louver on the inside of the door. Doors are furnished with latch rods.

The floor of each low-single and high-single case is fitted with a removeable steel plate. Each plate has six knockouts for cable entrances, 3-9/16" in diameter. Low-double and high-double cases have two plates, one on each side, high-triple cases have three plates. Plates can be reversed to alter the position of cable entrances in relation to the longitudinal centerline of the case. The plate of a half case has three knockouts, same size. One-door cases are available with choice of plates, as specified: a three-knockout plate or a plate with an elongated opening to fit couplings as used with pole-mounted cases.

ALUMINUM INSTRUMENT CASES

Fabricated of extruded parts, cases are of rugged construction, maintenance-free, and easily transportable. Their weight is approximately half that of equivalent size steel cases.

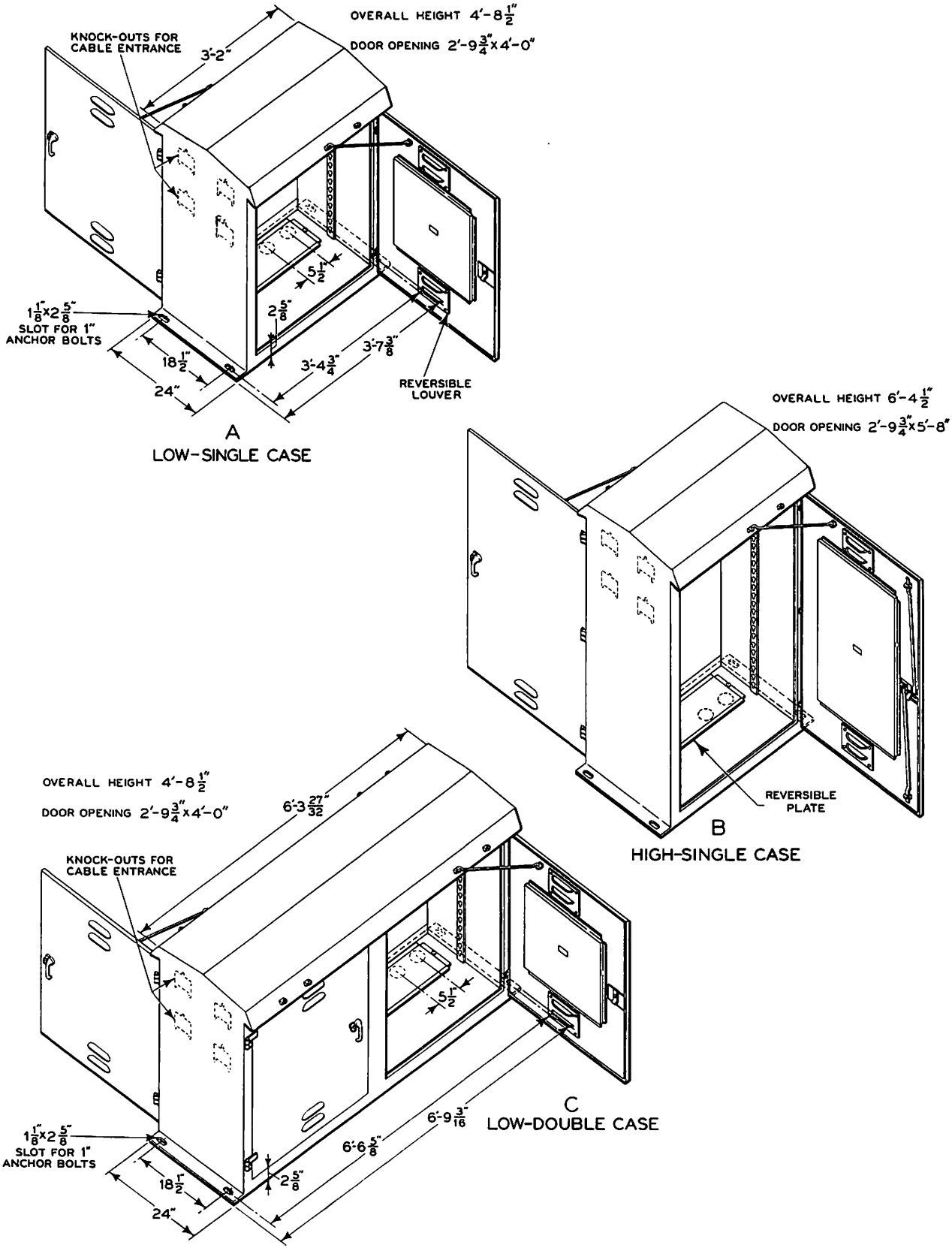
High-case doors are equipped with latch rods. Low-case doors have a single latch, as the extruded door members provide great rigidity. Nonclosable, louver-type ventilators are provided in each door.

These cases are provided with one covered opening on each side, to which aerial coupling or maintainer-call lamp can be attached in the field.

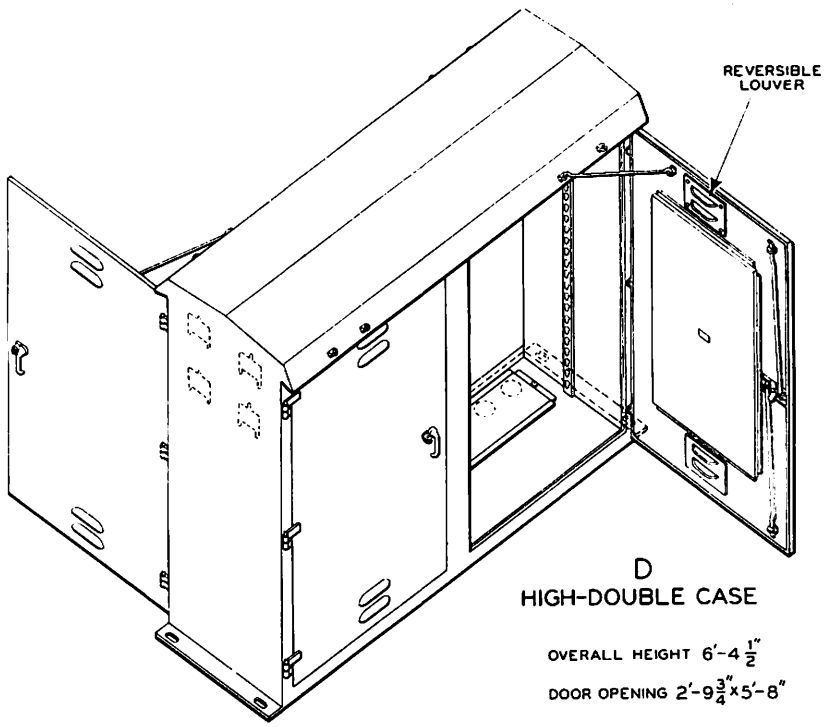
The floor of each low-single and high-single case is provided with three covered openings for cable entrances; these openings are 3-1/2" in diameter. Low-double and high-double cases have six covered openings.

Aluminum instrument cases are slightly larger than modular, steel instrument cases (See pages 6, 7 and 9 for sizes.)

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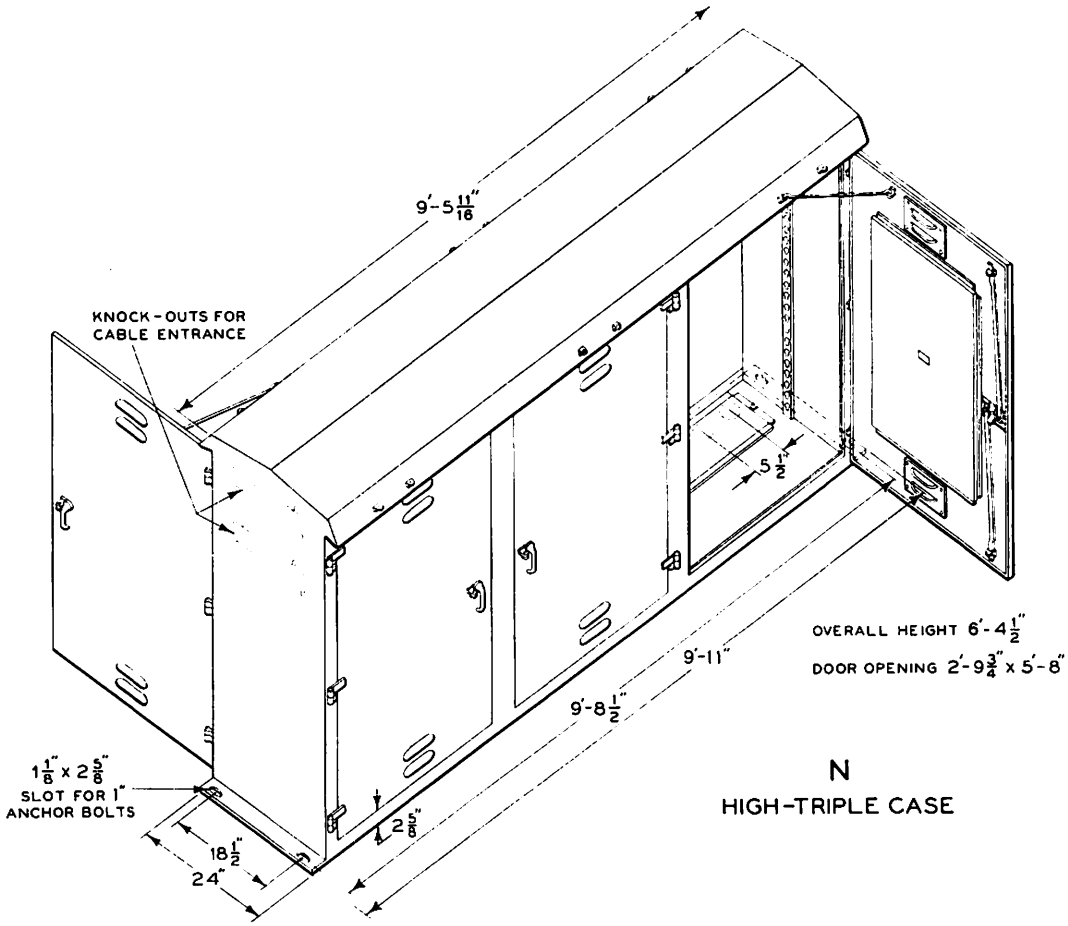


Modular steel instrument cases.



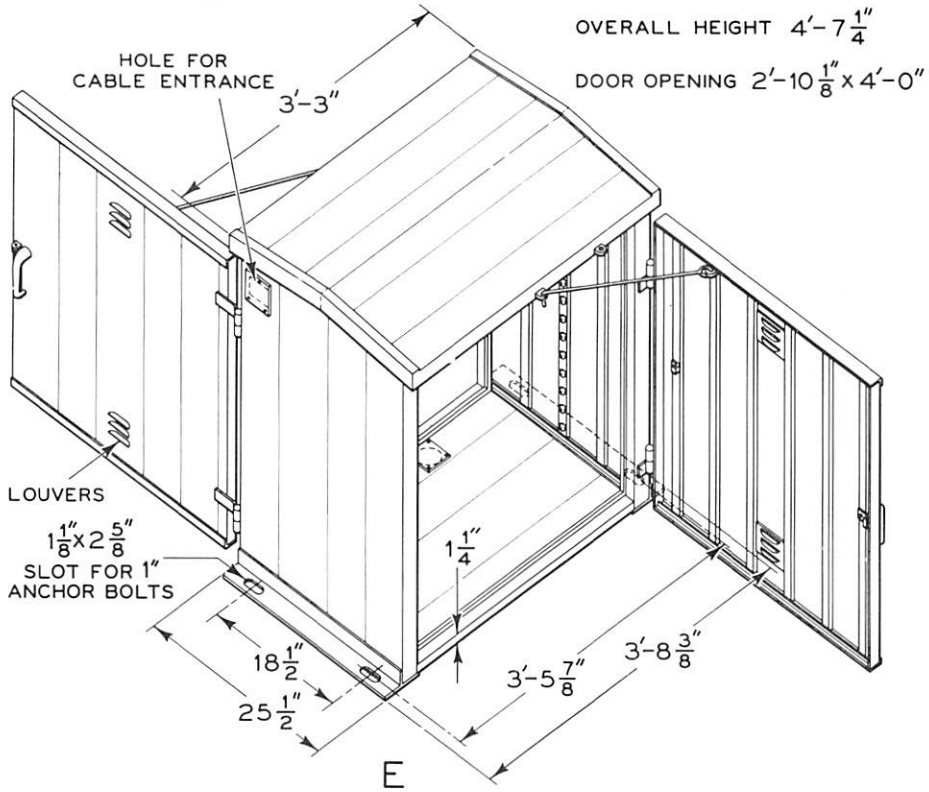
D
HIGH-DOUBLE CASE

OVERALL HEIGHT 6'-4 1/2"
DOOR OPENING 2'-9 3/4" X 5'-8"

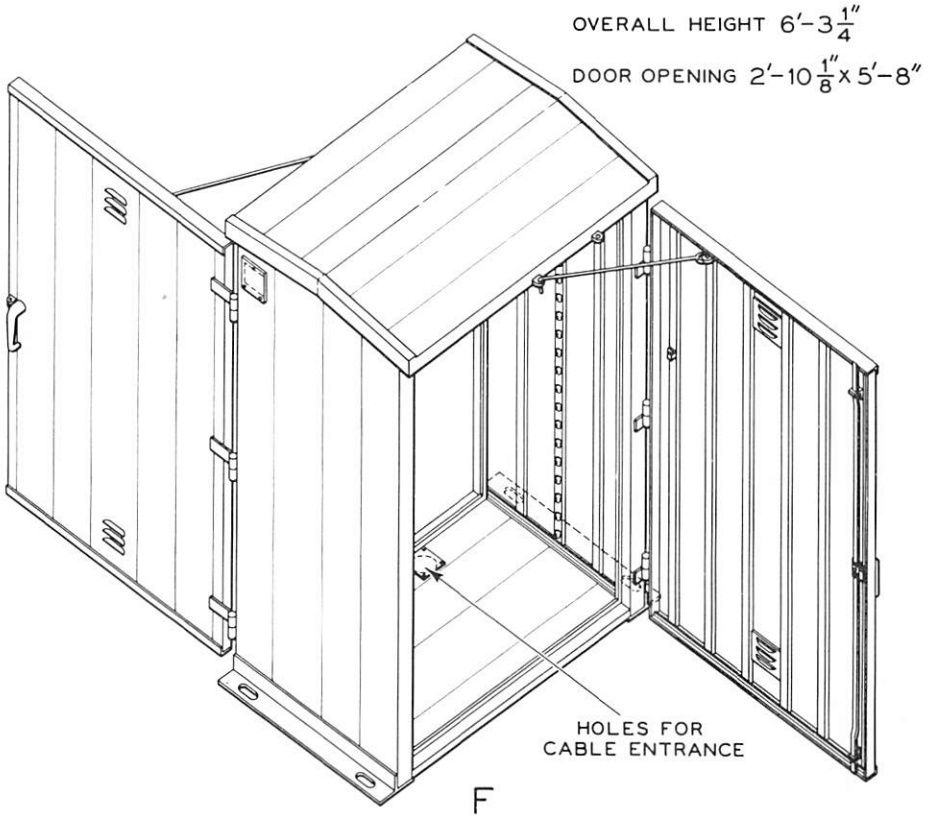


N
HIGH-TRIPLE CASE

Modular steel instrument cases.



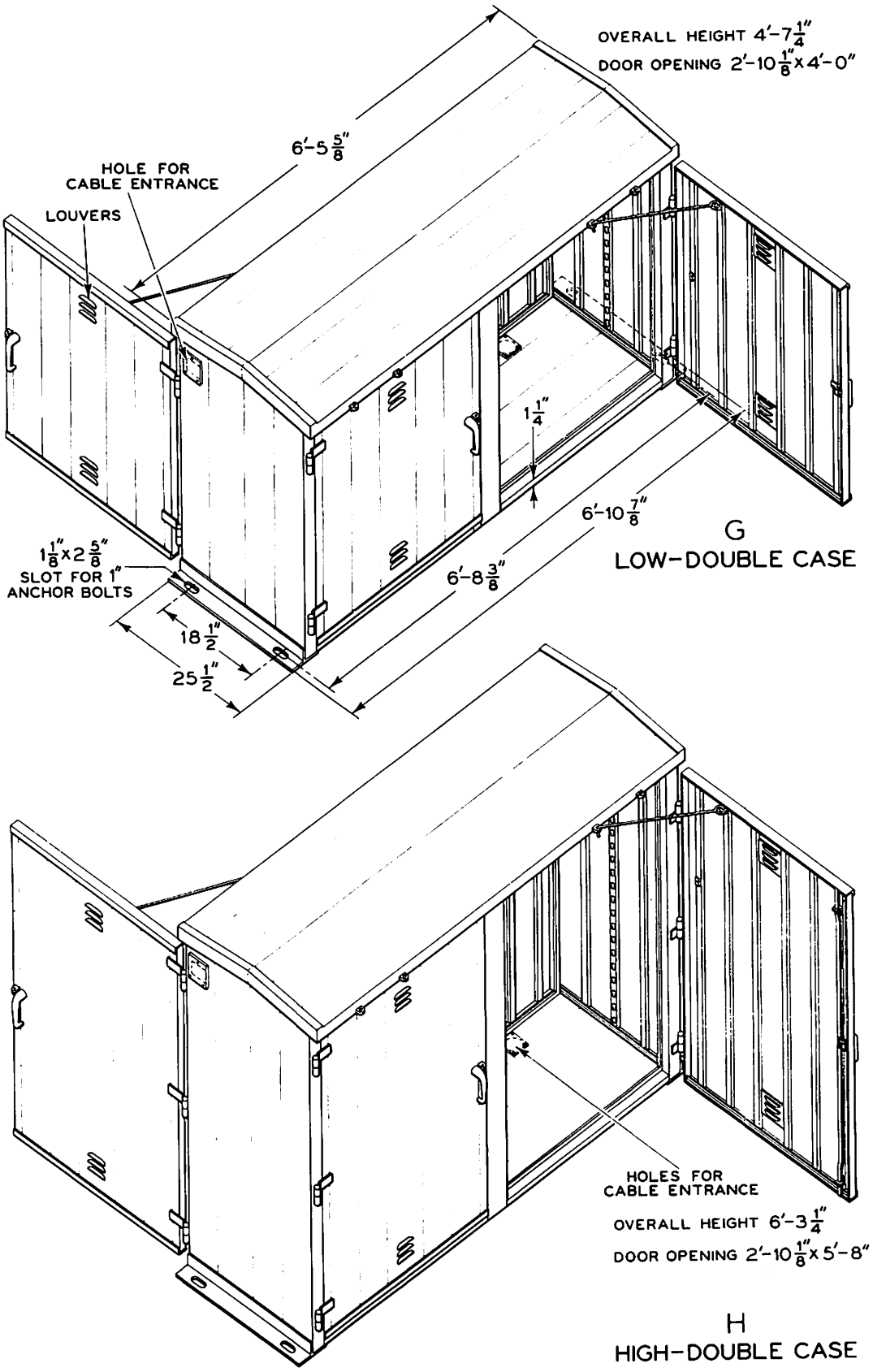
E
LOW-SINGLE CASE



F
HIGH-SINGLE CASE

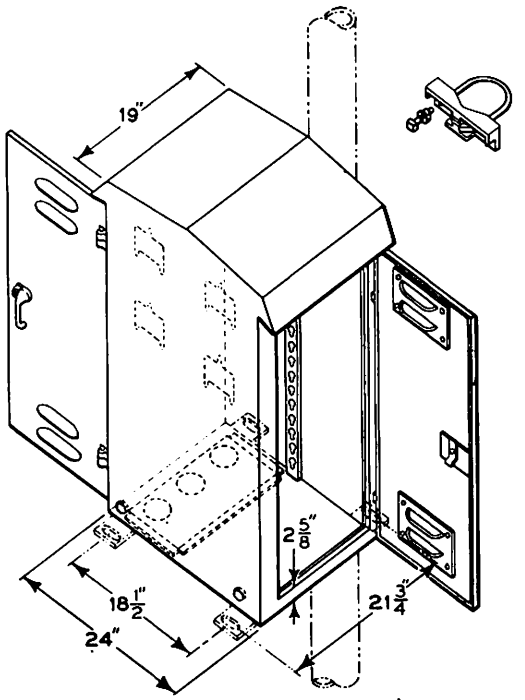
Modular aluminum instrument cases.

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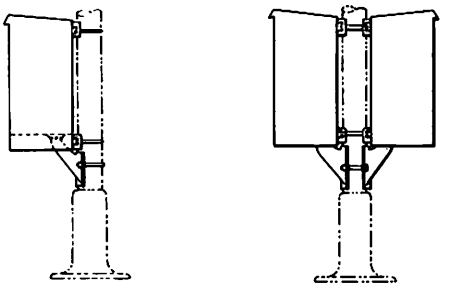
Modular aluminum instrument cases.

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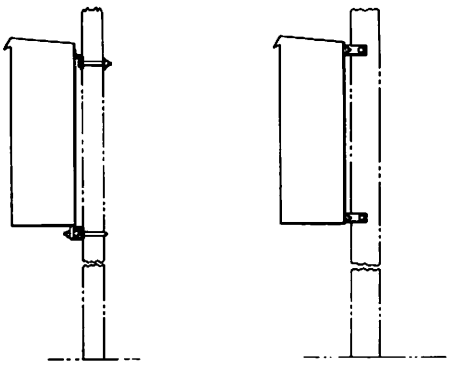


J
HALF CASE
STEEL

OVERALL HEIGHT 4'-8 1/2"
DOOR OPENING 14 3/4" X 4'-0"



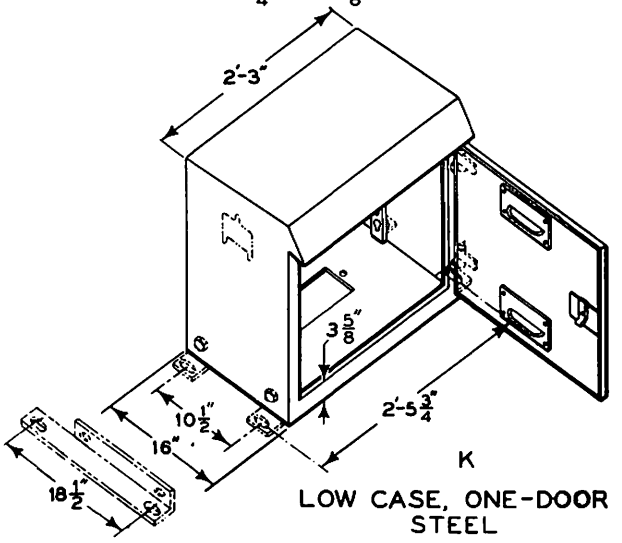
FOR MOUNTING ON METAL POLES
K AND M ONLY



FOR MOUNTING ON CONCRETE POLES
K AND M ONLY

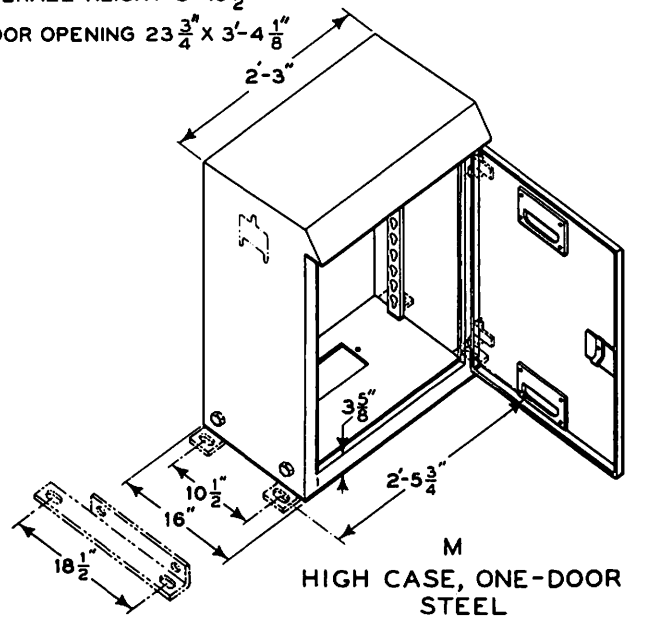
FOR BASE OR POLE MOUNTING – SEE
PAGES 19 & 20 FOR MOUNTING HARDWARE

OVERALL HEIGHT 2'-10 1/2"
DOOR OPENING 23 3/4" X 2'-4 1/8"



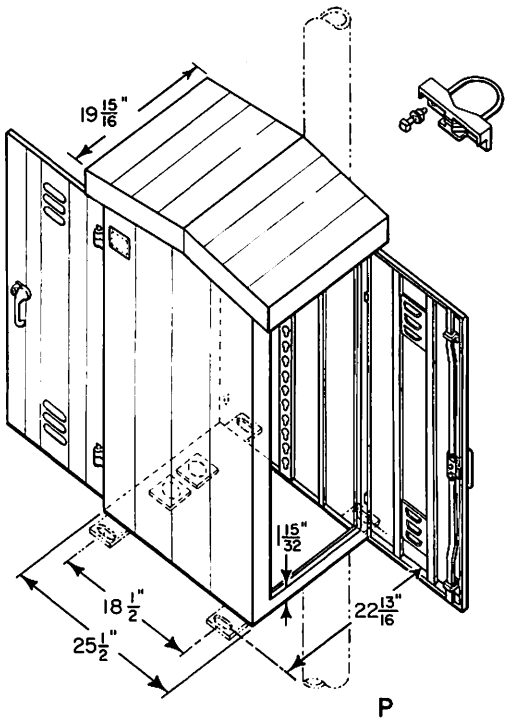
K
LOW CASE, ONE-DOOR
STEEL

OVERALL HEIGHT 3'-10 1/2"
DOOR OPENING 23 3/4" X 3'-4 1/8"



M
HIGH CASE, ONE-DOOR
STEEL

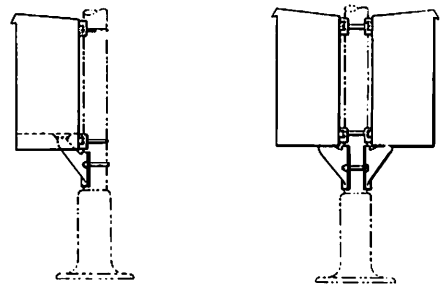
Modular steel instrument cases.



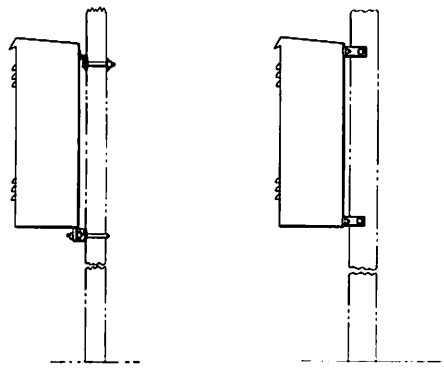
P
HALF CASE
ALUMINUM

OVERALL HEIGHT 4'-7 7/32"
DOOR OPENING 4'-0" x 15 1/16"

FOR BASE OR POLE MOUNTING-
SEE PAGES 19 AND 20 FOR
MOUNTING HARDWARE

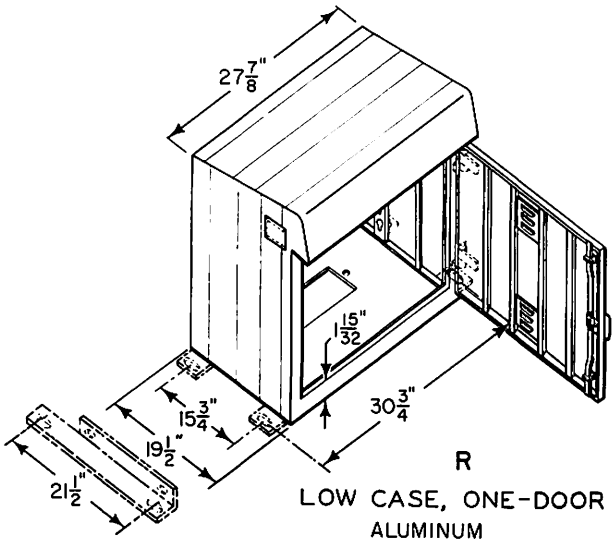


FOR MOUNTING ON METAL POLES
R AND S ONLY



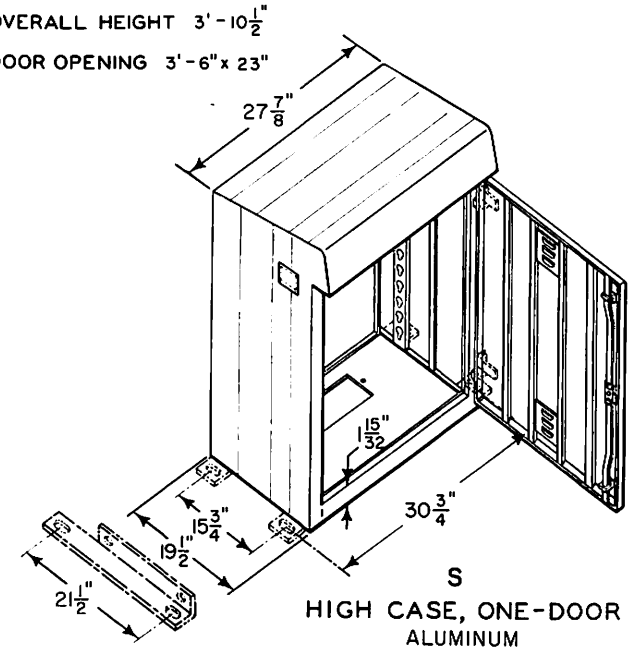
FOR MOUNTING ON CONCRETE POLES
R AND S ONLY

OVERALL HEIGHT 2'-11 1/2"
DOOR OPENING 2'-5" x 23"



R
LOW CASE, ONE-DOOR
ALUMINUM

OVERALL HEIGHT 3'-10 1/2"
DOOR OPENING 3'-6" x 23"



S
HIGH CASE, ONE-DOOR
ALUMINUM

Modular aluminum instrument cases.

MODULAR STEEL AND ALUMINUM CASES

NOTE: See general information on page 3. Cases are furnished as shown on pages 4-9, without fixtures. To order fixtures, see pages 11-24.

NAME	STEEL		ALUMINUM	
	CATALOG NUMBER	REF.	CATALOG NUMBER	REF.
LOW-SINGLE CASE	A5-102	A	A5-107	E
HIGH-SINGLE CASE	A5-112	B	A5-117	F
LOW-DOUBLE CASE	A5-122	C	A5-127	G
HIGH-DOUBLE CASE	A5-132	D	A5-137	H
HIGH-TRIPLE CASE	A5-135	N	--	--
THE FOLLOWING CASES MAY BE FOUNDATION OR POLE MOUNTED. ORDER MOUNTING HARDWARE FROM PAGES 19 AND 20.				
HALF CASE	A5-152	J	A5-157	P
LOW CASE, ONE-DOOR, see page 19 and specify plate Ref. V or W as req.	A5-162	K	A5-167	R
HIGH CASE, ONE-DOOR, see page 19 and specify plate Ref. V or W as req.	A5-172	M	A5-177	S

NOTE: IF IT IS DESIRED TO HAVE CASES SHIPPED WITH SHELVING AND FIXTURES INSIDE EACH CASE THEY ARE TO BE USED IN, PLEASE SO STATE ON ORDER. FOR EXAMPLE:

3 Low-Single Cases, A5-102, each to include the following:

2 Shelves	P5-150
1 Backboard	P5-100
1 Terminal Board Set	P5-105
1 Coupling Complete	P5-163

2 Low-Single Cases, A5-102, each to include the following:

1 Relay Support	P5-183
4 Relay Supports	P5-185
1 Coupling Complete	P5-163

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TYPICAL ARRANGEMENTS OF SHELVING AND BATTERY TRAYS

NOTE: The sketches shown on pages 11 to 15 illustrate a few of the many possible arrangements of backboards, terminal boards, shelves, battery trays and covers.

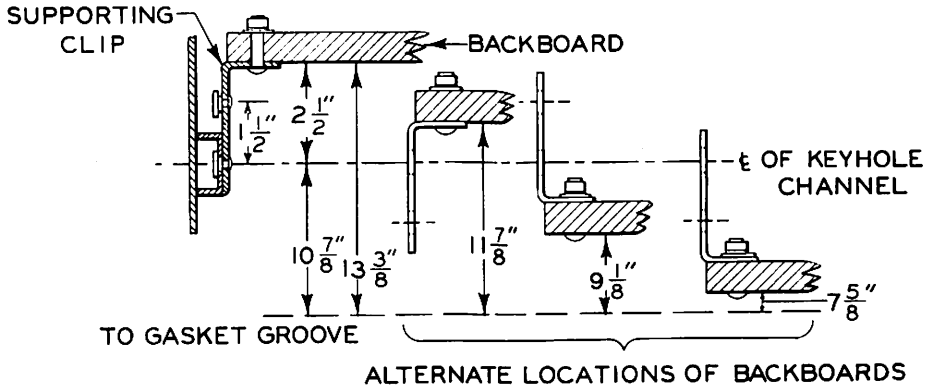
The backboard may be shifted from front to back by moving the supporting clips as illustrated below.

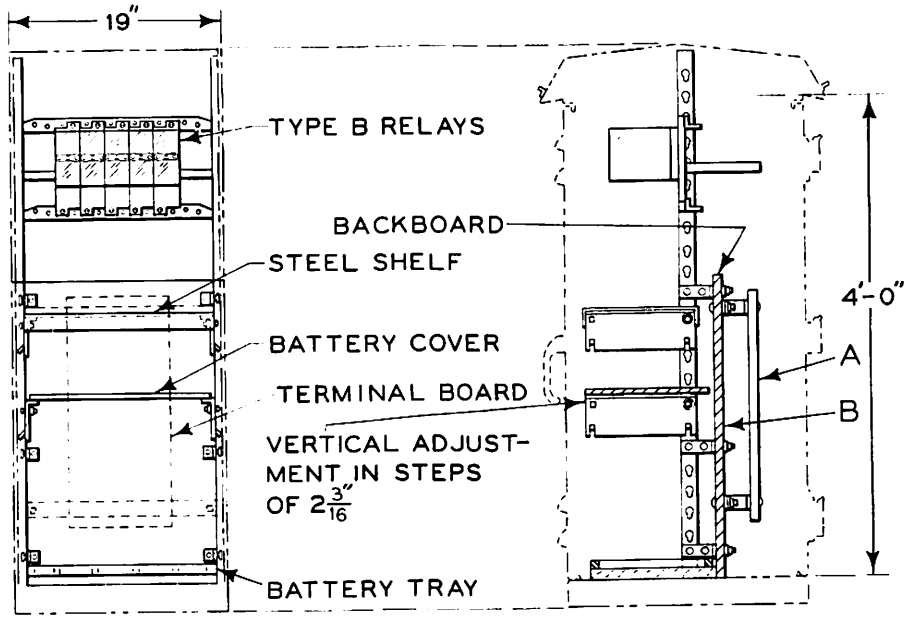
The vertical spacing of the shelves, trays, etc. may be varied in steps of 2-3/16".

See page 16 for ordering references for backboards and terminal boards.

See pages 19 and 20 for ordering references for detail parts.

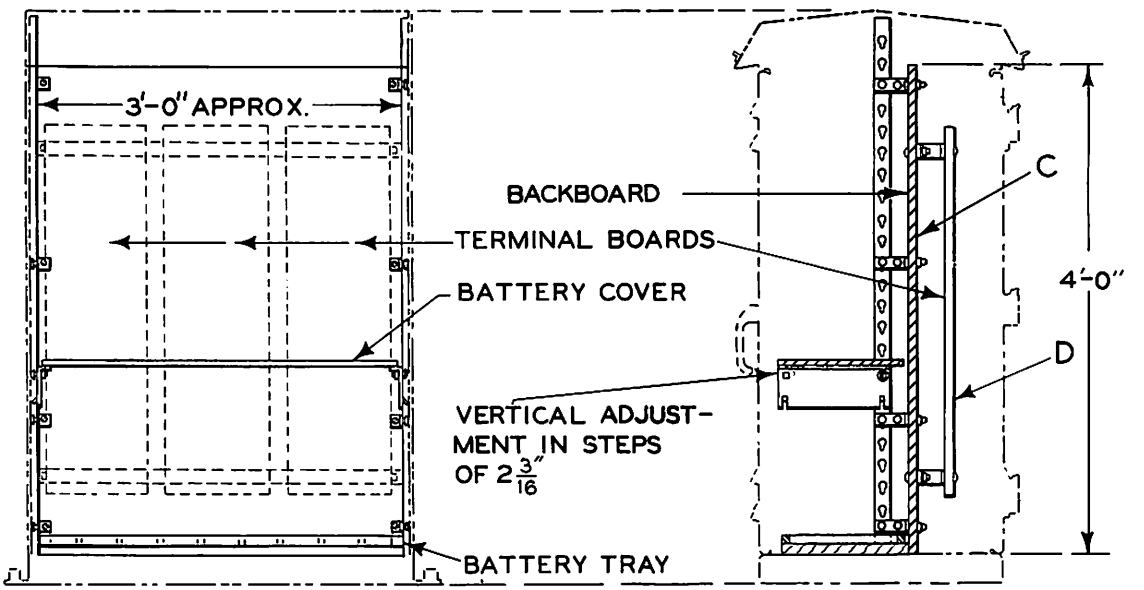
METHOD OF FASTENING BACKBOARD



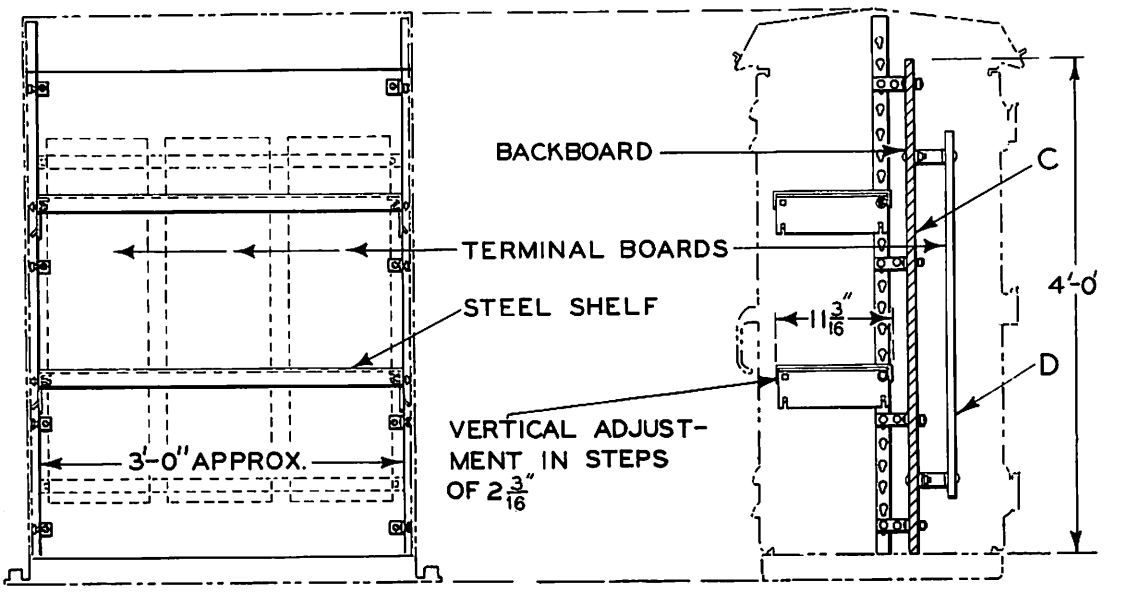


Half-case, five Type B1 relays, one steel shelf, one battery tray and cover (if shelf and battery fixtures are not used, maximum capacity for Type B1 relays is 25).

TYPICAL ARRANGEMENTS OF SHELVING AND BATTERY TRAYS



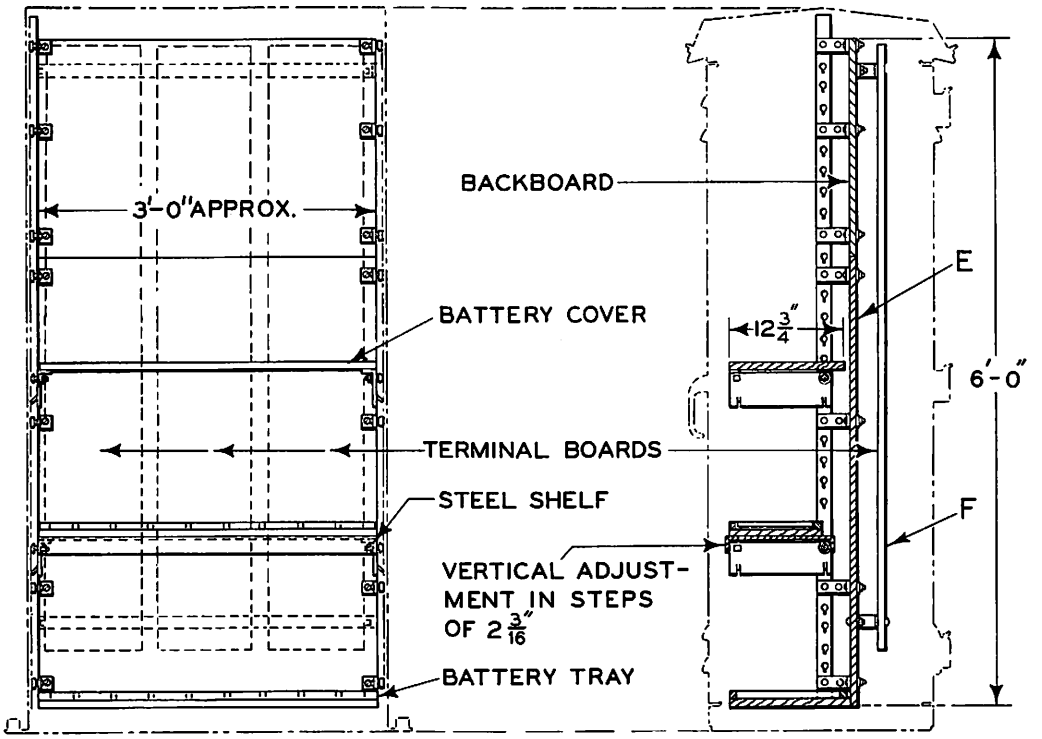
One tray and one cover for batteries.
Low-single case.



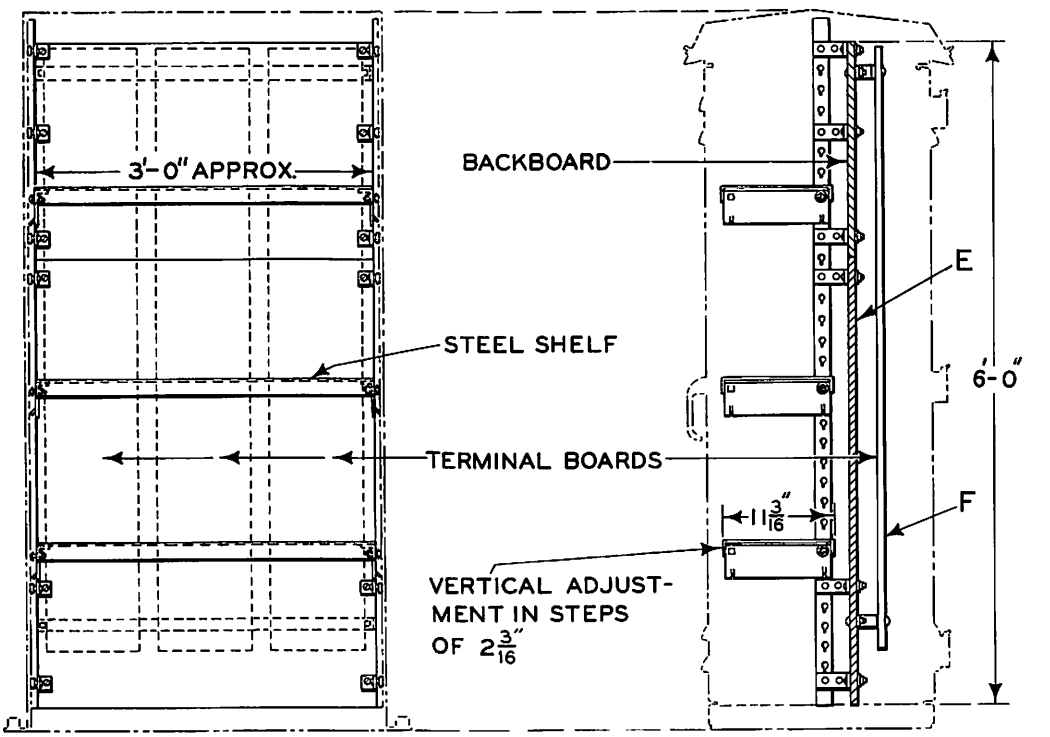
Two steel shelves.
Low-single case.

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TYPICAL ARRANGEMENTS OF SHELVING AND BATTERY TRAYS

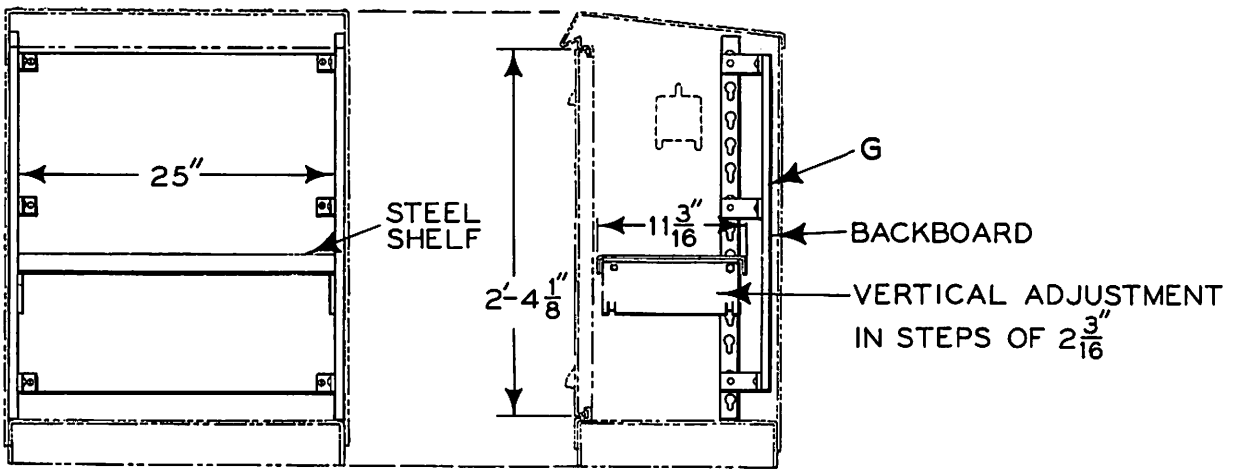


One steel shelf, two trays and one cover for batteries.
High-single case.

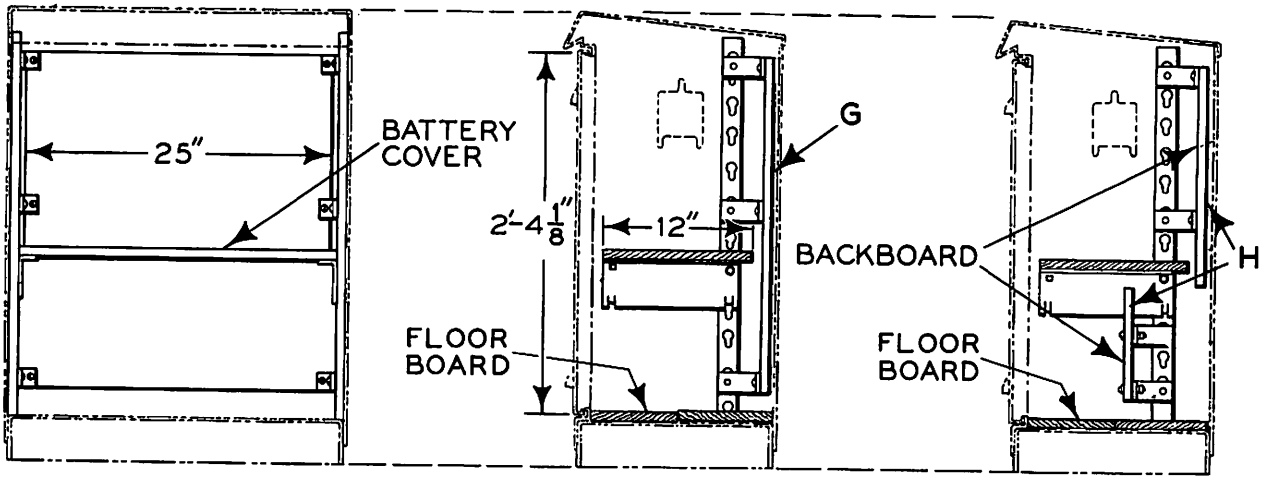


Three steel shelves.
High-single case.

TYPICAL ARRANGEMENTS OF SHELVING AND BATTERY TRAYS



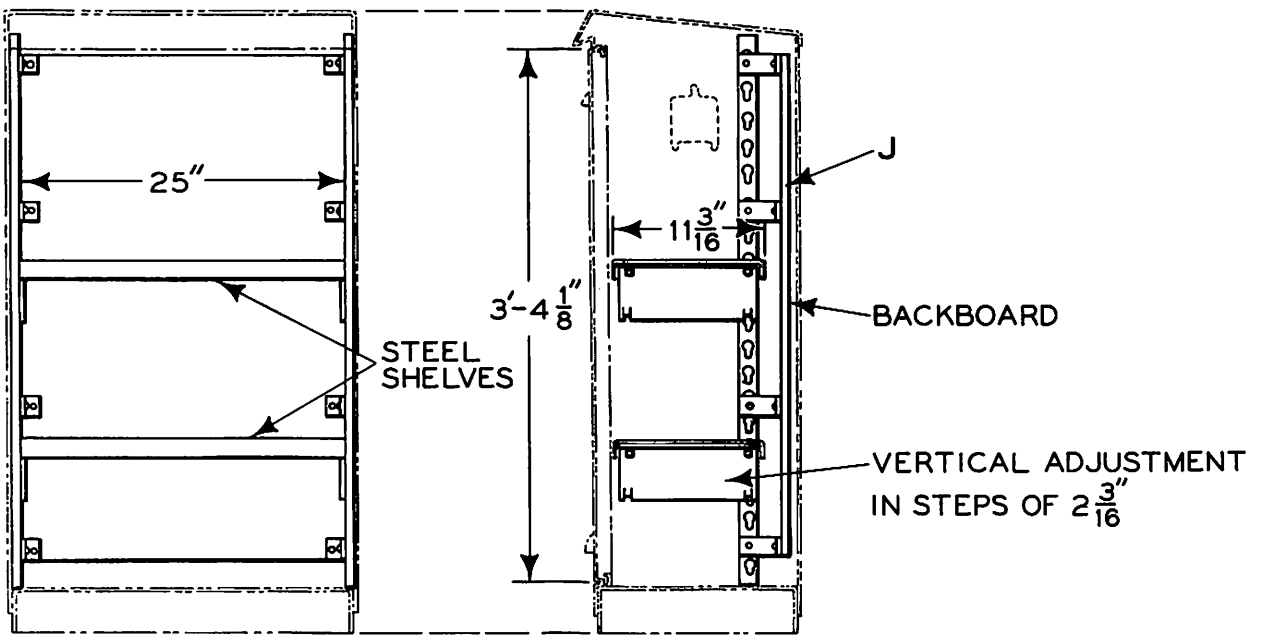
Steel shelf and backboard.
Low case, one-door.



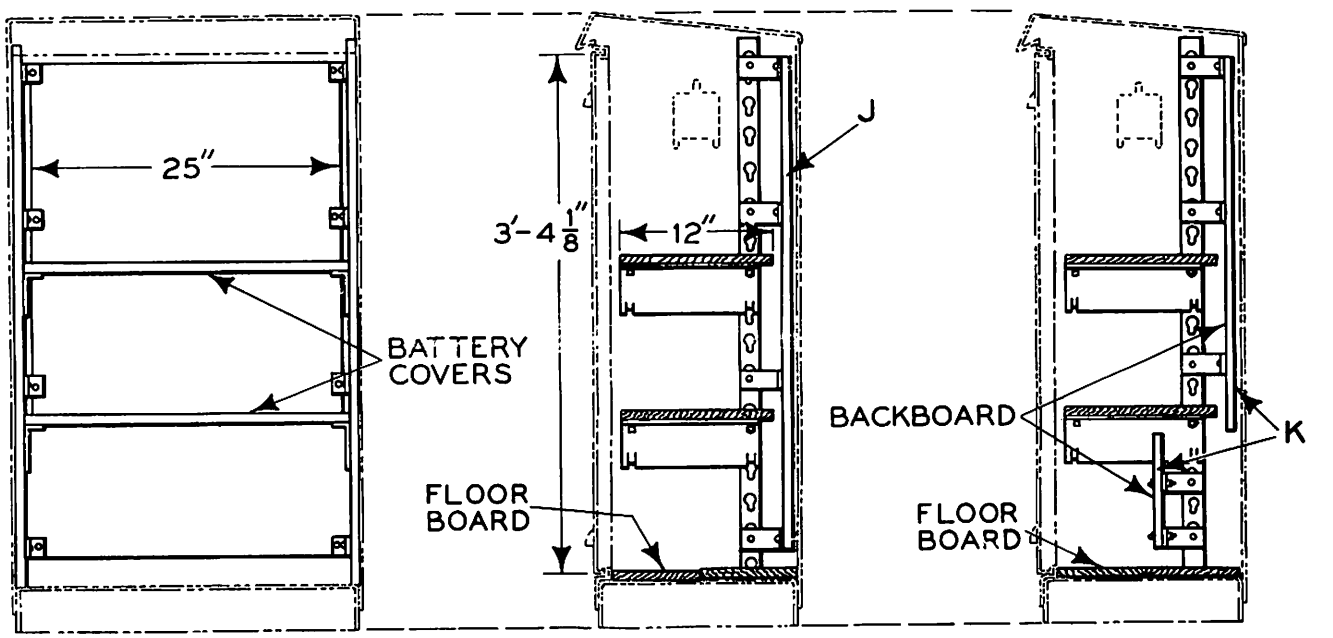
Cover board, floor boards and backboards.
Low case, one-door.

Signed by Israel Jones, texasrails.org 7/16/2026

TYPICAL ARRANGEMENTS OF SHELVING AND BATTERY TRAYS



Two steel shelves and backboard.
High case, one-door.



Cover boards, floor boards and backboards.
High case, one-door.

BACKBOARDS AND TERMINAL BOARD SETS

Order two of these items to equip a double case

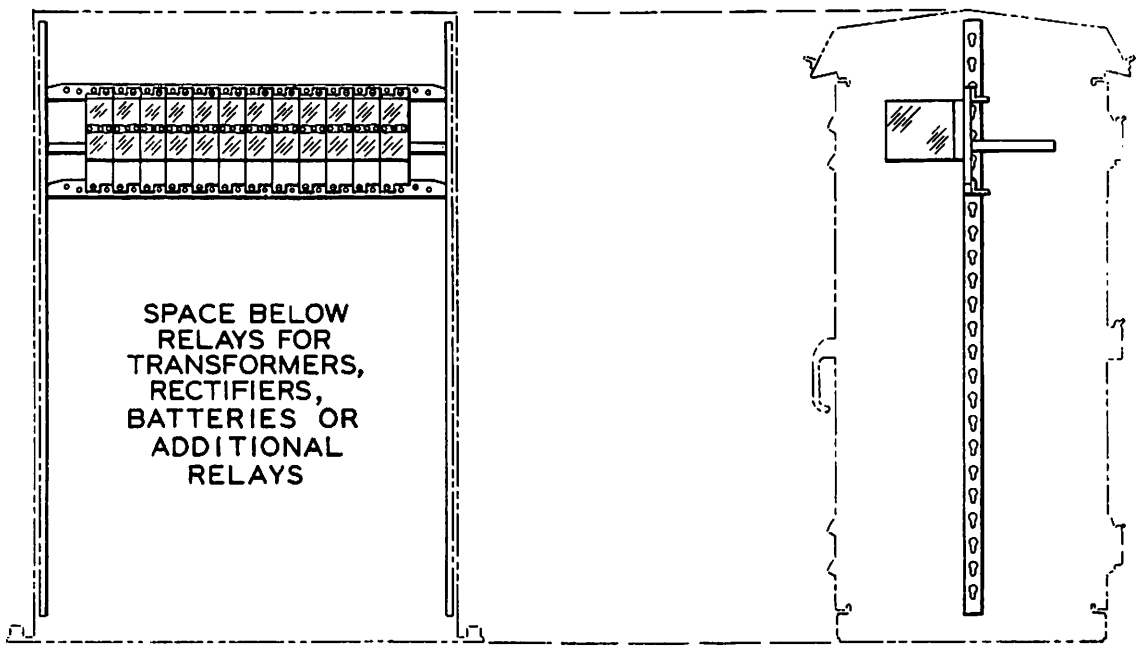
(Reference letters refer to illustrations on pages 11 through 15)

Order by catalog number and name shown in bold type

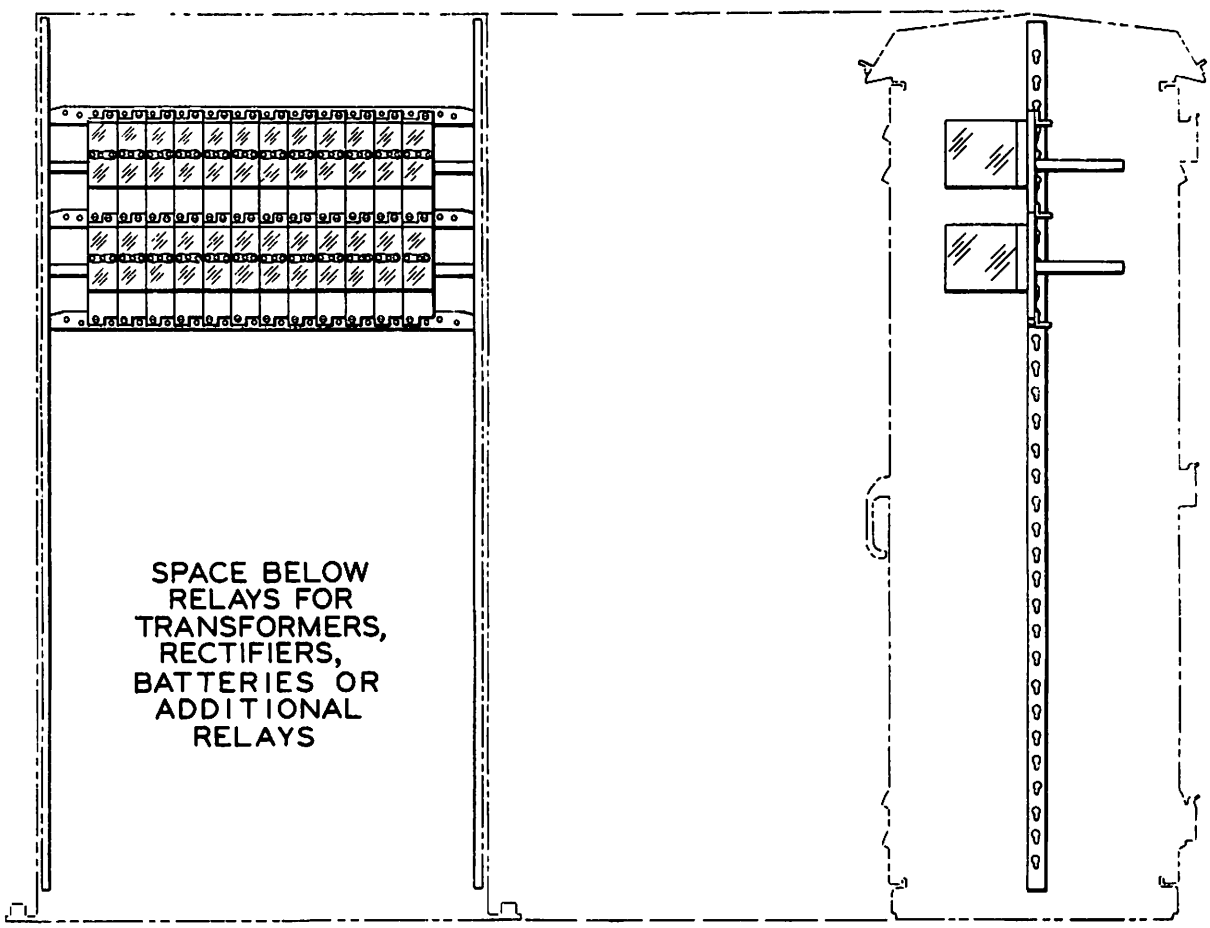
REF.	NAME	CATALOG NUMBER
A	TERMINAL BOARD SET, for half case, includes one 10" x 4'-0" board and mounting hardware	P5-107
B	BACKBOARD, for half case, includes mounting hardware.	P5-102
C	BACKBOARD, for low case, includes mounting hardware	P5-100
D	TERMINAL BOARD SET, for low case, includes three 10" x 4'-0" boards, and mounting hardware	P5-105
E	BACKBOARD, for high case, (two piece), includes mounting hardware	P5-101
F	TERMINAL BOARD SET, for high case, includes three 10" x 6'-0" boards and mounting hardware	P5-106
G	BACKBOARD, for low case, one-door, includes mounting hardware	P5-103
H	BACKBOARD, for low case, one-door, (two piece) includes mounting hardware.	P5-104
J	BACKBOARD, for high case, one-door, includes mounting hardware	P5-112
K	BACKBOARD, for high case, one-door, (two piece) includes mounting hardware	P5-113

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TYPICAL ARRANGEMENTS FOR TYPE B RELAYS

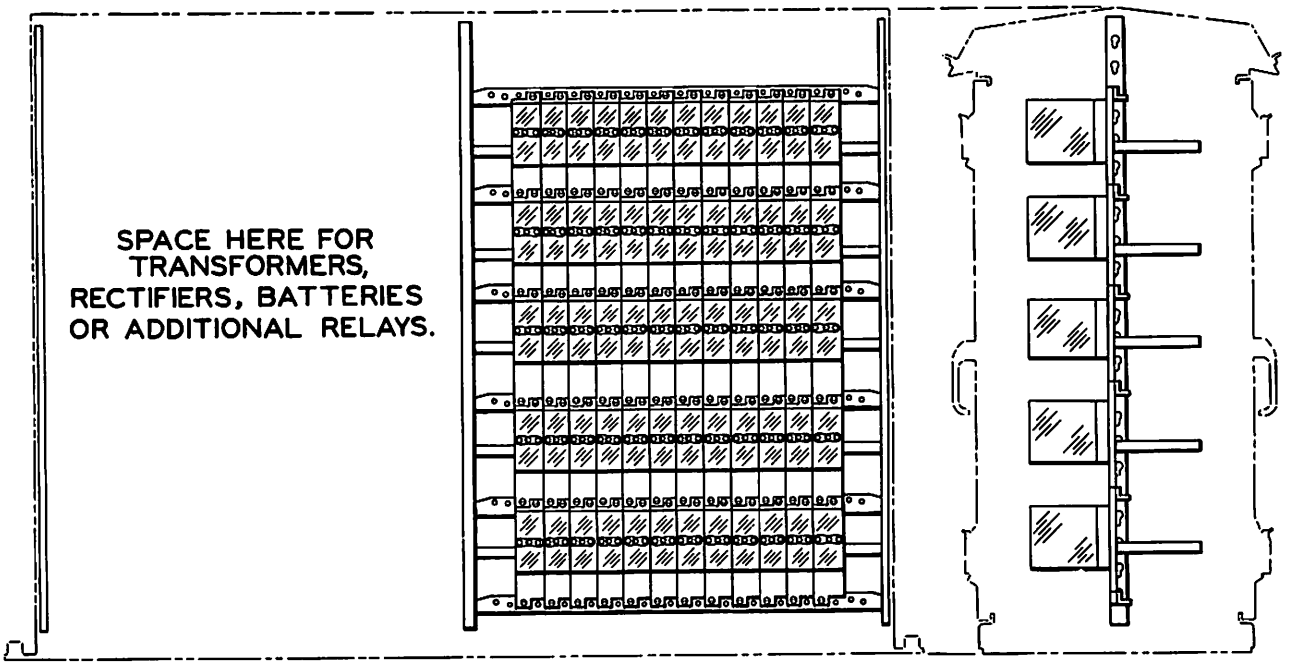


Low-single case (capacity 60 B1 relays, max. 12 per row)

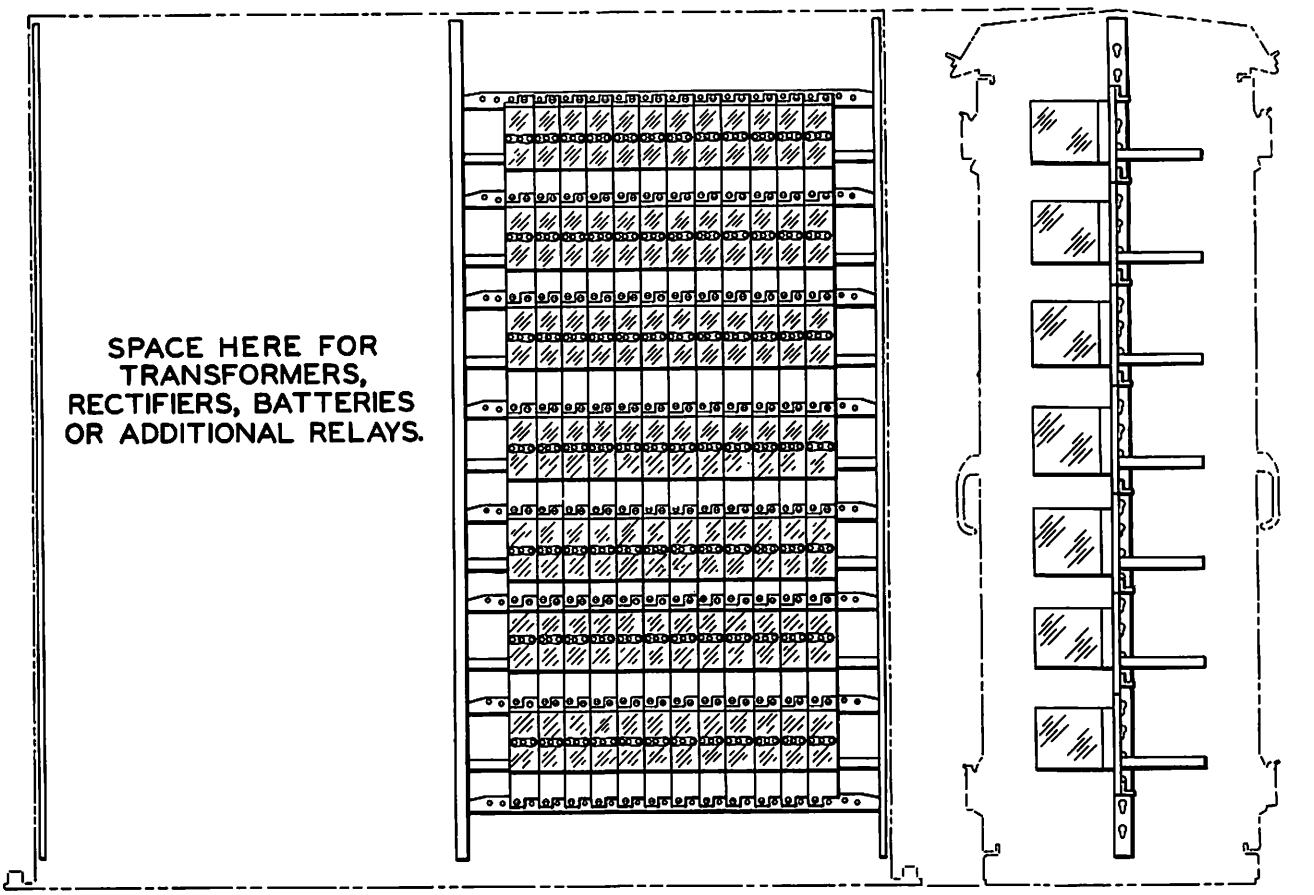


High-single case (capacity 84 B1 relays, max. 12 per row)

TYPICAL ARRANGEMENTS FOR TYPE B RELAYS



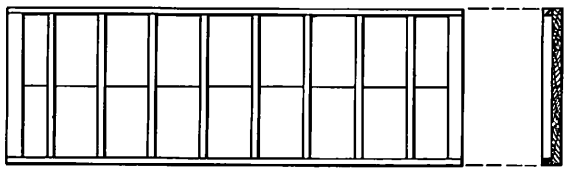
Low-double case (capacity 60 B1 relays per side, max. 12 per row)

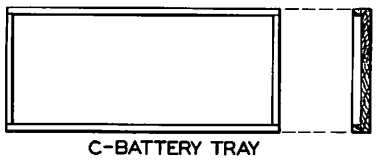


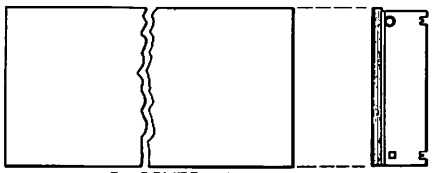
High-double case (capacity 84 B1 relays per side, max. 12 per row)

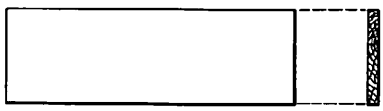
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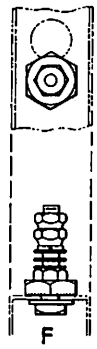

A-STEEL SHELF

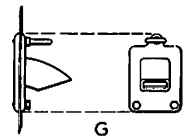

B-BATTERY TRAY

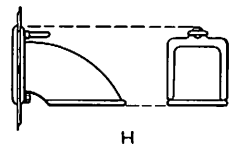

C-BATTERY TRAY

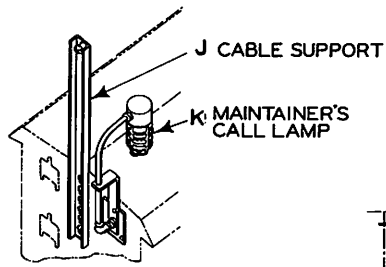

D-COVER BOARD


E-FLOOR BOARD
FOR ONE-DOOR CASE ONLY

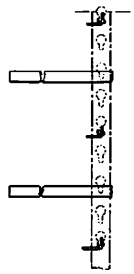

F
GROUND POST

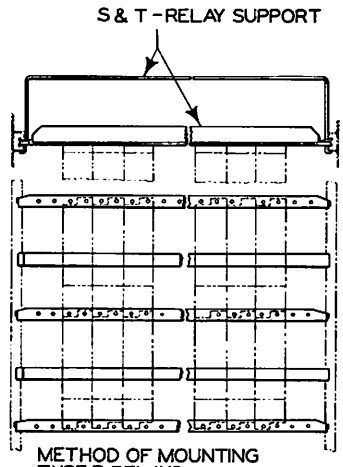

G
CABLE ENTRANCE COUPLING


H
CABLE ENTRANCE COUPLING

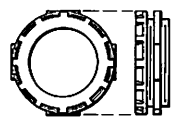


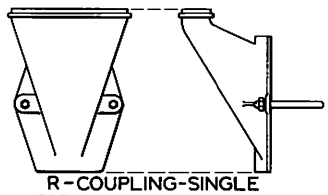

M-LIGHT SOCKET

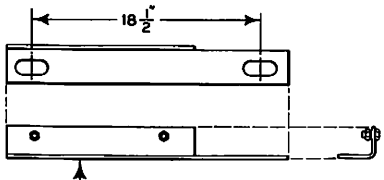




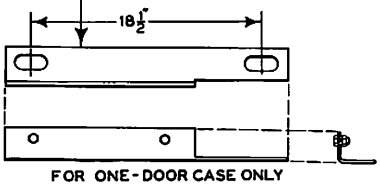
METHOD OF MOUNTING
TYPE B RELAYS


U

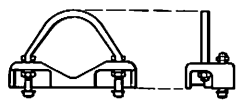

R-COUPLING-SINGLE
FOR ONE-DOOR CASE ONLY
(FOR METAL POLES ONLY)

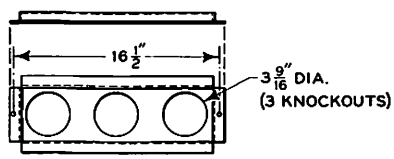


N-MOUNTING ANGLES

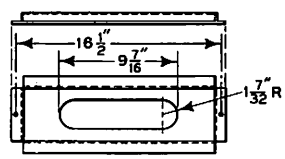


FOR ONE-DOOR CASE ONLY


P-CLAMP
FOR HALF CASE AND
ONE-DOOR CASE
(FOR METAL POLES ONLY)

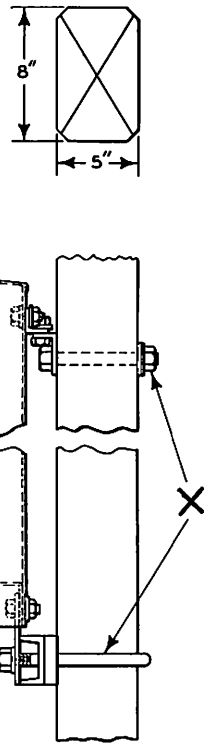


V-PLATE
FOR ONE-DOOR CASE ONLY



W-PLATE
FOR ONE-DOOR CASE ONLY

Fixtures for modular instrument cases.



METHOD OF MOUNTING ONE-DOOR CASE TO CONCRETE POLE

FIXTURES FOR MODULAR INSTRUMENT CASES

Order two of these items to equip a double case

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
*A	**SHELF**, steel, complete with mounting brackets. For all cases except half case and one-door	P5-150
A1	As above, except for half case.	P5-151
A2	Same as Ref. A, except for one-door case	P5-152
*B	**TRAY**, battery, wood, 35 3/4" x 12-1/2" acid-resistant finish, with cleats. For all cases except half case and one-door	P5-154
*B1	As above, except 35 3/4" x 19-1/2"	P5-153
B2	Same as Ref. B, except 17" x 12-1/2" for half case	P5-155
B3	Same as Ref. B, except 25" x 12-1/2" for high and low one-door cases	P5-732
*C	**TRAY**, battery, wood, 35 3/4" x 9-7/8" acid-resistant finish, with end and side cleats only. For all cases except half case and one-door case	P5-156
C1	As above, except 17" x 9-7/8" for half case	P5-157

Note: Items marked * are for both steel and aluminum cases, all other fixtures are for cases as described under each item.

Signed by Israel Jones, texasrails.org 7/16/2026

FIXTURES FOR MODULAR INSTRUMENT CASES

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
*D	**BOARD**, cover, complete with mounting brackets, acid-resistant finish. For all cases except half case and one-door case	P5-159
D1	As above, except for half case	P5-160
D2	Same as Ref. D, except for one-door case	P5-161
E	**BOARD**, floor, for one-door case, two piece set	P5-158
*F	**GROUND POST COMPLETE**, 5/16"-18, with hardened steel nut with serrated teeth which scrape paint from keyhole slot to ensure good ground connection	P5-162
G	**COUPLING COMPLETE**, for steel cases, for aerial cable entrance, 2" x 2" opening, with eyebolt, plate, bolts and washers for attaching to case	P5-163
G1	As above, except for aluminum cases	P5-199
H	**COUPLING COMPLETE**, for steel cases, for aerial cable entrance, 3-1/8" x 3-1/4" opening, with eyebolt, plate, bolts and washers for attaching to case	P5-164
H1	As above, except for aluminum cases	P5-200
J	**CABLE SUPPORT COMPLETE**, for low-single and low-double steel cases, includes 1" eyebolt, also bolts, nuts and washers for mounting to case	P5-165
J1	As above, except for high-single and high-double steel cases	P5-166
J2	Same as Ref. J, except for aluminum cases.	P5-201
J3	Same as Ref. J1, except for aluminum cases	P5-202
*K	**MAINTAINER'S CALL LAMP COMPLETE**, with socket for medium-screw base lamp which is also fitted with adapter for using standard, 2-pin, candelabra, signal lamp, includes all parts for mounting to case	P5-167
M	**LIGHT SOCKET**, pull-chain type, for steel cases, includes screws for fastening to bracket	P5-168
M1	As above, except for aluminum cases	P5-204
N	**MOUNTING ANGLE SET**, includes two angles and all mounting hardware, for adapting one-door case to standard foundation	P5-169
N1	**MOUNTING ANGLE SET**, includes four angles and all mounting hardware, for half case and one-door case	P5-170

Note: Items marked * are for both steel and aluminum cases, all other fixtures are for cases as described under each item.

FIXTURES FOR MODULAR INSTRUMENT CASES

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
P	**CLAMP COMPLETE**, single, includes all mounting hardware, for 4" pipe, for half case and one-door case	P5-174
R	**COUPLING COMPLETE**, single, includes all mounting hardware, for 4" pipe, for one-door case	P5-177
*S	**RELAY SUPPORT**, for steel cases, except half case and one-door, also for low- and high-single aluminum cases. For first (or single row) of Type B Relays, complete with wiring harness support.	P5-183
S1	**RELAY SUPPORT**, for steel cases, for first (or single row) of Type B Relays, complete with wiring harness support, for half case	P5-184
*S2	**RELAY SUPPORT**, for steel cases, except half case and one-door also for low- and high-single aluminum cases. For each additional row of Type B Relays, complete with wiring harness support.	P5-185
S3	**RELAY SUPPORT**, for steel cases, for each additional row of Type B Relays, complete with wiring harness support, for half case	P5-186
T	**RELAY SUPPORT**, for low- and high-double aluminum cases, for first (or single row) of Type B Relays, complete with wiring harness support	P5-205
T1	**RELAY SUPPORT**, for low- and high-double aluminum cases, for each additional row of Type B Relays, complete with wiring harness support	P5-206
*U	**BUSHING**, 3", insulating, for 3-9/16" dia. knockouts in bottom of case	P5-187
V	**PLATE**, with three 3-9/16" dia. knockouts, includes mounting screws, and washers	P5-189
V1	Same as above, except aluminum	P5-730
W	**PLATE**, with elongated opening, includes mounting screws and washers	P5-191
W1	Same as above, except aluminum	P5-731
X	**SUPPORT COMPLETE**, includes all hardware for mounting one-door case to A.A.R. concrete post	P5-195

Note: Items marked * are for both steel and aluminum cases; all other fixtures are for cases as described under each item.

Signed by Israel Jones, texasrails.org 7/16/2026

REPLACEMENT PARTS FOR MODULAR INSTRUMENT CASES

Order by catalog number and name shown in bold type

NAME	CATALOG NUMBER
For All Cases	
GASKET, for door, specify number feet	P5-309
CLIP, for backboard	P5-320
SHELF, steel, for all cases except half case and one-door	P5-321
SHELF, steel, for half case	P5-322
SHELF, steel, for one-door case	P5-325
BRACKET for supporting shelves and trays, includes screws nuts and washers	P5-323
For Aluminum Cases Only	
DOOR COMPLETE, for low-single case, also right-hand for low-double case.	P5-430
DOOR COMPLETE, for high-single case, also right-hand for high-double case	P5-431
DOOR COMPLETE, left-hand, for low-double case	P5-432
DOOR COMPLETE, left-hand, for high-double case	P5-433
DOOR COMPLETE, for half case	P5-439
DOOR COMPLETE, for high case, one-door	P5-440
DOOR COMPLETE, for low case, one-door	P5-441
HANDLE, with hex. nut and washers, for door of low cases	P5-434
As above, except for high cases	P5-435
As above, except for half case and one-door cases	P5-442
PIN, hinge for doors	P5-436
LATCH ROD, upper, for high-single and high-double cases	P5-437
LATCH ROD, lower, for high-single and high-double cases	P5-438

Memoranda

Signed by Israel Jones, texasrails.org 7/16/2026

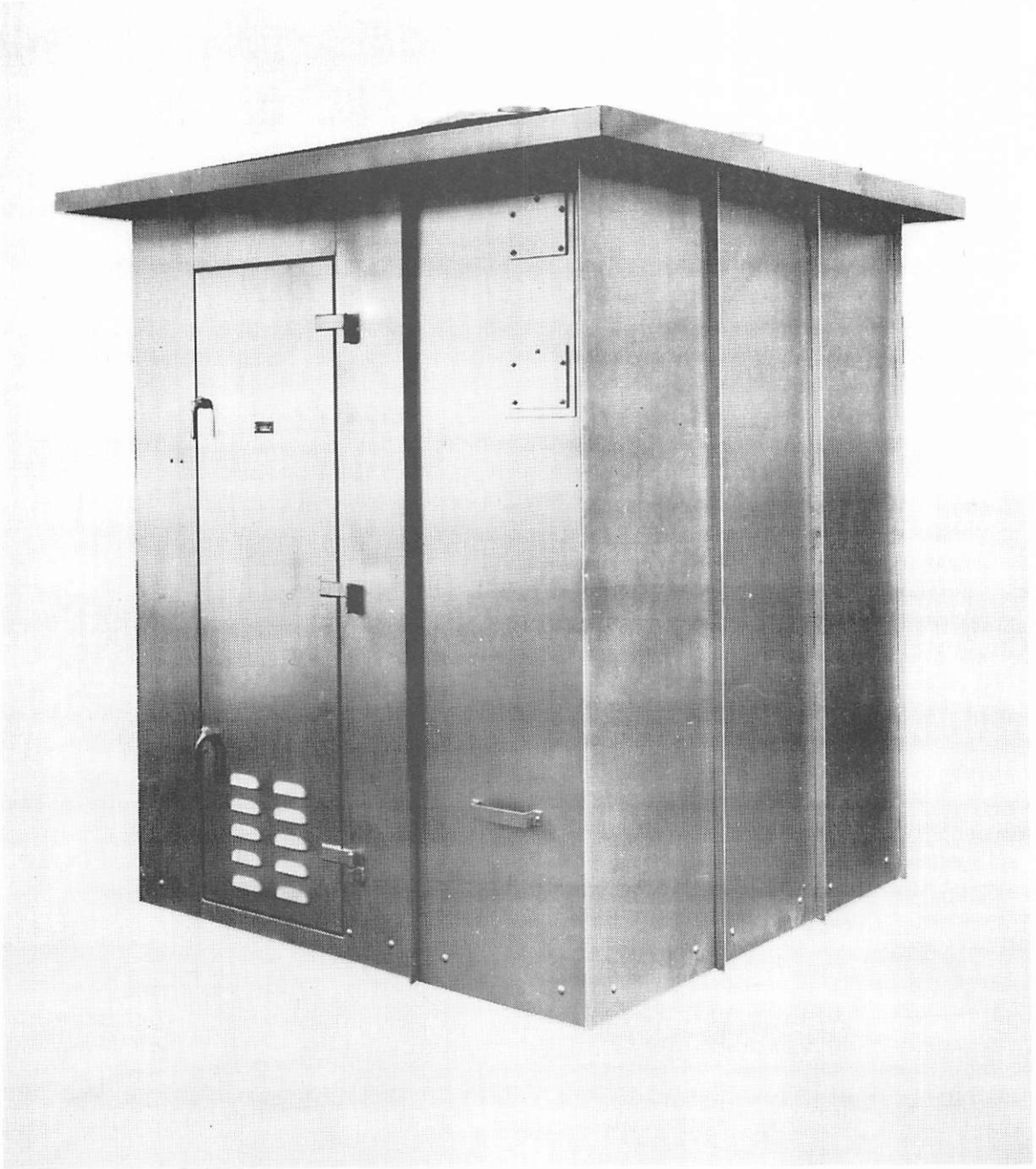
CATALOG SECTION 5

Modular Steel Instrument Housings and Equipment Racks

CONTENTS

	Page
General Information	103
Housing 8' wide (6' to 20' long)	104
Housing, 6' x 6'	106
Typical Arrangements	108
Adjustable Fixtures	114
Equipment Racks	120

GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL
ROCHESTER NEW YORK 14602



Signed by Israel Jones, texasrails.org 7/16/2026

Modular Steel Instrument Housings and Equipment Racks

GENERAL INFORMATION

Housings are heavy-gauge steel, durable and corrosion resistant. Permanently installed keyhole channels inside the housings provide for a wide choice of arrangements of interior fittings. The modular shelving is attached to the inside of the housing by mounting brackets and shelf brackets, which lock into the keyhole channels. These brackets may be moved up or down in increments of 2". Mounting boards, shelves, and battery cover boards may be fastened to these brackets. Shelves are for batteries, relays, or any shelf mounted equipment. A wood acid-resistant battery tray is available for use on the floor of the housing.

The in-line rack, furnished with each housing, is bolted to the roof trusses at the top and to the floor sections at the bottom. The rack will extend the full length if the housing has two doors, but will be one bay shorter if the housing has one door. The uprights for this rack are formed of square keyhole channels, spaced on 23-inch centers and bolted in place. These keyholes are spaced on 2 3/16" centers. Between the keyhole channels, a variety of equipment may be supported. Terminal mounting boards can be mounted by the same supporting clip as used in GRS modular cases. Type B relays may be mounted on plugboards bolted to relay support bars. Cables from these plugboards may be hung on the cable support bars. Type J relay cabinets may be mounted between the uprights by use of brackets which fasten in the keyhole channels at any height and may be moved up or down in increments of 2-3/16".

The housings are prime coated and painted gray inside and aluminum outside. All have heavy rubber floor covering.

Roof and side panels are replaceable. The side panels which carry the cable entrance couplings may be replaced without disconnecting cable or messenger. Underground cable entrance knockouts, seven inches in diameter, are provided as shown in pages 109 to 113 making several floor entrances available, depending upon the length of housing. Removable cover plates at each inside corner of the housing provide access to the foundation bolts. Cable entrance coupling mounting plates, with space for two couplings in each, are supplied on all four corners of the housing. Cable entrance couplings may be bolted on these plates at desired locations. A cable support for the messenger cable is available. A maintainer's call horn or a light may be mounted on the housing in place of a cable entrance coupling.

Telephone booths can be supplied for 8-foot wide housings only. Each booth has an inner door which gives access to the remainder of the housing. This door can be padlocked.

Each housing is furnished with suitable overhead lighting fixtures connected to a switch near the entrance, and one double appliance receptacle. A light is also furnished in each telephone booth, controlled by plunger-type door switch so that the lamp is lighted only when the outside door is opened. Rubber grommets are supplied for protection of wiring which runs through holes in roof trusses. Two doors are recommended in all housings where full-length, in-line racks are used. The additional door provides access to the back of the rack and terminal mounting board. When apparatus is mounted on the walls of the housing, only one door is necessary.

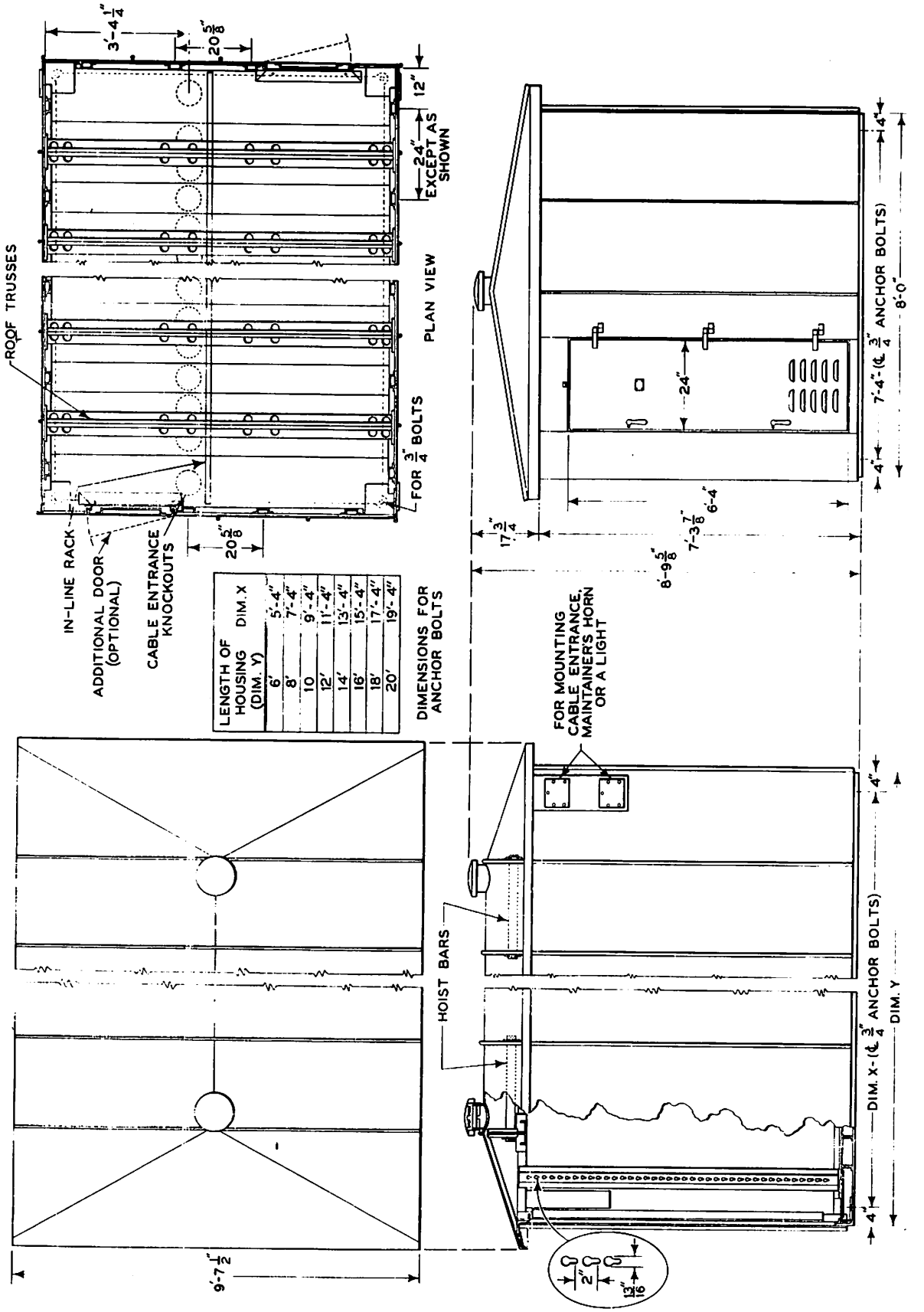
All doors have latches, provision for padlocking, and steel hooks for holding them open. Ventilating louvers on the door may be closed off by removing, inverting, and replacing the screen. A removable dust shield snaps into place directly behind the screen.

Round, waterproof, screened ventilators are provided at the peak of the roof. A sliding cover, operated from inside the housing, closes off the ventilator when desired.

Housings are equipped with a hoist bar under each roof ventilator.

Housings will be furnished with lining consisting of ½" thick insulating board.

Equipment racks are available in an assortment of widths and heights for mounting relays, systems modules, and terminal blocks in control towers. Some racks are free standing and some fasten to the floor.



Modular steel instrument housing.
8 ft. wide (6 ft. to 20 ft. long)

Signed by Israel Jones, texasrails.org 7/16/2026

MODULAR STEEL INSTRUMENT HOUSINGS
8ft. wide (6ft. to 20ft. long)

See general information on page 103.

Housings are furnished without fixtures except as noted below. See typical arrangements shown on pages 108 to 111. (To order fixtures, see pages 114 to 118):

Housings are equipped with the following:

1 - In-line rack.
2 - Rubber floor covering.
3 - Ventilators in roof.
4 - Lighting layout with overhead fixtures, switch, and double appliance receptacle.

When ordering, specify "Instrument Housing" and give catalog number.

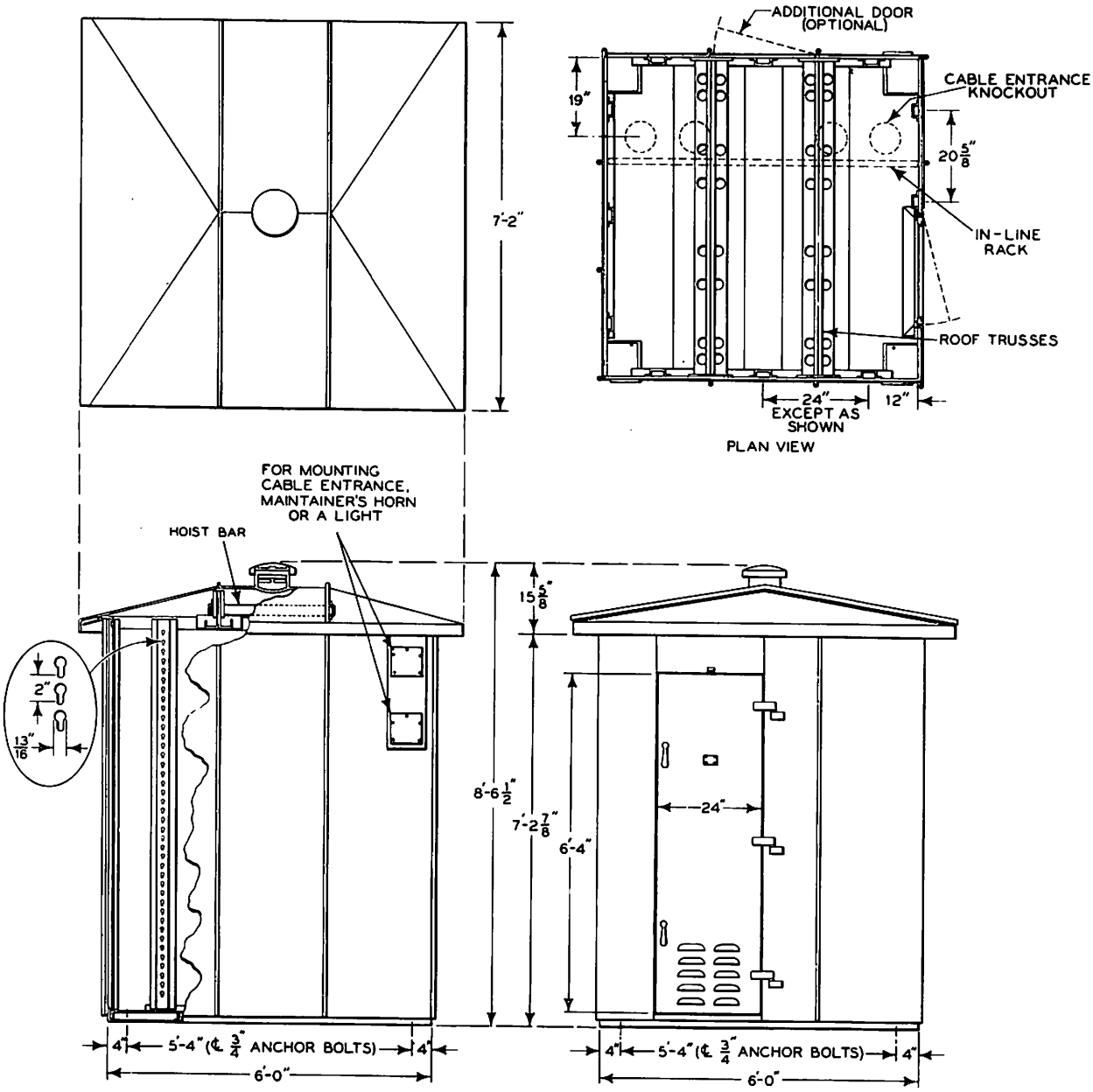
WIDTH OF HOUSING	LENGTH OF HOUSING	NUMBER OF DOORS	CATALOG NUMBER	
			With Telephone Booth	Without Telephone Booth
8'	6'	1	A5-502	A5-503
8'	6'	2	A5-507	A5-508
8'	8'	1	A5-512	A5-513
8'	8'	2	A5-517	A5-518
8'	10'	1	A5-522	A5-523
8'	10'	2	A5-527	A5-528
8'	12'	1	A5-532	A5-533
8'	12'	2	A5-537	A5-538
8'	14'	1		A5-543
8'	14'	2	A5-547	A5-548
8'	16'	1		A5-553
8'	16'	2	A5-557	A5-558
8'	18'	1		A5-563
8'	18'	2	A5-567	A5-568
8'	20'	2	A5-577	A5-578

NOTE: If it is desired to have housings shipped with shelving and fixtures (unmounted) inside each housing in which they are to be used, please so state on order. For example:

2 Instrument Housings A5-518, each to include:

1 - Relay support P5-573
8 - Relay supports P5-576
2 - Mounting kits for J relay units P5-735
1 - Battery tray P5-531
1 - Cover board P5-521
4 - Mounting boards P5-541
1 - Cable entrance coupling P5-611
1 - Terminal mounting board P5-570

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Modular steel instrument housing.
6 ft. x 6 ft.

MODULAR STEEL INSTRUMENT HOUSINGS
6ft. x 6ft.

See general information on page 103.

Housings are furnished without fixtures except as noted below. See typical arrangements shown on pages 112 and 113 (To order fixtures, see pages 114 to 118):

Housings are equipped with the following:

1 - In-line rack.
2 - Rubber floor covering.
3 - Ventilator in roof.
4 - Lighting layout with overhead fixtures, switch and double appliance receptacle.

When ordering, specify "Instrument Housing" and give catalog number.

WIDTH OF HOUSING	LENGTH OF HOUSING	NUMBER OF DOORS	CATALOG NUMBER
6'	6'	1	A5-591
6'	6'	2	A5-594

NOTE: If it is desired to have housings shipped with shelving and fixtures (unmounted) inside each housing in which they are to be used, please so state on order. For example:

2 Instrument Housings A5-594, each to include:

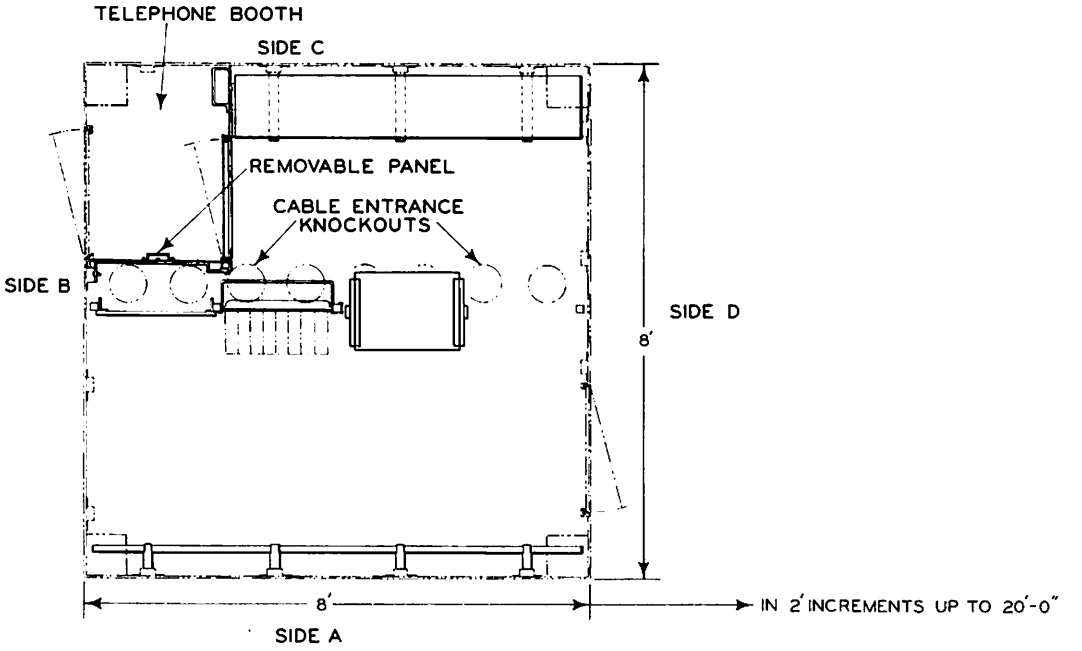
1 - Relay support P5-573
8 - Relay supports P5-576
2 - Mounting kits for J relay units . . . P5-735
1 - Battery tray P5-530
1 - Cover board P5-520
4 - Mounting boards P5-540
1 - Cable entrance coupling P5-611
1 - Terminal mounting board P5-570

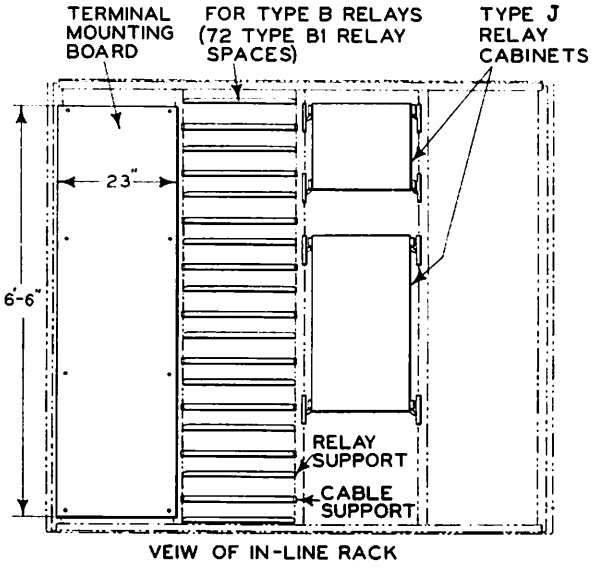
TYPICAL ARRANGEMENTS

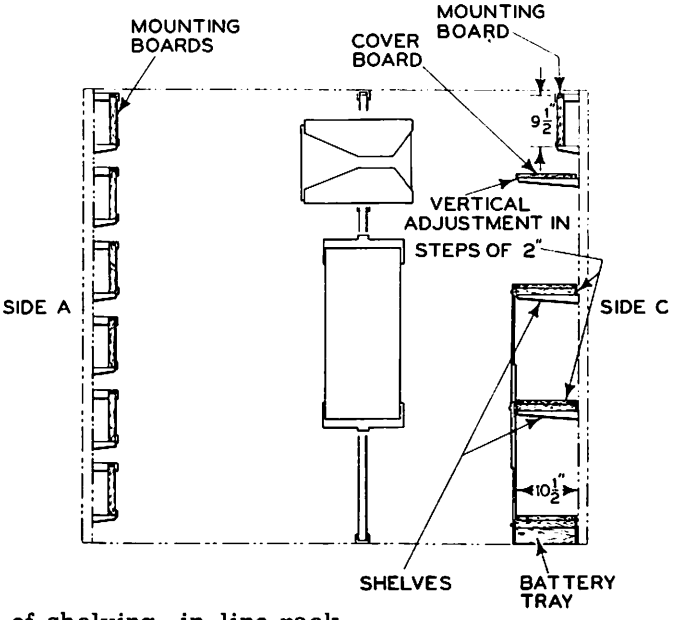
NOTE: The sketches shown on these pages illustrate only a few of the many possible arrangements of mountings for relays, mounting boards, shelves, battery trays, and covers.

The vertical spacing of the shelves, trays, etc. may be varied in steps of 2".

See pages 114 to 118 for ordering references for fixtures.



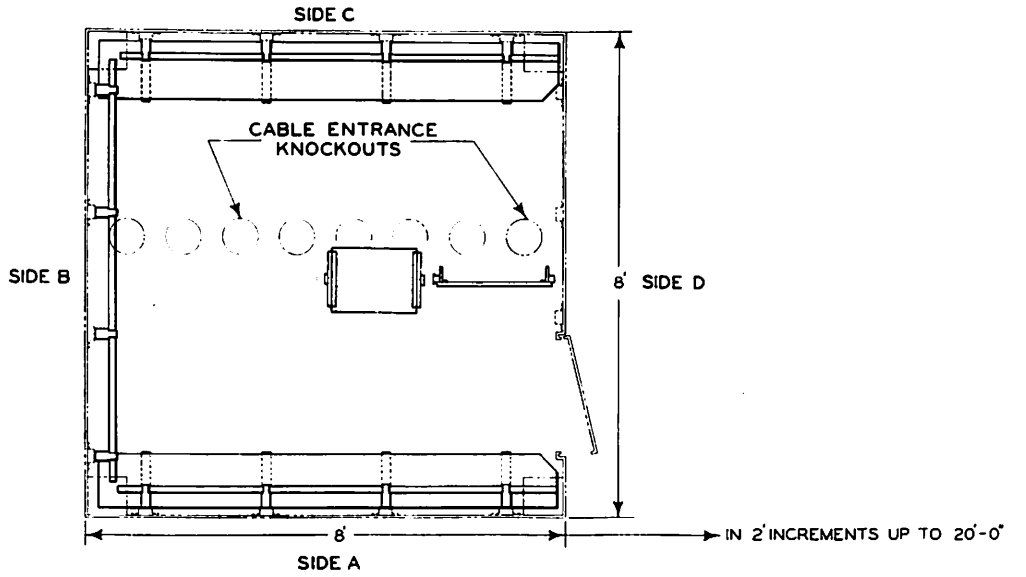


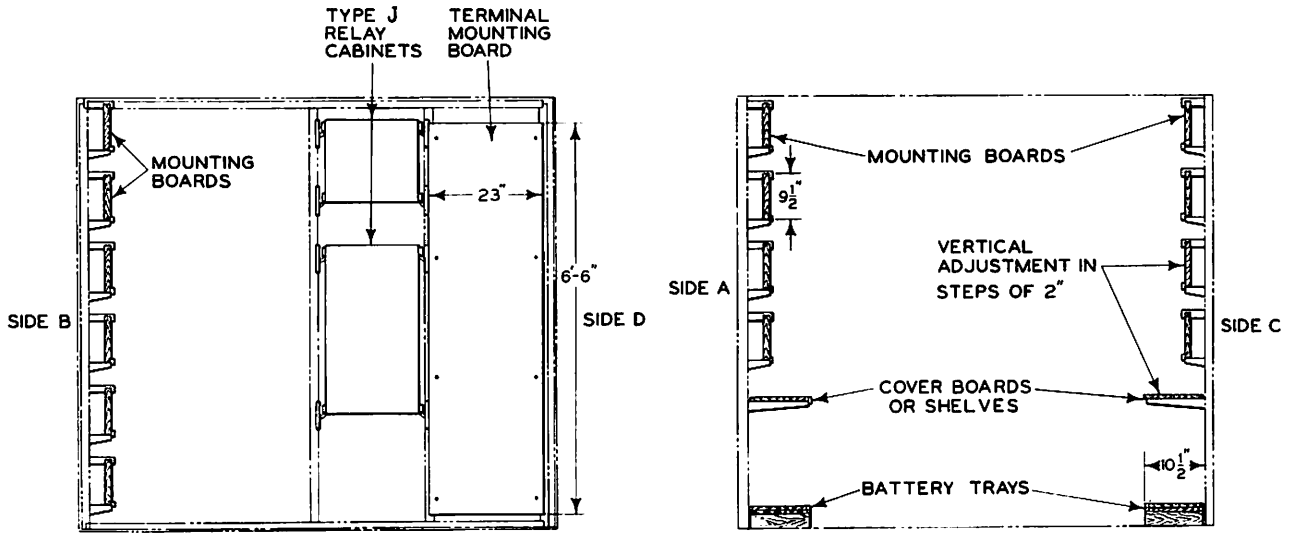


Typical arrangement of shelving, in-line rack for Type B relays, and shelving, for 8' x 8' instrument housing.

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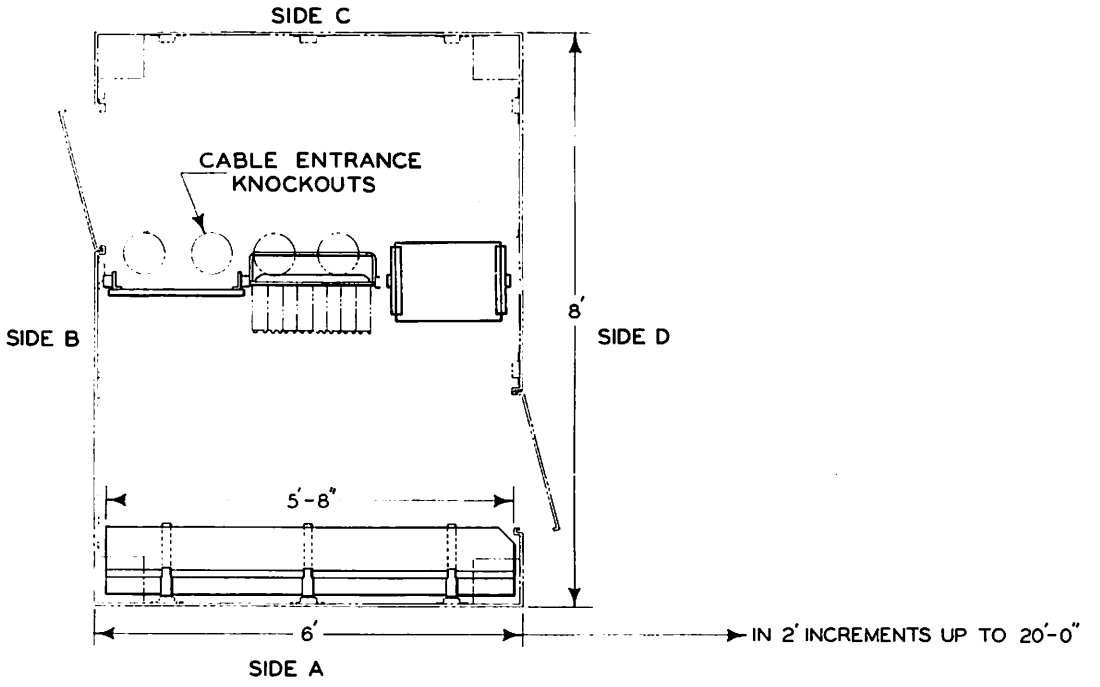
TYPICAL ARRANGEMENT

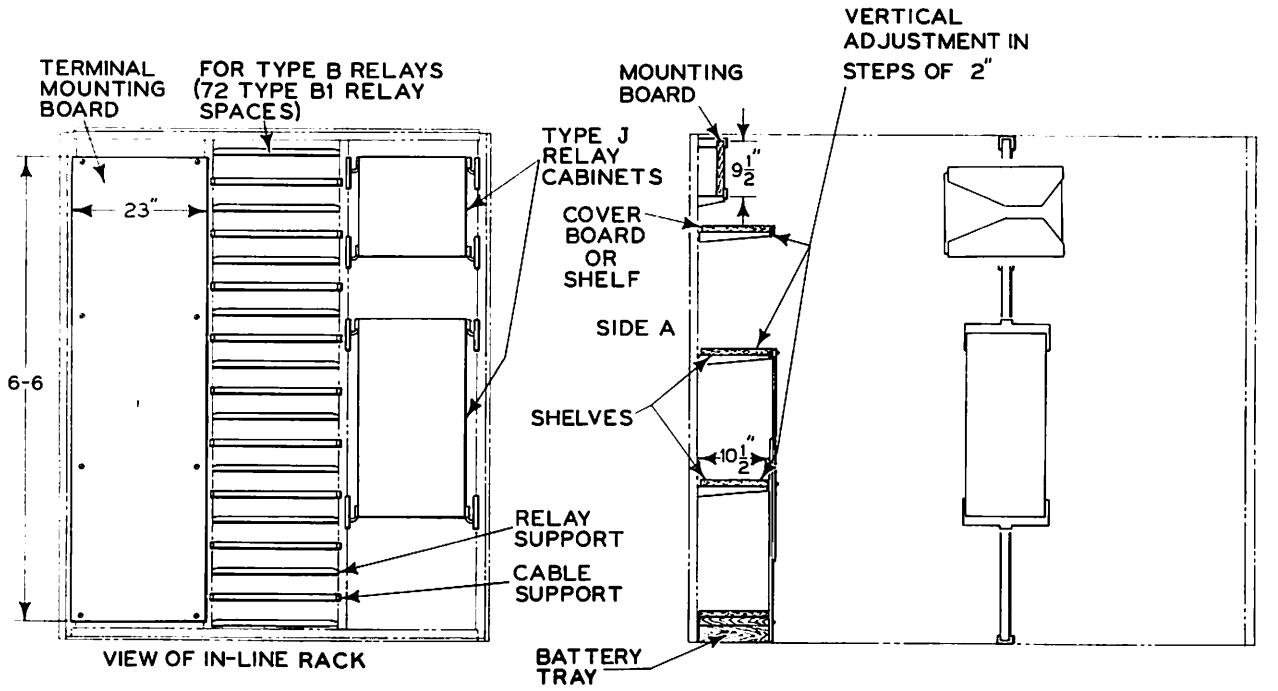




Typical arrangement of shelving and battery trays for 8' x 8' instrument housing.

TYPICAL ARRANGEMENT

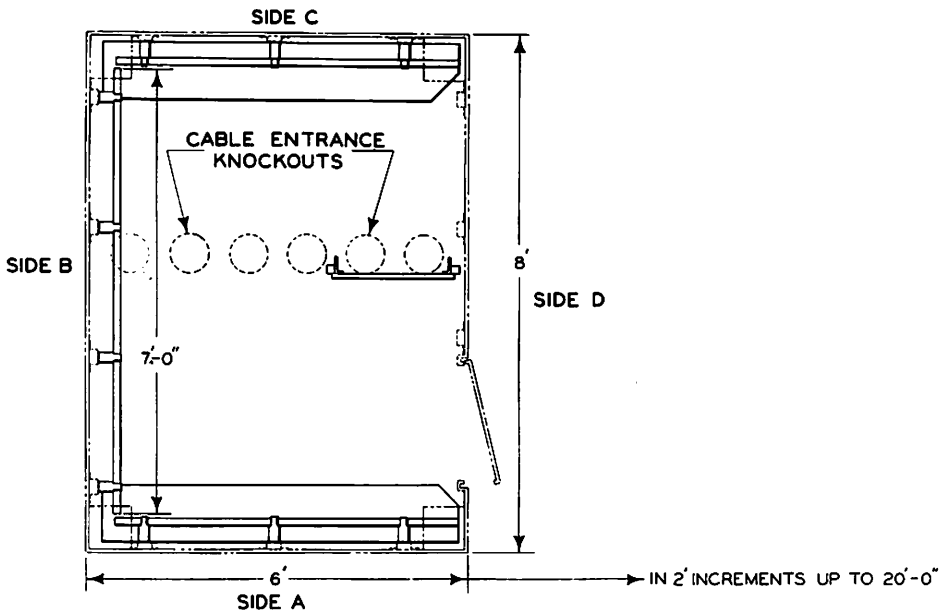


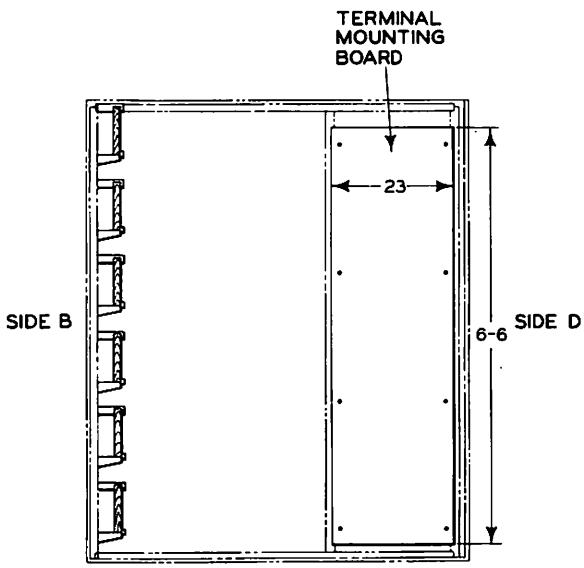


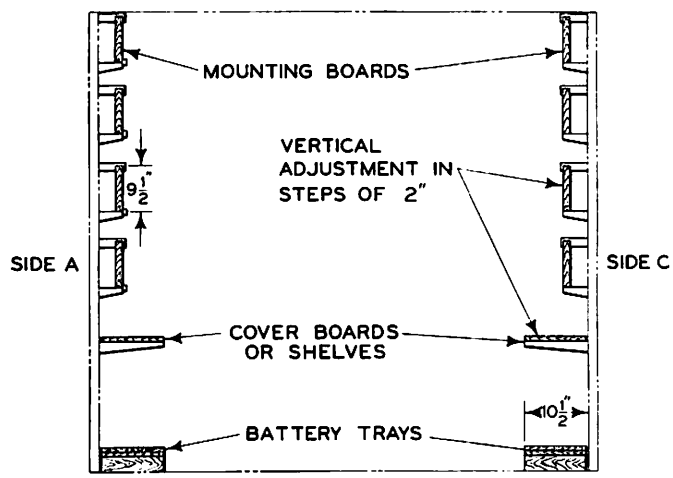
Typical arrangement of shelving, in-line rack
for Type B relays, and battery tray, for 8' x 6' instrument housing.

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TYPICAL ARRANGEMENT

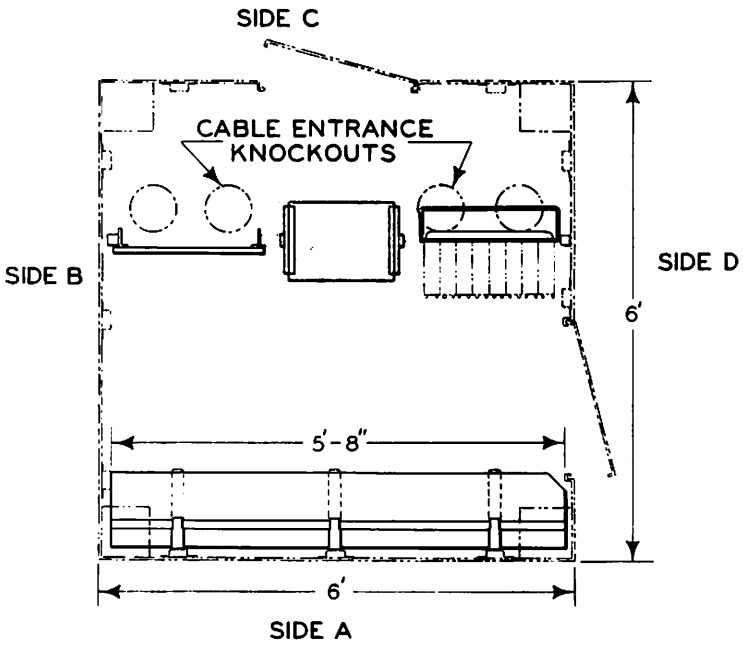


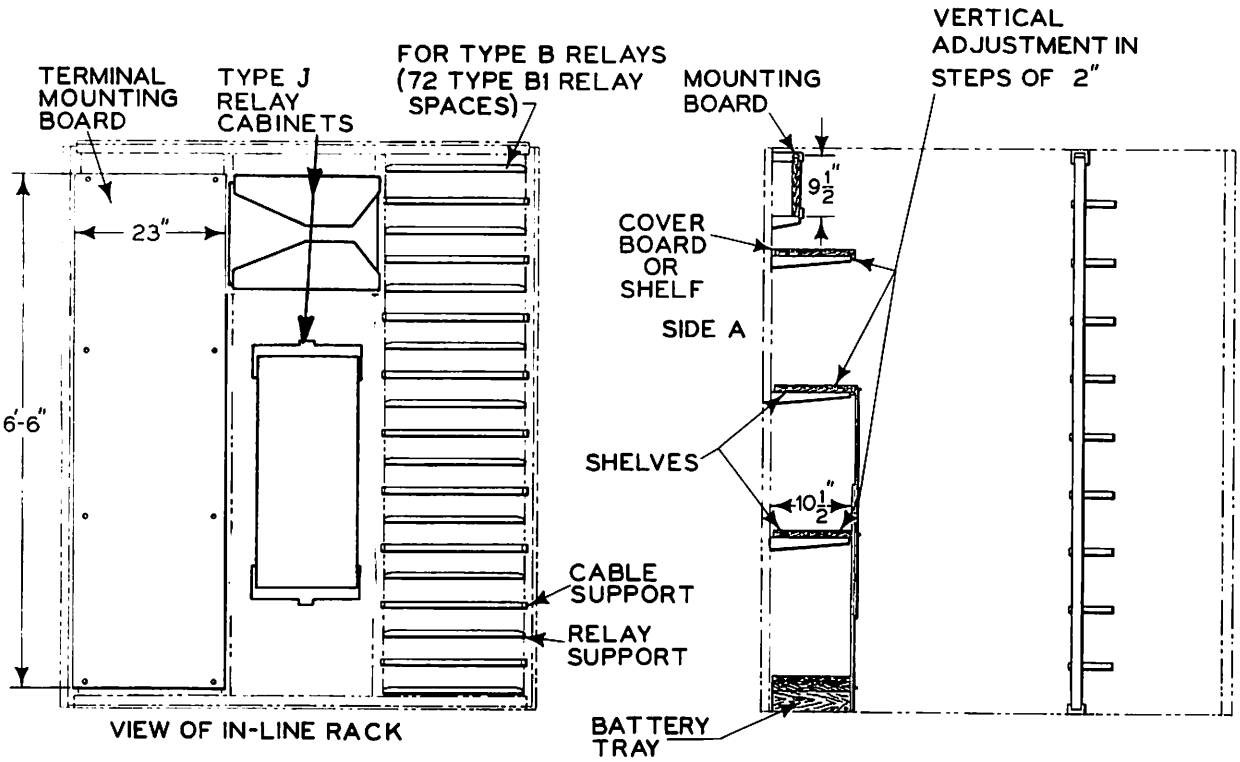




Typical arrangement of shelving and battery trays for 8' x 6' instrument housing.

TYPICAL ARRANGEMENT

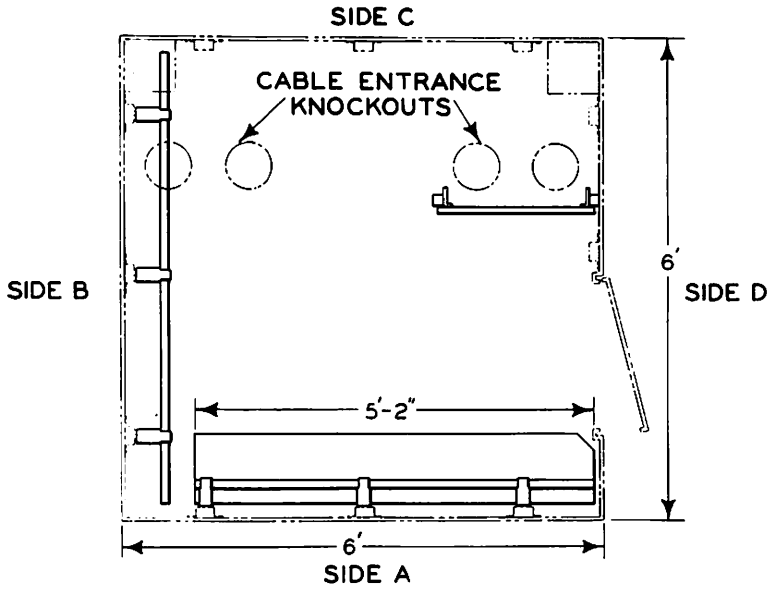


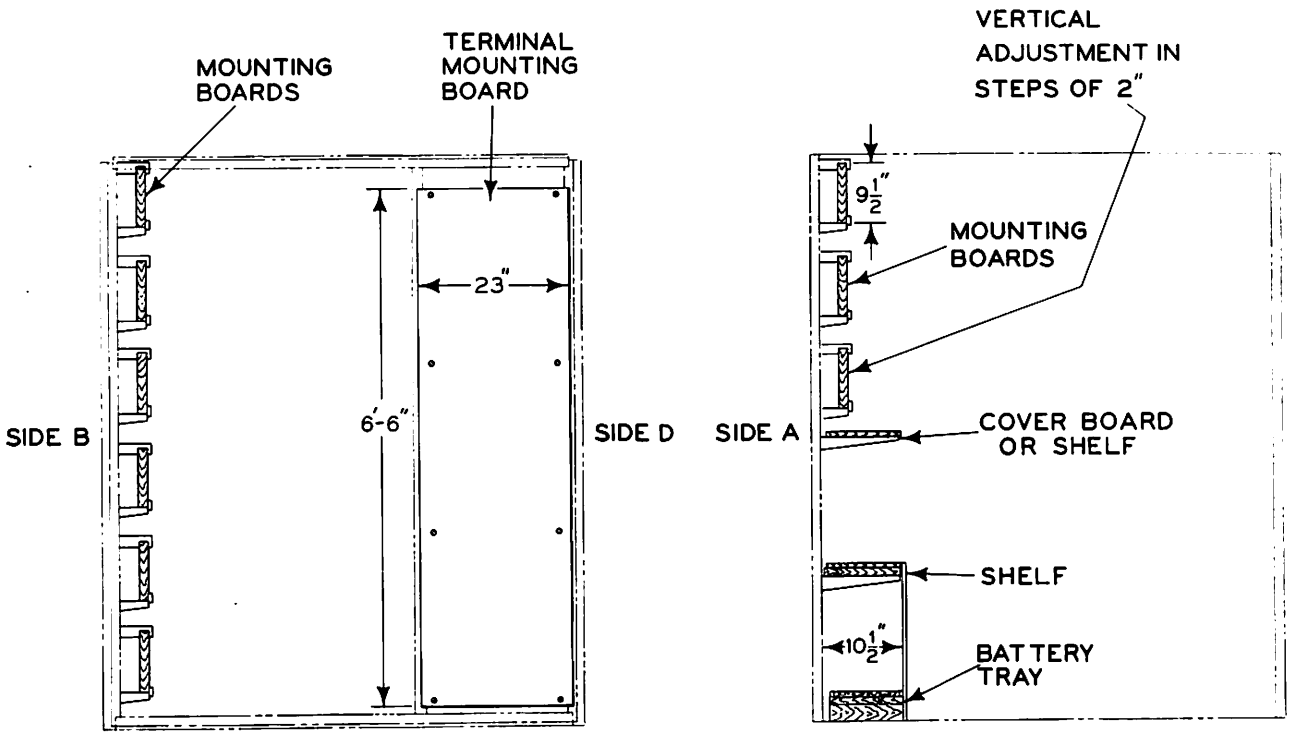


Typical arrangement of shelving, in-line rack for Type B relays, and battery tray, for 6' x 6' instrument housing.

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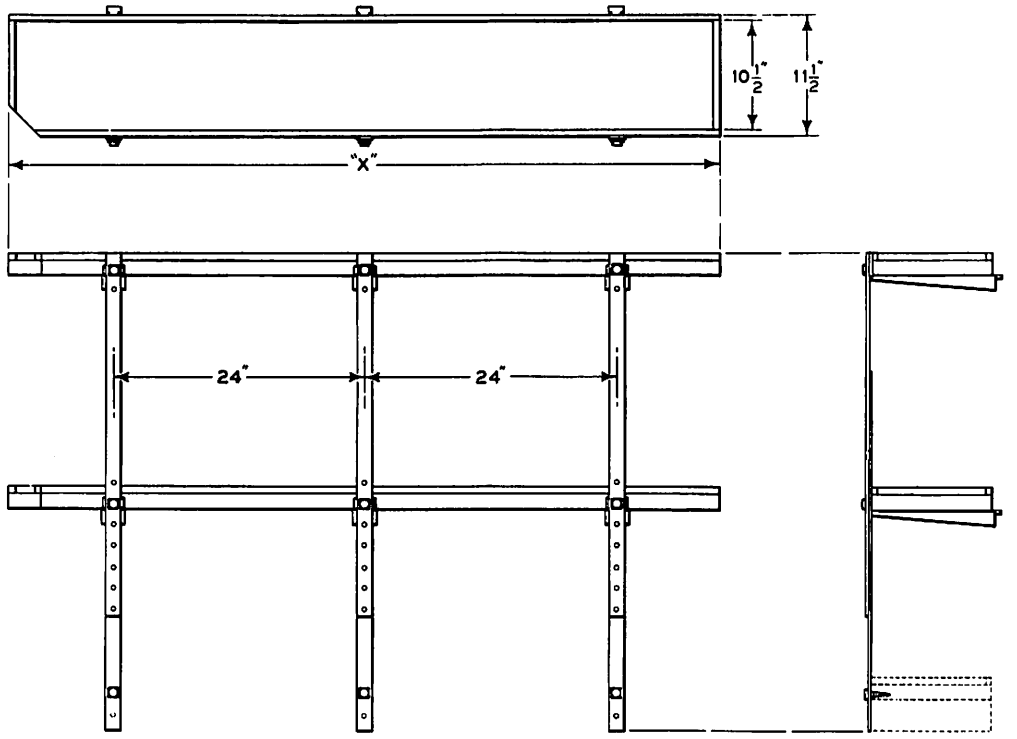
TYPICAL ARRANGEMENT



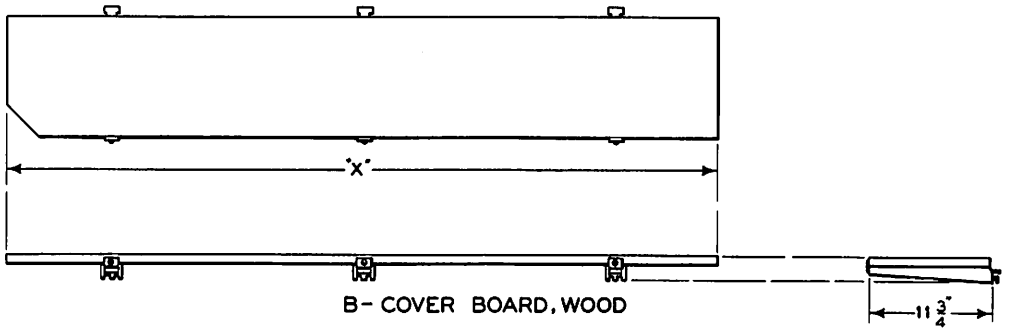


Typical arrangements of shelving and battery tray for 6' x 6' instrument housing.

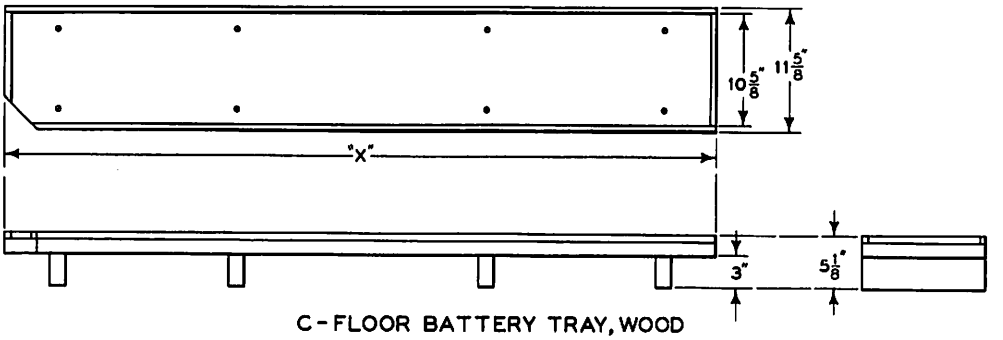
Signed by Israel Jones, texasrails.org 7/16/2026



A-SHELVES, WOOD, FOR BATTERIES, RELAYS, ETC.

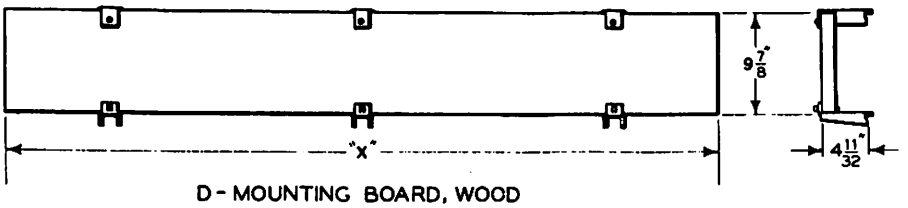


B- COVER BOARD, WOOD

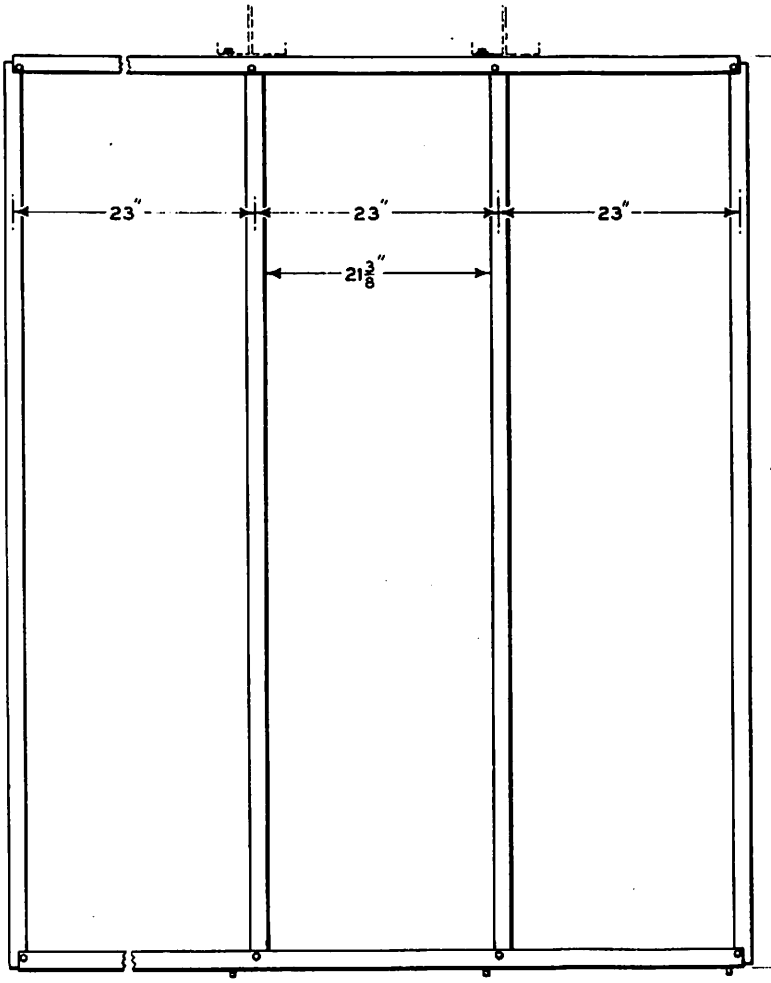


C-FLOOR BATTERY TRAY, WOOD

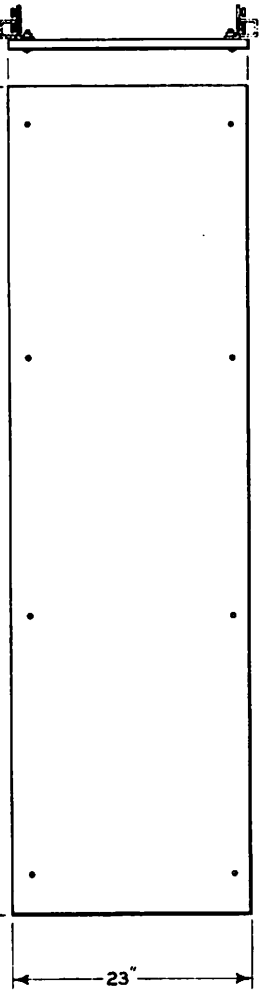
Fixtures for modular steel instrument housings.



D - MOUNTING BOARD, WOOD



E - IN-LINE RACK

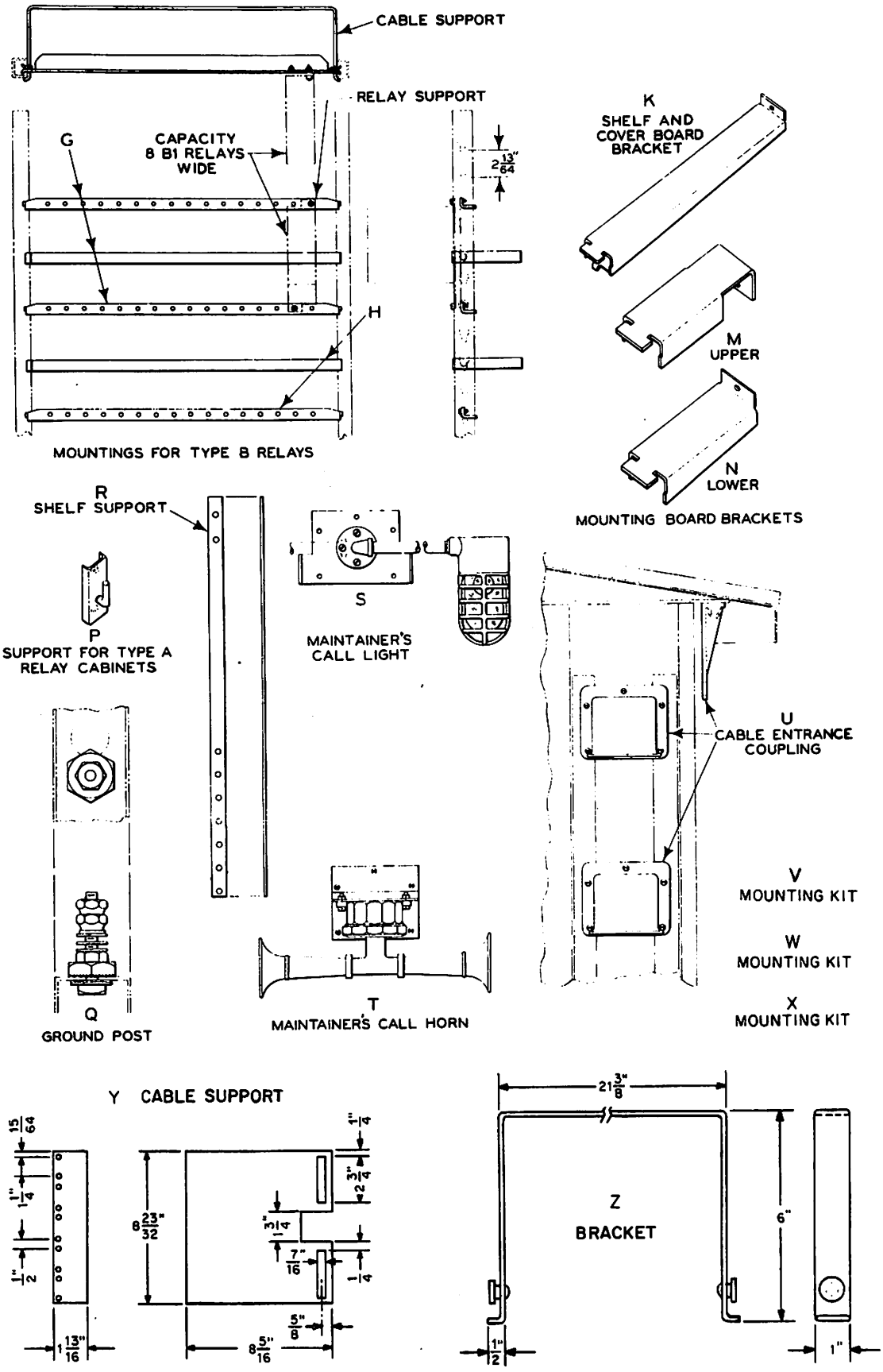


F - TERMINAL BOARD, WOOD

	LENGTH OF HOUSING							
	6'	8'	10'	12'	14'	16'	18'	20'
* DIMENSION "X"	5'-8"	7'-8"	9'-8"	11'-4"	13'-4"	15'-4"	17'-4"	19'-4"
MAX. NUMBER OF 23" BAYS, IN-LINE RACK	3	4	5	6	7	8	9	9

* DIMENSION "X" = LENGTH OF BOARDS, SHELVES AND TRAY, MAY BE SHORTENED IN FIELD

Fixtures for modular steel instrument housings.



Fixtures for modular steel instrument housings.

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FIXTURES FOR MODULAR STEEL HOUSINGS
All Include Mounting Hardware

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER			
		For 6' long Housing	For 8' long Housing	For 10' long Housing	For 12' long Housing
A	SHELF, Set of two, UPPER and LOWER	P5-500	P5-501	P5-502	P5-503
A1	SHELF, SINGLE	P5-510	P5-511	P5-512	P5-513
B	COVER BOARD	P5-520	P5-521	P5-522	P5-523
C	FLOOR BATTERY TRAY	P5-530	P5-531	P5-532	P5-533
D	MOUNTING BOARD	P5-540	P5-541	P5-542	P5-543

REF.	NAME	CATALOG NUMBER			
		For 14' long Housing	For 16' long Housing	For 18' long Housing	For 20' long Housing
A	SHELF, Set of two, UPPER and LOWER	P5-504	P5-505	P5-506	P5-507
A1	SHELF, SINGLE	P5-514	P5-515	P5-516	P5-517
B	COVER BOARD	P5-524	P5-525	P5-526	P5-527
C	FLOOR BATTERY TRAY	P5-534	P5-535	P5-536	P5-537
D	MOUNTING BOARD	P5-544	P5-545	P5-546	P5-547

REF.	NAME	CATALOG NUMBER
E	IN-LINE RACK, 1 bay long, for any length housing, when full length rack is not required	P5-560
E1	IN-LINE RACK, 2 bays long, any length housing when full length rack is not required	P5-561
E2	IN-LINE RACK, 3 bays long, for 6 ft. housing	P5-562
E3	" " " 4 " " " 8 ft. "	P5-563
E4	" " " 5 " " " 10 ft. "	P5-564
E5	" " " 6 " " " 12 ft. "	P5-565

(Continued on following page)

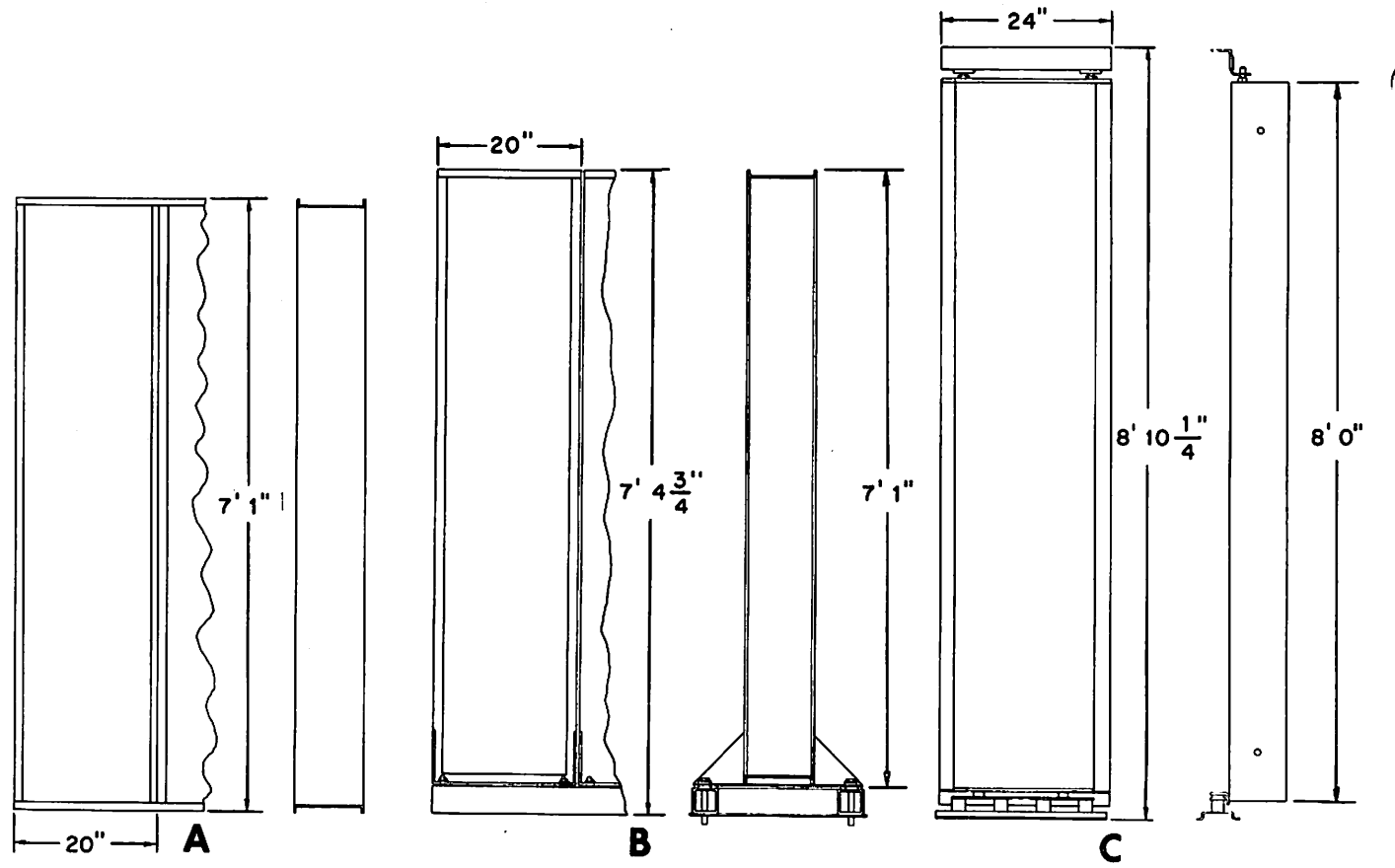
FIXTURES FOR MODULAR STEEL HOUSINGS
All Include Mounting Hardware

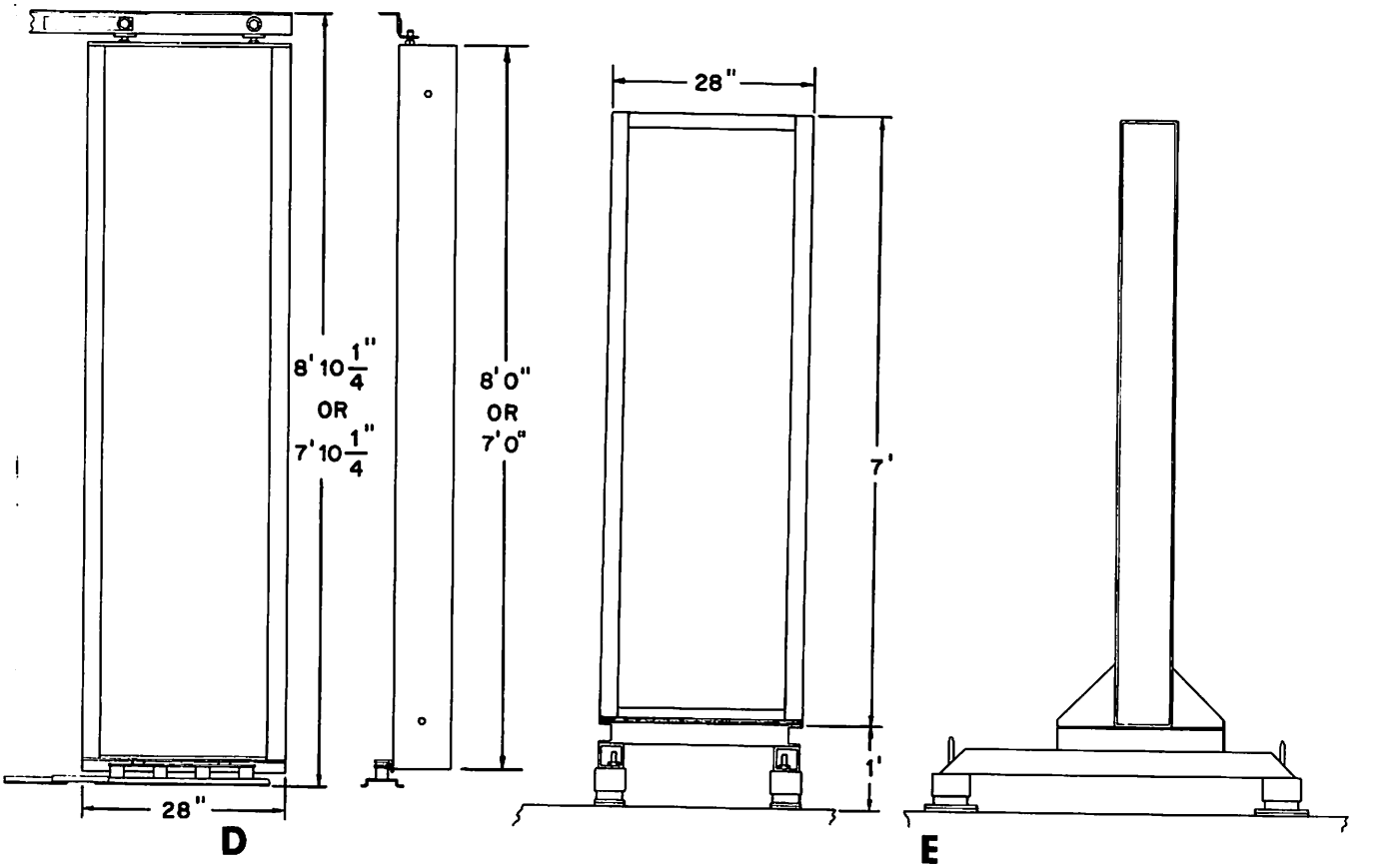
Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
E6	IN-LINE RACK, 7 bays long, for 14 ft. housing	P5-566
E7	" " " 8 " " " 16 ft. "	P5-567
E8	" " " 9 " " " 18 or 20 ft. housing	P5-568
F	TERMINAL MOUNTING BOARD, for in-line rack, includes mounting clips	P5-570
G	RELAY SUPPORT, for first (or single row) of Type B relays, complete with wiring harness support.	P5-573
H	RELAY SUPPORT, for each additional row of Type B relays, complete with wiring harness support.	P5-576
K	BRACKET, for supporting shelf Ref. A and cover board Ref. B	P5-582
M	BRACKET, upper, for mounting board, Ref. D.	P5-585
N	BRACKET, lower, for supporting mounting board, Ref. D	P5-588
P	SUPPORT, for Type A relay cabinet, four required per cabinet . .	P5-591
Q	GROUND POST, 5/16"-18 with hardened steel nut with serrated teeth which scrape paint from hole to ensure good ground connection	P5-162
R	SUPPORT, for battery shelf Ref. A	P5-593
S	MAINTAINER'S CALL LIGHT, right- or left- hand, with socket for medium screw base lamp and adapter for candelabra single contact bayonet base lamp	P5-596
T	MAINTAINER'S CALL HORN, 110 volt, d-c	P5-602
T1	Same as above, except 110 volt, a-c	P5-605
U	CABLE ENTRANCE COUPLING, includes two couplings and cable support	P5-608
U1	Same as above, except includes one coupling and cable support . .	P5-611
V	MOUNTING KIT, for mounting modular Type J relay unit	P5-735
W	MOUNTING KIT, for mounting system module to bracket (ref. Z) .	P5-736
X	MOUNTING KIT, for mounting system module bracket to rack . .	P5-737
Y	CABLE SUPPORT	P5-738
Z	BRACKET, for mounting 8-23/32" high system module in housing (requires 1 each ref. W & X for mounting)	P5-739
Z1	Same as above except for mounting 4 modules (req. 4 each ref. W&X)	P5-740
Z2	Same as above except for 12-7/32" high module (req. 2 each ref. W&X)	P5-741
Z3	Same as above except for 15-23/32" high module (req. 2 each ref. W&X)	P5-742
Z4	Same as above except for 19-7/32" high module (req. 2 ref. W&3 ref. X)	P5-743

Signed by Israel Jones, texasrails.org 7/16/2026

Memoranda



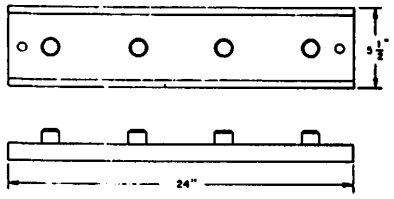


Signed by Israel Jones, texasrails.org 7/16/2026

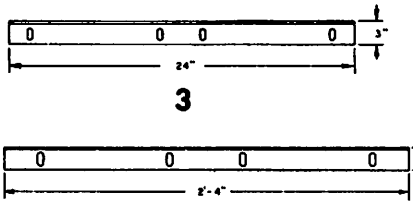
EQUIPMENT RACK ASSEMBLIES

Order by catalog number and name shown in bold type

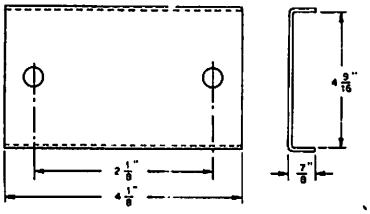
REF.	NAME	CATALOG NUMBER
A	BASIC 20" WIDE RACK, 7'1" high	A5-600
A1	Same as above except 8'7" high	A5-601
B	BASIC FREE STANDING 20" RACK, 7'1" high, shown mounted on base	A5-602
C	BASIC 24" WIDE RACK, 8' high, shown with mounting - see following page.	A5-605
C1	Same as above except 7' high	A5-606
D	BASIC 28" WIDE RACK, 8' high, shown with mounting - see following page.	A5-610
D1	Same as above except 7' high	A5-611
E	BASIC FREE STANDING 28" RACK, shock mounted	A5-612



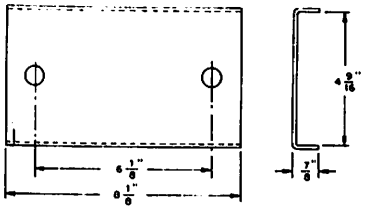
1 & 2



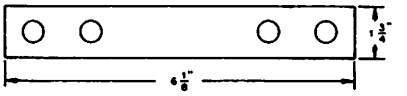
3 4



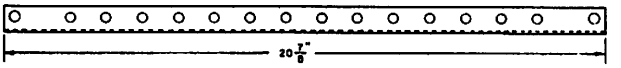
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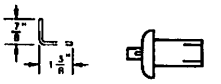
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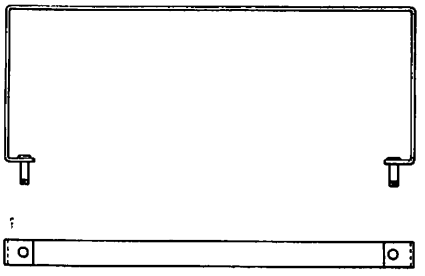
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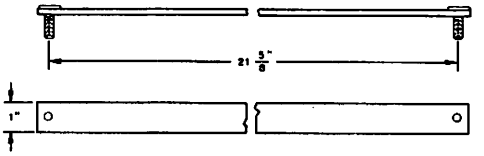
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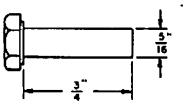
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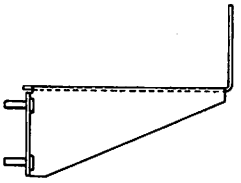
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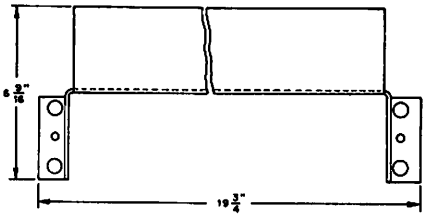


11

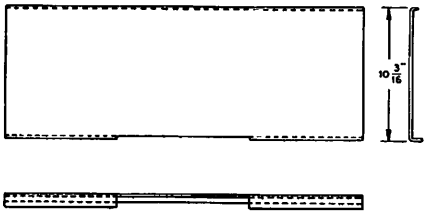


12

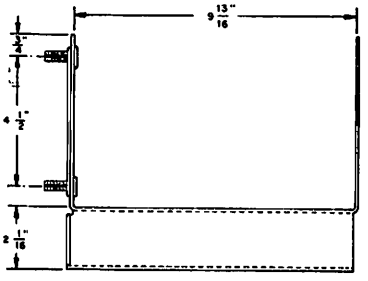


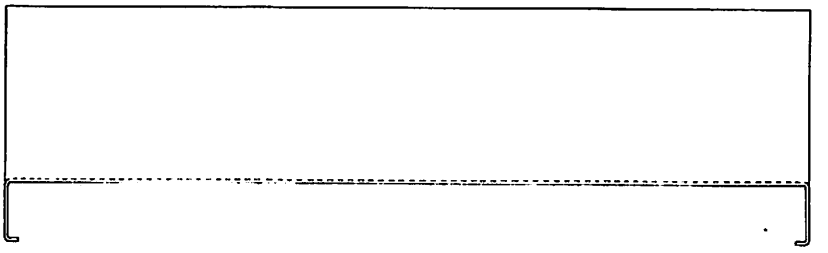


13

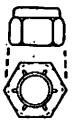


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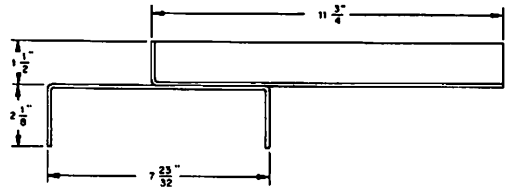
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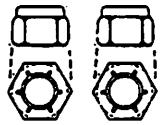


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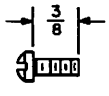
HARDWARE FOR EQUIPMENT RACKS

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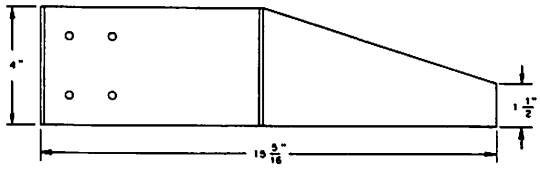




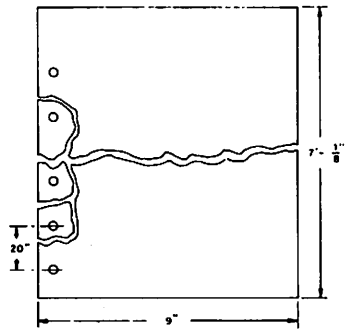
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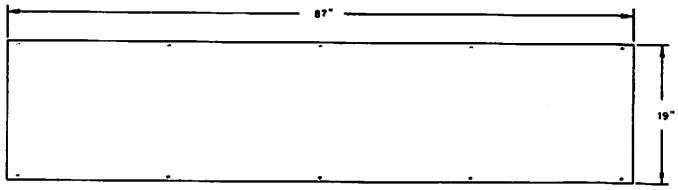
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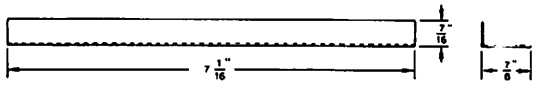
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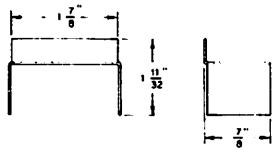
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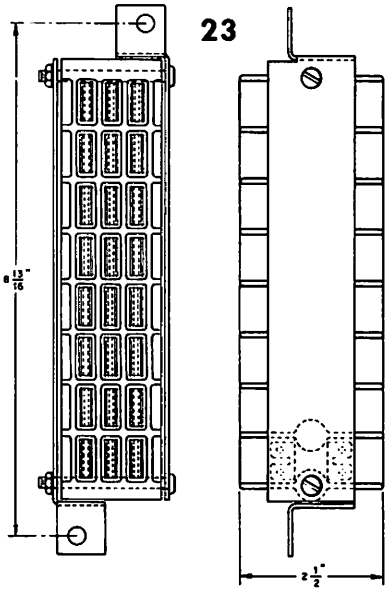
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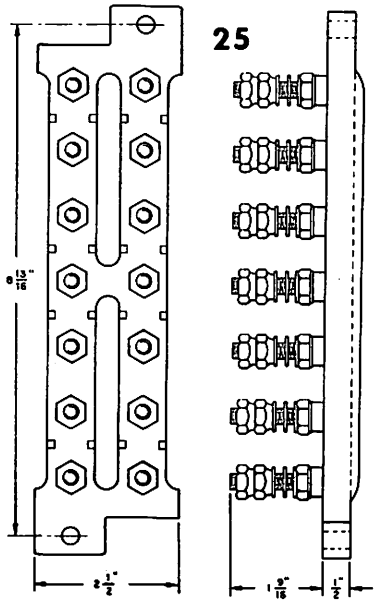
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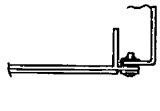
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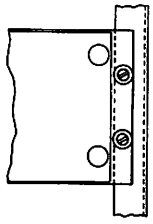


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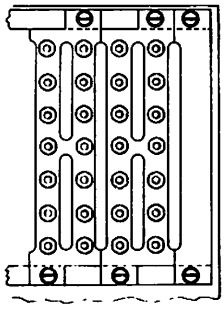


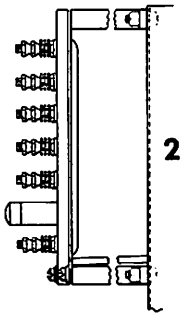
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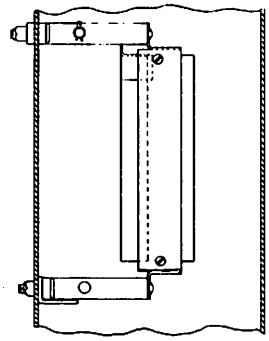


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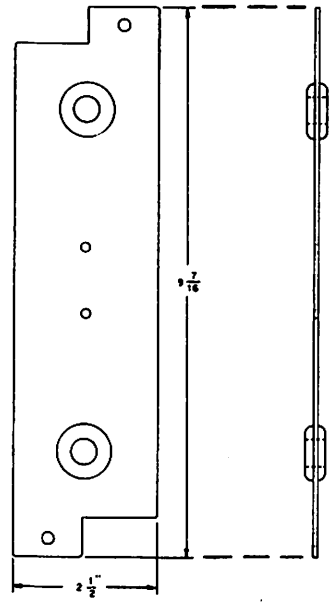


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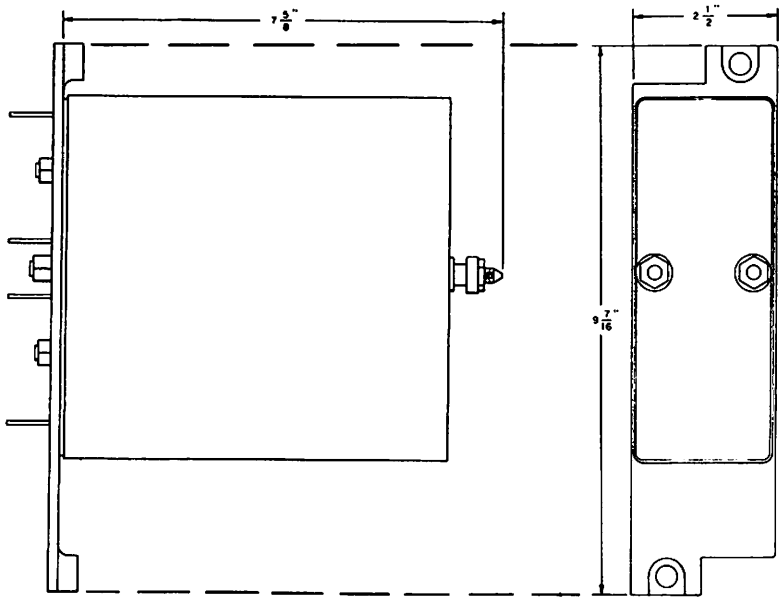


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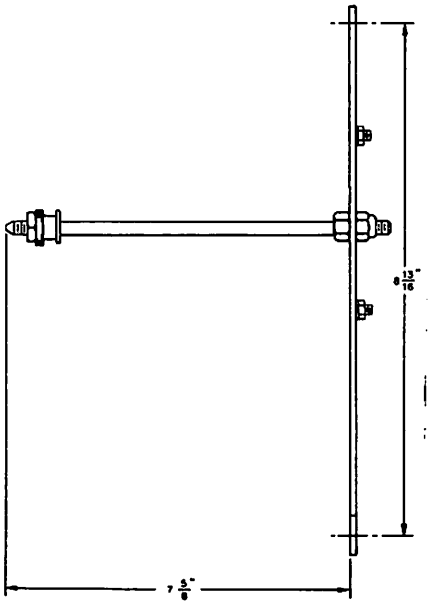
HARDWARE FOR EQUIPMENT RACKS (cont'd)



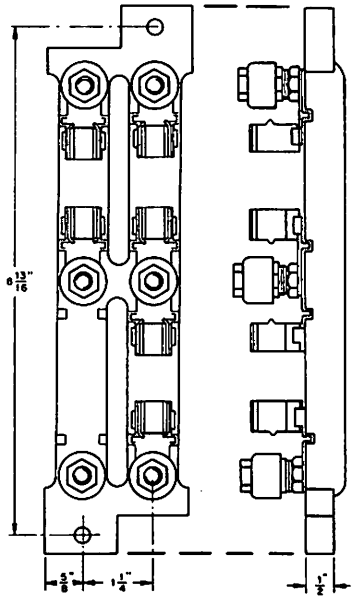
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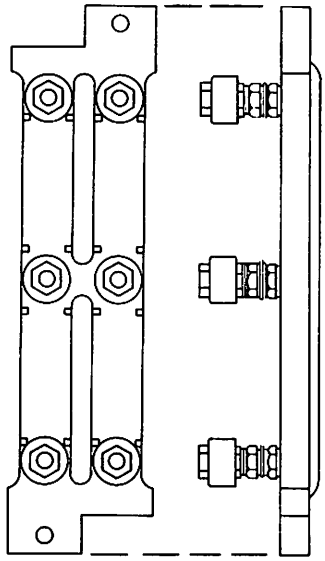
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32



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HARDWARE FOR EQUIPMENT RACKS (cont'd)

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HARDWARE FOR EQUIPMENT RACKS

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
1	BASE, for 24" wide rack, 2' long for 1 rack	P5-750
1A	Same as above except 4' - 1/8" long for 2 racks	P5-751
1B	Same as above except 6'-1/4" long for 3 racks	P5-752
1C	Same as above except 8'-3/8" long for 4 racks	P5-753
1D	Same as above except 10'-1/2" long for 5 racks	P5-754
1E	Same as above except 12'-5/8" long for 6 racks	P5-755
1F	Same as above except 14'-3/4" long for 7 racks	P5-756
1G	Same as above except 16'-7/8" long for 8 racks	P5-757
1H	Same as above except 18' 1" long for 9 racks	P5-758
1J	Same as above except 20'-1-1/8" long for 10 racks	P5-759
2	BASE, for 28" wide rack, 2' long for 1 rack (same as ref. 1)	P5-750
2A	Same as above except 4' 4-1/4" long for 2 racks	P5-763
2B	Same as above except 6'8-1/4" long for 3 racks	P5-764
2C	Same as above except 9' -3/4" long for 4 racks	P5-765
2D	Same as above except 11' 4-1/4" long for 5 racks	P5-766
2E	Same as above except 13' 8-3/8" long for 6 racks	P5-767
2F	Same as above except 16'-3/4" long for 7 racks	P5-768
3	ANGLE, for 24" wide rack, 2' long for 1 rack	P5-771
3A	Same as above except 4'-1/8" long for 2 racks	P5-772
3B	Same as above except 6'-1/4" long for 3 racks	P5-773
3C	Same as above except 8'-3/8" long for 4 racks	P5-774
3D	Same as above except 10'-1/2" long for 5 racks	P5-775
3E	Same as above except 12'-2/5" long for 6 racks	P5-776
3F	Same as above except 14'-3/4" long for 7 racks	P5-777
3G	Same as above except 16'-7/8" long for 8 racks	P5-778
3H	Same as above except 18'-1' long for 9 racks	P5-779
3J	Same as above except 20' 1-1/8" long for 10 racks	P5-780
4	ANGLE, for 28" wide rack, 2'4" long for 1 rack	P5-783
4A	Same as above except 4' 8-1/8" long for 2 racks	P5-784
4B	Same as above except 7'-1/4" long for 3 racks	P5-785

HARDWARE (cont'd)

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
4C	Same as above except 9' 4-3/4" long for 4 racks	P5-786
4D	Same as above except 11' 8-1/4" long for 5 racks	P5-787
4E	Same as above except 14'-5/8" long for 6 racks	P5-788
4F	Same as above except 16' 4-3/4" long for 7 racks	P5-789
5	CHANNEL, for use with 5 to 8 rows of 24" racks	P5-792
5A	Same as above except for 9 to 10 rows of 24" racks	P5-796
6	CHANNEL, for use with 4 to 6 rows of 28" racks	P5-800
6A	Same as above except for 7 rows of 28" racks	P5-803
7	PLATE, for splicing 5 to 8 rows of 24" wide racks, or 4 to 6 rows of 28" wide racks, or for splicing wire chase ref. 13 (use 2 plates for 9-10 rows of 24" racks or 2 rows of 28" racks)	P5-807
8	MOUNTING BAR, for B relays, for 20" wide rack	P5-820
8A	Same as above except for 24" wide rack	P5-821
8B	Same as above except for 28" wide rack	P5-822
9	RIVET, for mounting bar ref. 8	P5-823
9A	Same as above except for use on refs. 8A & 8B	P5-824
10	CABLE SUPPORT, for 20" rack	P5-825
11	CABLE SUPPORT, for 24" rack	P5-826
11A	Same as above except for 28" rack	P5-827
12	NUT, for cable support ref. 10 and wire chase ref. 13	P71-356
13	WIRE CHASE, for 20" rack	P5-829
14	WIRE CHASE, for 24"rack	P5-830
14A	Same as above except for 28" rack	P5-831
15	COVER, for wire chase ref. 14	P5-832
15A	Same as above except for use with ref. 14A	P5-833
16	NUT, for wire chase refs. 14 and 14A	P5-835
17	BRACKET, lower right & upper left, for mounting modular relay units to 24" rack	P5-836
17A	Same as above except for 28" rack	P5-837

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HARDWARE (cont'd)

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
18	BRACKET, same as ref. 17 except for upper right & lower left	P5-838
18A	Same as above except for 28" rack	P5-839
19	HARDWARE KIT, for mounting bracket to rack	P5-840
20	HARDWARE KIT, for mounting cabinet to bracket.	P5-841
21	END PLATE, for 20" racks, 2 per row of racks, includes hardware . .	P5-842
22	MOUNTING BOARD, for use with 20" wide 8'7" high racks, includes hardware	P5-843
22A	Same as above except for 20" wide 7'1" high racks	P5-844
23	TERMINAL BLOCK, for Faston terminals, 24 way	P5-845
23A	Same as above except 64 way	P5-846
23B	Same as above except 32 way	P5-847
24	DESIGNATION PLATE, for terminal block, side	P5-848
24A	Same as above except top	P5-849
25	TERMINAL BLOCK, AAR, 14 way	P5-850
26	MOUNTING KIT, for mounting small 28" system modules to 20" rack	P5-854
26A	Same as above except for large system modules	P5-855
27	MOUNTING KIT, for mounting terminal block on 24" rack	P5-858
27A	Same as above except for 28" rack	P5-859
28	MOUNTING KIT, for mounting Faston terminal block on 24" rack . .	P5-860
28A	Same as above except for 28" rack	P5-861
29	MOUNTING PLATE, for terminal blocks	P5-862
30	MOUNTING PLATE, for mounting J relay in B1 space	P5-863
31	MOUNTING PLATE, for mounting JT relay in B1 space	P5-864
32	FUSE MOUNTING BOARD, for 4 250V - 30A fuses	P5-865
33	RESISTOR MOUNTING BOARD, for 4 sealed resistors with 3" mounting centers	P5-866

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CASES AND HOUSINGS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A5-102	58271-5GR2		CASE	
A5-107	29021 GR3		CASE	
A5-112	58271-7GR3		CASE	
A5-117	29021-2GR4		CASE	
A5-122	58271-6GR2		CASE	
A5-127	29021-1GR3		CASE	
A5-132	58271-8GR4		CASE	
A5-135	58271-9GR2		CASE H T	
A5-137	29021-3GR4		CASE	
A5-152	58271-10GR2		CASE	
A5-157	29021-5GR2		CASE	
A5-162			LOW CASE ONE DOOR W/PLATE AS SPECIFIED	
	58271-12GR2		CASE	
	305		PLATE	
	03615-16	2	SCREW	
	01250-12	2	WASHER	
A5-167			LOW CASE ONE DOOR W/PLATE AS SPECIFIED	
	29021-8GR2		LOW CASE	
	305		PLATE	
	03615-16	2	SCREW	
	01250-12	2	WASHER	
A5-172			HIGH CASE ONE DOOR W/PLATE AS SPECIFIED	
	58271-14GR4		CASE	
	305		PLATE	
	03615-16	2	SCREW	
	01250-12	2	WASHER	
A5-177			HIGH CASE SINGLE DOOR ALUM W/PLATE AS SPECIFIED	
	29021-7GR2		CASE	
	305		PLATE	
	03615-16	2	SCREW	
	01250-12	2	WASHER	
A5-202	36006-66GR3		CASE	
A5-212	36006-65GR3		CASE	
A5-220			CABLE POST	
	45935-4GR24		POLE / BASE	
	30391		PINNACLE	
	36288-2		CAP	
	36291 GR1		CLAMP	
A5-225			CABLE ENTRANCE POST	
	37946 GR2		COUPLING	
	317-1GR3		CLAMP	
	41892-3		BUSHING	
	40585-1		CONDUIT	
A5-226			CABLE ENTRANCE POST	
	37946 GR2		COUPLING	
	317-1GR3		CLAMP	
	41892-3		BUSHING	
	40585-2		CONDUIT	
A5-228			CABLE ENTRANCE POST	
	37946 GR2		COUPLING	
	41892-3		BUSHING	
	46190-23		CONDUIT	
A5-229			CABLE ENTRANCE POST	
	37946 GR2		COUPLING	
	41892-3		BUSHING	
	46190-22		CONDUIT	
A5-502			HOUSING 8 FT X 6 FT	105
	55675-606GR5		HOUSING	
	55698-44GR2		LIGHTING LAYOUT	
	55698-38GR1		LIGHTING LAYOUT	
A5-503			HOUSING 8 FT X 6FT	105
	55675-606GR3		HOUSING	
	55698-44GR2		LIGHTING LAYOUT	

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CASES AND HOUSINGS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A5-507			HOUSING 8 FT X 6FT	105
	55675-606GR2		HOUSING	
	55698-44GR2		LIGHTING LAYOUT	
	55698-38GR1		LIGHTING LAYOUT	
A5-508			HOUSING 8' X 6' W/LIGHTING LAYOUT DWG 55698-62 GR1	105
	55675-806GR2		HOUSING	
	2386-14	2	SWITCH	
	46529-6	2	OUTLET	
	49388-27	2	COVER	
	01274-8	4	CLIP	
	53029-75	13	WASHER	
	03615-20	9	SCREW	
	424-11	13	NUT	
	44515-90	4	CONNECTOR	
	641-69	5	CLAMP	
	0927-5	2	BOX	
	49893-13	2	RECEPTACLE	
	81083-6GR1	44	CONDUIT	
	56353-44	4	CONNECTOR	
	41825-559	2	SUPPORT	
	0784	4	BOLT	
	01273-8	4	WASHER	
	03615-24	4	SCREW	
	01273-6	4	WASHER	
	58277 GR1		GROUND POST ASSY.	
	0930-8		BREAKER BOX	
	58745-27		ARRESTER	
	51943-91	3	BREAKER	
	80551-75GR1	44	WIRE #14 STRANDED GREEN	
	80551-72GR1	44	WIRE #14 STRANDED WHITE	
	80551-74GR1	44	WIRE #14 STRANDED BLACK	
	0958-11	2	WIRE	
A5-512				105
A5-513			HOUSING 8 FT X 8 FT	105
	55675-608GR3		HOUSING	
	55698-44GR3		LIGHTING LAYOUT	

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CASES AND HOUSINGS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A5-517			HOUSING 8 FT X 8 FT	105
	55675-608GR2		HOUSING	
	55698-44GR3		LIGHTING LAYOUT	
	55698-38GR1		LIGHTING LAYOUT	

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A5-518			HOUSING 8' X 8' W/LIGHTING LAYOUT DWG 55698-62 GR1	105
	55675-808GR2		HOUSING COMP	
	2386-14	2	SWITCH	
	46529-6	2	OUTLET	
	49388-27	2	COVER	
	01274-8	4	CLIP	
	53029-75	13	WASHER	
	03615-20	9	SCREW	
	424-11	13	NUT	
	44515-90	4	CONNECTOR	
	641-69	5	CLAMP	
	0927-5	2	BOX	
	49893-13	2	RECEPTACLE	
	81083-6GR1	44	CONDUIT	
	56353-44	4	CONNECTOR	
	41825-559	2	SUPPORT	
	0784	4	BOLT	
	01273-8	4	WASHER	
	03615-24	4	SCREW	
	01273-6	4	WASHER	
	58277 GR1		GROUND POST ASSMY.	
	0930-8		BREAKER BOX	
	58745-27		ARRESTOR	
	51943-91	3	BREAKER	
	80551-75GR1	44	WIRE #14 STRAND GREEN	
	80551-72GR1	44	WIRE #14 STRAND WHITE	
	80551-74GR1	44	WIRE #14 STRAND BLACK	
	0958-11	2	WIRE	

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CASES AND HOUSINGS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A5-522			HOUSING 8 FT X 10 FT	105
	55675-610GR6		HOUSING	
	55698-44GR4		LIGHTING LAYOUT	
	55698-38GR1		LIGHTING LAYOUT	
A5-523			HOUSING 8 FT X 10 FT	105
	55675-610GR3		HOUSING	
	55698-44GR4		LIGHTING LAYOUT	
A5-527			HOUSING 8 FT X 10 FT	105
	55675-610GR2		HOUSING	
	55698-44GR4		LIGHTING LAYOUT	
	55698-38GR1		LIGHTING LAYOUT	
A5-528			HOUSING 8' X 10' COMPL. W/ LIGHTING LAYOUT 55698-62 GR 1	105
	55675-810GR2		HOUSING COMPL.	
	2386-14	2	SWITCH	
	46529-6	2	OUTLET	
	49388-27	2	COVER	
	01274-8	4	CLIP	
	53029-75	13	WASHER	
	03615-20	9	SCREW	
	424-11	13	NUT	
	44515-90	4	CONNECTOR	
	641-69	5	CLAMP	
	0927-5	2	BOX	
	49393-13	2	RECEPTACLE	
	81083-6GR1	44	CONDUIT	
	56353-44	4	CONNECTOR	
	41825-559	2	SUPPORT	
	0784	4	BOLT	
	01273-8	4	WASHER	
	03615-24	4	SCREW	
	01273-6	4	WASHER	
	58277 GR1		GROUND POST ASSY.	
	0930-8		BREAKER BOX	
	58745-27		ARRESTOR	
	51943-91	3	BREAKER	
	80551-75GR1	44	WIRE #14 STRANDED GREEN	
	80551-72GR1	44	WIRE #14 STRANDED WHITE	
	80551-74GR1	44	WIRE #14 STRANDED BLACK	
	0958-11	2	WIRE	
A5-532				105

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CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A5-533			HOUSING 8 FT X 12 FT	105
	55675-612GR3		HOUSING	
	55698-44GR5		LIGHTING LAYOUT	
A5-537			HOUSING 8 FT.X 12 FT	105
	55675-612GR2		HOUSING	
	55698-44GR5		LIGHTING LAYOUT	
	55698-38GR1		LIGHTING LAYOUT	
A5-538			HOUSING 8' X 12' COMPL. W/ LIGHTING LAYOUT 55698-62 GR 2	105
	55675-812GR2		HOUSING COMPL.	
	2386-14	2	SWITCH	
	46529-6	2	OUTLET	
	49388-27	2	COVER	
	01274-8	4	CLIP	
	53029-75	20	WASHER	
	03615-20	12	SCREW	
	424-11	16	NUT	
	44515-90	8	CONNECTOR	
	641-69	4	CLAMP	
	0927-5	4	BOX	
	49893-13	4	RECEPTACLE	
	81083-6GR1	48	CONDUIT	
	56353-44	4	CONNECTOR	
	41825-559	2	SUPPORT	
	0784	4	BOLT	
	01273-8	4	WASHER	
	03615-24	4	SCREW	
	01273-6	4	WASHER	
	58277 GR1		GROUND POST ASSY.	
	0930-8		BREAKER	
	58745-27		ARRESTOR	
	51943-91	3	BREAKER	
	80551-75GR1	48	WIRE #14 STRANDED GREEN	
	80551-72GR1	48	WIRE #14 STRANDED WHITE	
	80551-74GR1	48	WIRE #14 STRANDED BLACK	
	0958-11	4	WIRE	

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CASES AND HOUSINGS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A5-542			HOUSING 8FT X 14FT	105
	55675-614GR6		HOUSING	
	55698-44GR6		LIGHTING LAYOUT	
	55698-38GR1		LIGHTING LAYOUT	
A5-543			HOUSING 8 FT X 14 FT	105
	55675-614GR3		HOUSING	
	55698-44GR6		LIGHTING LAYOUT	
A5-547			HOUSING 8 FT X 14 FT	105
	55675-614GR2		HOUSING	
	55698-44GR6		LIGHTING LAYOUT	
	55698-38GR1		LIGHTING LAYOUT	
A5-548			HOUSING 8' X 14' COMPL. W/ LIGHTING LAYOUT 55698-62 GR 3	105
	55675-814GR2		HOUSING COMPL.	
	2386-14	2	SWITCH	
	46529-6	2	OUTLET	
	49388-27	2	COVER	
	01274-8	4	CLIP	
	53029-75	22	WASHER	
	03615-20	14	SCREW	
	424-11	18	NUT	
	44515-90	8	CONNECTOR	
	641-69	6	CLAMP	
	0927-5	4	BOX	
	49893-13	4	RECEPTACLE	
	81083-6GR1	56	CONDUIT	
	56353-44	4	CONNECTOR	
	41825-559	2	SUPPORT	
	0784	4	BOLT	
	01273-8	4	WASHER	
	03615-24	4	SCREW	
	58277 GR1		GROUND POST ASSY.	
	0930-8		BREAKER BOX	
	58745-27		ARRESTOR	
	51943-91	3	BREAKER	
	01273-6	4	WASHER	
	80551-75GR1	56	WIRE #14 STRANDED GREEN	
	80551-72GR1	56	WIRE #14 STRANDED WHITE	
	80551-74GR1	56	WIRE #14 STRANDED BLACK	
	0958-11	4	WIRE	
A5-552				

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CASES AND HOUSINGS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A5-553			HOUSING 8 FT X 16 FT	105
	55675-616GR3		HOUSING	
	55698-44GR7		LIGHTING LAYOUT	
A5-557			HOUSING 8 FT X 16 FT	105
	55675-616GR2		HOUSING	
	55698-44GR7		LIGHTING LAYOUT	
	55698-38GR1		LIGHTING LAYOUT	
A5-558			HOUSING 8' X 16' COMPL. W/ LIGHTING LAYOUT 55698-62 GR 3	105
	55675-816GR2		HOUSING COMPL.	
	2386-14	2	SWITCH	
	46529-6	2	OUTLET	
	49388-27	2	COVER	
	01274-8	4	CLIP	
	53029-75	22	WASHER	
	03615-20	14	SCREW	
	424-11	18	NUT	
	44515-90	8	CONNECTOR	
	641-69	6	CLAMP	
	0927-5	4	BOX	
	49893-13	4	RECEPTACLE	
	81083-6GR1	56	CONDUIT	
	56353-44	4	CONNECTOR	
	41825-559	2	SUPPORT	
	0784	4	BOLT	
	01273-8	4	WASHER	
	03615-24	4	SCREW	
	58277 GR1		GROUND POST ASSY.	
	01273-6	4	WASHER	
	0930-8		BREAKER BOX	
	58745-27		ARRESTOR	
	51943-91	3	BREAKER	
	80551-75GR1	56	WIRE #14 STRANDED GREEN	
	80551-72GR1	56	WIRE #14 STRANDED WHITE	
	80551-74GR1	56	WIRE #14 STRANDED BLACK	
	0958-11	4	WIRE	
A5-562				

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CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A5-563			HOUSING 8 FT X 18 FT	105
	55675-618GR3		HOUSING	
	55698-44GR8		LIGHTING LAYOUT	
A5-567			HOUSING 8 FT X 18 FT	105
	55675-618GR2		HOUSING	
	55698-44GR8		LIGHTING LAYOUT	
	55698-38GR1		LIGHTING LAYOUT	
A5-568			HOUSING 8' X 18' COMPL. W/ LIGHTING LAYOUT 55698-62 GR 4	105
	55675-818GR2		HOUSING COMPL.	
	2386-14	2	SWITCH	
	46529-6	2	OUTLET	
	49388-27	2	COVER	
	01274-8	4	CLIP	
	53029-75	30	WASHER	
	03615-20	18	SCREW	
	424-11	22	NUT	
	44515-90	12	CONNECTOR	
	641-69	6	CLAMP	
	0927-5	6	BOX	
	49893-13	6	RECEPTACLE	
	81083-6GR1	60	CONDUIT	
	56353-44	4	CONNECTOR	
	41825-559	2	SUPPORT	
	0784	4	BOLT	
	01273-8	4	WASHER	
	03615-24	4	SCREW	
	01273-6	4	WASHER	
	58277 GR1		GROUND POST ASSY.	
	0930-8		BREAKER BOX	
	58745-27		ARRESTOR	
	51943-91	3	BREAKER	
	80551-75GR1	60	WIRE #14 STRANDED GREEN	
	80551-72GR1	60	WIRE #14 STRANDED WHITE	
	80551-74GR1	60	WIRE #14 STRANDED BLACK	
	958-11	6	WIRE	
↑5-572				105
↑5-573				105

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CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A5-577			HOUSING 8 FT X 20 FT	105
	55675-620GR5		HOUSING	
	55698-44GR11		LIGHTING LAYOUT	
	55698-38GR1		LIGHTING LAYOUT	
A5-578			HOUSING 8' X 20' COMPL. W/ LIGHTING LAYOUT 55698-62 GR 5	105
	55675-820GR2		HOUSING COMPL.	
	2386-14	2	SWITCH	
	46529-6	2	OUTLET	
	49388-27	2	COVER	
	01274-8	4	CLIP	
	53029-75	32	WASHER	
	03615-20	20	SCREW	
	424-11	24	NUT	
	44515-90	12	CONNECTOR	
	641-69	8	CLAMP	
	0927-5	6	BOX	
	49893-13	6	RECEPTACLE	
	81083-6GR1	68	CONDUIT	
	56353-44	4	CONNECTOR	
	41825-559	2	SUPPORT	
	0784	4	BOLT	
	01273-8	4	WASHER	
	03615-24	4	SCREW	
	01273-6	4	WASHER	
	58277 GR1		GROUND POST ASSY.	
	0930-8		BREAKER BOX	
	58745-27		ARRESTOR	
	51943-91	3	BREAKER	
	80551-75GR1	68	WIRE #14 STRANDED GREEN	
	80551-72GR1	68	WIRE #14 STRANDED WHITE	
	80551-74GR1	68	WIRE #14 STRANDED BLACK	
	0958-11	6	WIRE	

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CASES AND HOUSINGS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A5-579			HOUSING 8' X 22' COMPL. W/ LIGHTING LAYOUT 55698-62 GR 6	
	55675-822GR2		HOUSING COMPL.	
	2386-14	2	SWITCH	
	46529-6	2	OUTLET	
	49388-27	2	COVER	
	01274-8	4	CLIP	
	53029-75	38	WASHER	
	03615-20	22	SCREW	
	424-11	26	NUT	
	44515-90	16	CONNECTOR	
	641-69	6	CLAMP	
	0927-5	8	BOX	
	49893-13	8	RECEPTACLE	
	81083-6GR1	72	CONDUIT	
	56353-44	4	CONNECTOR	
	41825-559	2	SUPPORT	
	0784	4	BOLT	
	01273-8	4	WASHER	
	03615-24	4	SCREW	
	01273-6	4	WASHER	
	58277 GR1		GROUND POST ASSY.	
	0930-8		BREAKER BOX	
	58745-27		ARRESTOR	
	51943-91	3	BREAKER	
	80551-75GR1	72	WIRE #14 STRANDED GREEN	
	80551-72GR1	72	WIRE #14 STRANDED WHITE	
	80551-74GR1	72	WIRE #14 STRANDED BLACK	
	0958-11	8	WIRE	

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A5-580			HOUSING 8' X 24' COMPL. W/ LIGHTING LAYOUT 55698-62 GR 7	
	55675-824GR2		HOUSING COMPLETE	
	46529-6	2	OUTLET	
	49388-27	2	COVER	
	01274-8	4	CLIP	
	53029-75	40	WASHER	
	03615-20	24	SCREW	
	424-11	28	NUT	
	44515-90	16	CONNECTOR	
	641-69	8	CLAMP	
	0927-5	8	BOX	
	49893-13	8	RECEPTACLE	
	81083-6GR1	76	CONDUIT	
	56353-44	4	CONNECTOR	
	41825-559	2	SUPPORT	
	0784	4	BOLT	
	01273-8	4	WASHER	
	03615-24	4	SCREW	
	01273-6	4	WASHER	
	58277 GR1		GROUND POST ASSY.	
	0930-8		BREAKER BOX	
	58745-27		ARRESTOR	
	51943-91	3	BREAKER	
	80551-75GR1	76	WIRE #14 STRANDED GREEN	
	80551-72GR1	76	WIR #14 STRANDED WHITE	
	80551-74GR1	76	WIRE #14 STRANDED BLACK	
	958-11	8	WIRE	
	2386-14	2	SWITCH	

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CASES AND HOUSINGS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A5-591			HOUSING 6FT X 6FT	107
	55675-506GR2		HOUSING	
	55698-44GR1		LIGHTING LAYOUT	
A5-594	55675-866GR1		HOUSING 6FT X 6FT	107
A5-600	31918-69GR1		RACK	121
A5-602	31918-72GR1		RACK	121
A5-605	31918-67GR1		RACK	121
A5-606			RELAY RACK ASSEMBLY DWG 31918-68 GR1	
	087-2	4	WASHER	
	401-215		PLATE NM	
	401-641		PLATE NM	
	441-505	4	STUD	
	441-542	2	STUD	
	493-203	2	WASHER	
	493-204	4	WASHER	
	493-209	4	WASHER	
	879-54		STUD	
	1048-5	2	NUT	
	01250-15	3	WASHER	
	01250-20	4	WASHER	
	01273-8	4	WASHER	
	01273-10	2	WASHER	
	01273-11	2	WASHER	
	01273-13	2	WASHER	
	3343-31	2	SCREW	
	7350-331	2	BUSHING	
	21435-2	2	BUSHING	
	21506-54		PLATE	
	30819-2	2	NUT	
	31919-55GR1		FRAME	
	33645-26	4	SPACER	
	35703-3	4	WASHER	
	43238-2	4	NUT	
	45938-5	2	BOLT	
	52822-16	4	NUT	
	54392	6	SCREW	
	59791-28	2	ANGLE	
A5-612	31918-73GR1		RACK	121

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CASES AND HOUSINGS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
P5-100			BACKBOARD F/LOW CASE DWG 58273 GR1	
	01250-12	8	WASHER	
	18493 GR1	8	CLIP	
	29757-39	8	SCREW	
	42333-48	8	NUT	
	56886-478		BACKBOARD BD	
P5-101			BACKBOARD F/HIGH CASE DWG 58273-1 GR1	
	01250-12	14	WASHER	
	18493 GR1	14	CLIP	
	29757-39	14	SCREW	
	42333-48	14	NUT	
	56886-475		BOARD	
	56886-478		BD BCKBD	
P5-102			BACKBORAD ADJ GROUP DWG 58273-4 GR1	
	01250-12	8	WASHER	
	18493 GR1	8	CLIP	
	29757-39	8	SCREW	
	42333-48	8	NUT	
	56886-550		BD BCK	
P5-103			BACKBOARD DWG 58273-3 GR1	
	01307	6	SCREW	
	18493 GR1	6	CLIP	
	56886-555		BD BCKBD	
P5-104	58273-3GR2		BACKBOARD	
P5-105			TERMINAL BOARD DWG 58288-1 GR3	
	0471-54	16	BOLT	
	01273-6	16	WASHER	
	41825-473	2	SUPPORT	
	56886-546	3	BOARD	
P5-106			TERMINAL BOARD DWG 58288 GR3	
	0471-54	16	BOLT	
	01273-6	16	WASHER	
	41825-473	2	SUPPORT	
	56886-468	3	BOARD	
P5-107			TERMINAL BOARD COMP DWG 58288-2 GR1	
	0471-54	8	BOLT	
	01273-6	8	WASHER	
	41825-512	2	SUPPORT	
	56886-546		BOARD	
P5-112			BACKBOARD F/CASE DWG 58273-10 GR1	
	01307	8	SCREW	
	18493 GR1	8	CLIP	
	56886-587		BOARD	
P5-113	58273-10GR2		BACKBOARD	
P5-150			SHELF	
	15918-178		SHELF	
	1156-13	2	NUT	
	01250-17	2	WASHER	
	01273-8	2	WASHER	
	34418-105		BRACKET	
	35090-43	2	BOLT	
P5-151			SHELF	
	15918-181		SHELF	
	1156-13	2	NUT	
	01250-17	2	WASHER	
	01273-8	2	WASHER	
	34418-105	2	BRACKET	
	35090-43	2	BOLT	
P5-152			SHELF	
	15918-180		SHELF	
	1156-13	2	NUT	
	01250-17	2	WASHER	
	01273-8	2	WASHER	
	34418-105	2	BRACKET	
	35090-43	2	BOLT	
P5-153	58278-1GR1		TRAY	
P5-154	58278 GR1		TRAY	
P5-155	58278-4GR1		TRAY	

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CAT.NO.	DRAWING NO.	QTY	NAME	PG.
P5-156	58278-3GR1		TRAY	
P5-157	58278-3GR2		TRAY	
P5-158			BOARD	
	32108-315		BOARD	
	32108-316		BOARD	
P5-159			BOARD	
	56886-485		BOARD	
	1156-13	2	NUT	
	01250-17	2	WASHER	
	01273-8	2	WASHER	
	34418-105	2	BRACKET	
	35090-43	2	BOLT	
P5-160			BOARD	
	56886-552		BOARD	
	1156-13	2	NUT	
	01250-17	2	WASHER	
	01273-8	2	WASHER	
	34418-105	2	BRACKET	
	35090-43	2	BOLT	
P5-161			BOARD	
	56886-61		BOARD	
	1156-13	2	NUT	
	01250-17	2	WASHER	
	01273-8	2	WASHER	
	34418-105	2	BRACKET	
	35090-43	2	BOLT	
P5-162	58277 GR1		POST	
P5-165	58239 GR2		SUPPORT	
P5-166			CABLE	
			SUPPORT	
			COMP DWG	
			58239 GR1	
	1155-16		NUT	
	1156-13	3	NUT	
	01250-16	3	WASHER	
	01273-7		WASHER	
	01273-8	3	WASHER	
	35090-36	3	BOLT	
	38508-11		EYE BOLT	
	53148-1		BAG	
	56118-111		CHANNEL	
P5-167			MTR. CALL	
			LAMP	
	52955-1GR2		LAMP	
	0820-2		BUSHING	
	27589	3	NUT	
	42087-20		CONDUIT	
	35132-40		ELBOW	
	7554-7		CONDUIT	
	0441-5	2	SCREW	
	01273-7	3	WASHER	
	0304		BUSHING	
	51342-4		PLATE	
	3440-64		SCREW	
	58437-9GR1		BRACKET	
	34866-60		LAMP	
	55345		ADAPTER	
			55345	
P5-168			RECEPTACLE	
			COMP W	
			HARDWARE	
	49893-12		RECEPTACLE	
	03406-20	2	SCREW	
	53029-67	2	WASHER	
	01272-3	2	NUT	
P5-169			MOUNTING	
			ANGLE SET	
	59793-188		ANGLE	
	59793-189		ANGLE	
	3343-34	4	SCREW	
	1048-6	4	NUT	
	01273-10	4	WASHER	
P5-170			MOUNTING	
			ANGLE SET	
	59793-124	4	ANGLE	
	3343-34	4	SCREW	
	1048-6	4	NUT	
	01273-10	4	WASHER	
P5-171			CLAMP	
	41850-2	2	ADAPTER	
	42241	2	STUD	
	1048-6	4	NUT	
	01250-21	4	WASHER	
	47295-13	4	BOLT&NUT	
	01273-10	8	WASHER	

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CAT.NO.	DRAWING NO.	QTY	NAME	PG.
P5-172			CLAMP	
	41850-2	2	ADAPTER	
	42241-1	2	STUD	
	1048-6	4	NUT	
	01250-21	6	WASHER	
	47295-13	4	BOLT&NUT	
	01273-10	8	WASHER	
P5-173			CLAMP	
	41850-2	2	ADAPTER	
	42241-2	2	STUD	
	1048-6	4	NUT	
	01250-21	6	WASHER	
	47295-13	4	BOLT&NUT	
	01273-10	8	WASHER	
P5-174			CLAMP	
	41850-2		ADAPTER	
	47295-13	2	BOLT&NUT	
	01273-10	2	WASHER	
	31359		U BOLT	
	01250-21	4	WASHER	
P5-175			CLAMP	
	41850-2		ADAPTER	
	47295-13	2	BOLT&NUT	
	01273-10	4	WASHER	
	30345		U BOLT	
	1048-6	2	NUT	
	01250-21	4	WASHER	
P5-176			CLAMP	
	41850-2		ADAPTER	
	47295-13	2	BOLT&NUT	
	01273-10	4	WASHER	
	30346		U BOLT	
	1048-6	2	NUT	
	01250-21	4	WASHER	
P5-177			COUPLING	
	45689-83		COUPLING	
	31359		U BOLT	
	01250-21	2	WASHER	
P5-178			COUPLING	
	45689-83		COUPLING	
	30345		U BOLT	
	1048-6	2	NUT	
	01273-10	2	WASHER	
	01250-21	2	WASHER	
P5-179			COUPLING	
	45689-83		COUPLING	
	30346		U BOLT	
	1048-6	2	NUT	
	01273-10	2	WASHER	
	01250-21	2	WASHER	
P5-180			COUPLING	
	45689-83	2	COUPLING	
	42241	2	STUD	
	1048-6	4	NUT	
	01250-21	4	WASHER	
	01273-10	4	WASHER	
P5-181			COUPLING	
	45689-83	2	COUPLING	
	42241-1	2	STUD	
	1048-6	4	NUT	
	01250-21	4	WASHER	
	01273-10	4	WASHER	
P5-182			COUPLING	
	45689-83	2	COUPLING	
	42241-2	2	STUD	
	1048-6	4	NUT	
	01250-21	4	WASHER	
	01273-10	4	WASHER	
P5-183			RELAY	
			SUPPORT	
	18481	2	SUPPORT	
	41824-43GR1		SUPPORT	
P5-184			RELAY	
			SUPPORT	
	18481-3	2	SUPPORT	
	41824-43GR2		SUPPORT	
P5-185			RELAY	
			SUPPORT	
	18481		SUPPORT	
	41824-43GR1		SUPPORT	
P5-186			RELAY	
			SUPPORT	
	18481-3		SUPPORT	
	41824-43GR2		SUPPORT	
P5-187	17549-1		BUSHING	
P5-188	17549-7		BUSHING	
P5-189			PLATE	
	305-628		PLATE	
	03615-16	2	SCREW	
	01250-12	2	WASHER	

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CAT.NO.	DRAWING NO.	QTY	NAME	PG.
P5-191			PLATE	
	305-629		PLATE	
	3955-38	2	SCREW	
	01250-12	2	WASHER	
P5-195			SUPPORT	
	41825-532		SUPPORT	
	01250-21	2	WASHER	
	3343-35	6	SCREW	
	01273-10	6	WASHER	
	1048-5	6	NUT	
	59791-143		ANGLE	
	59791-144		ANGLE	
	32446-17		BOLT	
	073-2		WASHER	
	01273-13	3	WASHER	
	50357-23		U BOLT	
	0272-9	2	NUT	
	53336-9		BLOCK	
	51072-77		CHANNEL	
P5-197			SUPPORT	
	49092-238	2	BRACKET	
	01250-21	2	WASHER	
	3343-35	4	SCREW	
	01273-10	4	WASHER	
	41927-3	2	B/N	
	01273-11	2	WASHER	
	43209-5	4	WASHER	
	1048-5	4	NUT	
P5-199			COUPLING	
	45689-187		COUPLING	
	51342-4		PLATE	
	38508-11		EYE BOLT	
	01273-7	3	WASHER	
	0441-5	2	SCREW	
P5-200			COUPLING	
	45689-186		COUPLING	
	51342-4		PLATE	
	38508-11		EYE BOLT	
	01273-7	3	WASHER	
	0441-5	2	SCREW	
P5-201			CABLE	
			SUPPORT	
			COMP DWG	
			58289-1	
			GR2	
	1155-11		NUT	
	1156-13	3	NUT	
	01250-16	3	WASHER	
	01273-7		WASHER	
	01273-8	3	WASHER	
	35090-46	3	BOLT	
	38508-11		EYEBOLT	
	56118-138		CHANNEL	
P5-202	58289-1GR1		SUPPORT	
P5-204			LAMP COMP	
			DWG 52955-	
			9 GR1	
	34496-21	2	RIVET	
	49893-12		RECEPTACLE	
	53148-1		BAG	
	54437-6		ANGLE	
P5-205			RELAY	
			SUPPORT	
	18481	2	SUPPORT	
	41824-70GR1		SUPPORT	
P5-206			RELAY	
			SUPPORT	
	18481		SUPPORT	
	41824-70GR1		SUPPORT	
P5-300			DOOR	
	37868-212GR1		DOOR	
	18387	2	BAFFLE	
	47527-11	2	SCREEN	
	01250-10	8	WASHER	
	01272-7	8	NUT	
P5-301			DOOR	
	37868-198GR1		DOOR	
	18387	2	BAFFLE	
	47527-11	2	SCREEN	
	01250-12	8	WASHER	
	01272-7	8	NUT	
P5-302			DOOR	
	37868-213GR1		DOOR	
	18387	2	BAFFLE	
	47527-11	2	SCREEN	
	01250-10	8	WASHER	
	01272-7	8	NUT	

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CAT.NO.	DRAWING NO.	QTY	NAME	PG.
P5-304			DOOR	
	37868-211GR1		DOOR	
	18387	2	BAFFLE	
	47527-11	2	SCREEN	
	01250-10	8	WASHER	
	01272-7	8	NUT	
P5-305			DOOR	
	37868-214GR1		DOOR	
	18387-1	2	BAFFLE	
	47527-14	2	SCREEN	
	01250-10	8	WASHER	
	01272-7	8	NUT	
P5-306			HANDLE	
	53720-9		HANDLE	
	42333-51		NUT	
	01250-22		WASHER	
	1225-105		WASHER	
	35703-3	2	WASHER	
P5-307	730-130		PIN	
P5-310	18387		BAFFLE	
P5-311	18387-1		BAFFLE	
P5-312	47527-11		SCREEN	
P5-313	47527-14		SCREEN	
P5-316	56109-62		ROD	
P5-317	56109-64		ROD	
P5-320			CLIP	
	18493 GR1		CLIP	
	01250-12		WASHER	
	53029-75		WASHER	
	3955-36		SCREW	
	0383-1		NUT	
P5-321	15918-178		SHELF	
P5-322	15918-181		SHELF	
P5-323	55478-24GR1		BRACKET COMP	
P5-325	15918-180		SHELF	
P5-326			DOOR	
	37868-225GR1		DOOR	
	18387-1	2	BAFFLE	
	47527-14	2	SCREEN	
	01250-10	8	WASHER	
	01272-7	8	NUT	
P5-327	56109-77		ROD	
P5-328	56109-78		ROD	
P5-340	58278-9GR1		TRAY	
P5-341	58278-10GR1		TRAY	
P5-342	56886-590		BOARD	
P5-343	56886-589		BOARD	
P5-344	58278-11GR1		TRAY	
P5-345	56425-7		SHELF	
P5-347			TERMINAL BOARD COMP DWG 58288-6 GR1	
	01307	8	SCREW	
	16111-100	2	SPRING	
	32108-340		BOARD	
	41825-589	2	SUPPORT	
P5-349			BACKBOARD	
	58273-11GR1		BACKBOARD	
	58273-12GR1		BACKBOARD	
P5-350	58273-11GR1		BACKBOARD	
P5-351	58273-13GR1		BACKBOARD	
P5-352	58273-12GR1		BACKBOARD	
P5-355			RELAY SUPPORT	
	18481-4	2	SUPPORT	
	41824-43GR3		SUPPORT	
P5-356			RELAY SUPPORT	
	18481-4		SUPPORT	
	41824-43GR3		SUPPORT	
P5-359	55478-28GR1		BRACKET	
P5-370			PINNACLE	
	30391		PINNACLE	
	36288-2		CAP	
P5-372	36291 GR1		CLAMP	
P5-375	45935-4GR24		POLE / BASE	
P5-376	45935-4GR2		POLE / BASE	
P5-380	37946 GR2		COUPLING	
P5-383	317-1GR3		CLAMP	
P5-385	41892-3		BUSHING	
P5-387	40585-1		CONDUIT	
P5-389	40585-2		CONDUIT	
P5-391	46190-23		CONDUIT	
P5-393	46190-22		CONDUIT	
P5-402	37868-217GR1		DOOR	
P5-403	37868-216GR1		DOOR	
P5-405	43460-14		GASKET	
P5-409	47527		SCREW	
P5-411	47526		PLATE	

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CAT.NO.	DRAWING NO.	QTY	NAME	PG.
P5-418			CLIP	
	18493 GR1		CLIP	
	01307		SCREW	
P5-426	36678		COVER	
P5-430	37868-237GR1		DOOR	
P5-431	37868-237GR2		DOOR	
P5-432	37868-237GR3		DOOR	
P5-433	37868-237GR4		DOOR	
P5-434			DOOR	
			HANDLE FOR	
			LOW CASE	
	53720-20		HANDLE	
	42333-51		NUT	
	01250-20		WASHER	
	35703-3	2	WASHER	
	1225-222		WASHER	
	626-208		WASHER	
P5-435			DOOR	
			HANDLE FOR	
			HIGH CASE	
	53720-20		HANDLE	
	42333-51		NUT	
	01250-20		WASHER	
	1225-222		WASHER	
	626-208		WASHER	
P5-436	730-140		PIN	
P5-437	56109-79		ROD	
P5-438	56109-81		ROD	
P5-439	37868-243GR3		DOOR	
P5-440	37868-243GR1		DOOR	
P5-441	37868-243GR2		DOOR	
P5-442			HANDLE	
			COMPLETE	
			WITH	
			HARDWARE	
	53720-2		HANDLE	
	42333-51		NUT	
	1533-57	2	WASHERS	
	01250-20		WASHERS	
	1225-222		WASHERS	
P5-500			SHELF	117
	22701-5	2	SHELF	
	22869-2	6	BRACKET	
	41825-607	6	SUPPORT	
	54392-61	9	SCREW	
P5-501			SHELF	117
	22701-6	2	SHELF	
	22869-2	8	BRACKET	
	41825-607	8	SUPPORT	
	54392-61	12	SCREW	
P5-502			SHELF	117
	22701-14	4	SHELF	
	22701-5	4	SHELF	
	22869-2	10	BRACKET	
	41825-607	10	SUPPORT	
	54392-61	15	SCREW	
P5-503			SHELF	117
	22701-5	4	SHELF	
	22869-2	12	BRACKET	
	41825-607	12	SUPPORT	
	54392-61	18	SCREW	
P5-504			SHELF	117
	22701-5	2	SHELF	
	22701-6	2	SHELF	
	22869-2	14	BRACKET	
	41825-607	14	SUPPORT	
	54392-61	21	SCREW	
P5-505			SHELF	117
	22701-6	4	SHELF	
	22869-2	16	BRACKET	
	41825-607	16	SUPPORT	
	54392-61	24	SCREW	
P5-506			SHELF	117
	22701-6	2	SHELF	
	22701-5	2	SHELF	
	22701-14	2	SHELF	
	22869-2	18	BRACKET	
	41825-607	18	SUPPORT	
	54392-61	27	SCREW	
P5-507			SHELF	117
	22701-5	4	SHELF	
	22701-14	4	SHELF	
	22869-2	20	BRACKET	
	41825-607	20	SUPPORT	
	54392-61	30	SCREW	
P5-510			SHELF	117
	22701-5		SHELF	
	22869-2	3	BRACKET	
	41825-607	3	SUPPORT	
	54392-61	6	SCREW	

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CAT.NO.	DRAWING NO.	QTY	NAME	PG.
P5-511			SHELF	117
	22701-6		SHELF	
	22869-2	4	BRACKET	
	41825-607	4	SUPPORT	
	54392-61	8	SCREW	
P5-512			SHELF	117
	22701-5		SHELF	
	22701-14		SHELF	
	22869-2	5	BRACKET	
	41825-607	5	SUPPORT	
	54392-61	10	SCREW	
P5-513			SHELF	117
	22701-5	2	SHELF	
	22869-2	6	BRACKET	
	41825-607	6	SUPPORT	
	54392-61	12	SCREW	
P5-514			SHELF	117
	22701-5		SHELF	
	22701-6		SHELF	
	22869-2	7	BRACKET	
	41825-607	7	SUPPORT	
	54392-61	14	SCREW	
P5-515			SHELF	117
	22701-6	2	SHELF	
	22869-2	8	BRACKET	
	41825-607	8	SUPPORT	
	54392-61	16	SCREW	
P5-516			SHELF	117
	22701-6		SHELF	
	22701-5		SHELF	
	22701-14		SHELF	
	22869-2	9	BRACKET	
	41825-607	9	SUPPORT	
	54392-61	18	SCREW	
P5-517			SHELF	117
	22701-5	2	SHELF	
	22701-14	2	SHELF	
	22869-2	10	BRACKET	
	41825-607	10	SUPPORT	
	54392-61	20	SCREW	
P5-520			COVER	117
			BOARD	
	22762-11		BOARD	
	22869-2	3	BRACKET	
	54392-61	3	SCREW	
P5-521			COVER	117
			BOARD	
	22762-12		BOARD	
	22869-2	4	BRACKET	
	54392-61	4	SCREW	
P5-522			COVER	117
			BOARD	
	22762-11		COVER	
			BOARD	
	22762-16		COVER	
			BOARD	
	22869-2	5	BRACKET	
	54392-61	5	SCREW	
P5-523			COVER	117
			BOARD	
	22762-11	2	BOARD	
	22869-2	6	BRACKET	
	54392-61	6	SCREW	
P5-524			COVER	117
			BOARD	
	22762-11		BOARD	
	22762-12		BOARD	
	22869-2	7	BRACKET	
	54392-61	7	SCREW	
P5-525			COVER	117
			BOARD	
	22762-12	2	BOARD	
	22869-2	8	BRACKET	
	54392-61	8	SCREW	
P5-526			COVER	117
			BOARD	
	22762-12		COVER	
			BOARD	
	22762-11		COVER	
			BOARD	
	22762-16		COVER	
			BOARD	
	22869-2	9	BRACKET	
	54392-61	9	SCREW	
P5-527			COVER	117
			BOARD	
	22762-11	2	COVER	
			BOARD	
	22762-16	2	COVER	
			BOARD	
	22869-2	10	BRACKET	
	01307-2	10	SCREW	

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CAT.NO.	DRAWING NO.	QTY	NAME	PG.
P5-530	20161-4		TRAY	117
P5-531	20161-5		TRAY	117
P5-532	20161-11	2	TRAY	117
P5-533	20161-4	2	BATTERY TRAY	
P5-534			TRAY	117
	20161-4		TRAY	
	20161-5		TRAY	
P5-535	20161-5	2	BATTERY TRAY	117
P5-536			TRAY	117
	20161-5		TRAY	
	20161-4		TRAY	
	20161-11		TRAY	
P5-540			MOUNTING BOARD	117
	22868-16		BOARD	
	20167	3	BRACKET	
	20168-1	3	BRACKET	
	54392-60	3	SCREW	
	0471-54	3	BOLT	
	53029-75	3	WASHER	
P5-541			MOUNTING BOARD	117
	22868-17		BOARD	
	20167	4	BRACKET	
	20168-1	4	BRACKET	
	54392-60	4	SCREW	
	0471-54	4	BOLT	
	53029-75	4	WASHER	
P5-542			MOUNTING BOARD	117
	22868-16		BOARD	
	22868-34		BOARD	
	20167	5	BRACKET	
	20168-1	5	BRACKET	
	54392-60	5	SCREW	
	0471-54	5	BOLT	
	53029-75	5	WASHER	
P5-543			MOUNTING BOARD	117
	22868-16	2	BOARD	
	20167	6	BRACKET	
	20168-1	6	BRACKET	
	54392-60	6	SCREW	
	0471-54	6	BOLT	
	53029-75	6	WASHER	
P5-544			MOUNTING BOARD	117
	22868-16		BOARD	
	22868-17		BOARD	
	20167	7	BRACKET	
	20168-1	7	BRACKET	
	54392-60	7	SCREW	
	0471-54	7	BOLT	
	53029-75	7	WASHER	
P5-545			MOUNTING BOARD	117
	22868-17	2	BOARD	
	20167	8	BRACKET	
	20168-1	8	BRACKET	
	54392-60	8	SCREW	
	0471-54	8	BOLT	
	53029-75	8	WASHER	
P5-546			MOUNTING BOARD	117
	22868-17		BOARD	
	22868-16		BOARD	
	22868-34		BOARD	
	20167	9	BRACKET	
	20168-1	9	BRACKET	
	54392-60	9	SCREW	
	0471-54	9	BOLT	
	53029-75	9	WASHER	
P5-547			MOUNTING BOARD	117
	22868-33	3	BOARD	
	20167	10	BRACKET	
	20168-1	10	BRACKET	
	54392-60	10	SCREW	
	0471-54	10	BOLT	
	53029-75	10	WASHER	
P5-560			RELAY RACK DWG 20165 GR9	
	01250-12	4	WASHER	
	01250-17	4	WASHER	
	6170-2	4	SCREW	
	18459-2GR1	2	SUPPORT	
	29757-43	4	SCREW	
	42333-58	4	NUT	
	42333-60	2	NUT	
	51072-524		CHANNEL	
	51072-584		CHANNEL	

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CAT.NO.	DRAWING NO.	QTY	NAME	PG.
P5-561			RELAY RACK DWG 20165 GR8	
	01250-12	6	WASHER	
	01250-17	4	WASHER	
	6170-2	4	SCREW	
	18459-2GR1	3	SUPPORT	
	29757-43	6	SCREW	
	42333-41	2	NUT	
	42333-48	6	NUT	
	51072-584	2	CHANNEL	
P5-562	20165 GR1		RACK	117
P5-563	20165 GR2		RACK	117
P5-564	20165 GR3		RACK	117
P5-565	20165 GR4		RACK	117
P5-566	20165 GR5		RACK	118
P5-567	20165 GR6		RACK	118
P5-568	20165 GR7		RACK	118
P5-570			TERMINAL BOARD	118
	56886-424		BOARD	
	18493 GR1	8	CLIP	
	3955-35	8	SCREW	
	01250-12	8	WASHER	
	01273-6	8	WASHER	
	42333-58	8	NUT	
P5-573			RELAY SUPPORT	118
	18481-2	2	SUPPORT	
	41824-41GR1		SUPPORT	
P5-576			RELAY SUPPORT	118
	18481-2		SUPPORT	
	41824-41GR1		SUPPORT	
P5-582	22869-2		BRACKET	118
P5-585	20168-1		BRACKET	118
P5-588	20167		BRACKET	118
P5-591	40915-28GR1		SUPPORT	118
P5-593	41825-607		SUPPORT	118
P5-596			MTR. CALL LIGHT	120
	52955-1GR2		LAMP	
	55345		ADAPTER 55345	
	0826		NUT	
	47915-13		NIPPLE	
	34866-60		LAMP	
	3360		FLANGE	
	305-689		PLATE	
	45609-28	4	SCREW	
	424-10	4	NUT	
	01273-6	4	WASHER	
	0775		ELBOW	
P5-602	52999-19GR2		HORN	118
P5-605	52999-19GR1		HORN	118
P5-608			COUPLING	118
	45689-153	2	COUPLING	
	188		SUPPORT	
	2400-1		WASHER	
	42333-63		NUT	
P5-611			COUPLING	118
	45689-153		COUPLING	
	188		SUPPORT	
	2400-1		WASHER	
	42333-63		NUT	
P5-700			DOOR	
	37868-196GR1		DOOR	
	55471-12GR1		SCREEN	
	50737-44		SHIELD	
P5-701			DOOR	
	37868-197GR1		DOOR	
	55471-12GR1		SCREEN	
	50737-44		SHIELD	
P5-703	55471-12GR1		SCREEN	
P5-704	50737-44		SHIELD	
P5-706	55680-3GR1		VENTILATOR	
P5-708	45689-153		COUPLING	
P5-709	188		SUPPORT	
P5-710	55678-6		BATTEN	
P5-711	55678-5		BATTEN	
P5-712	55678-7		BATTEN	
P5-713	55677-100GR1		PANEL	
P5-714	55677-104GR3		PANEL	
P5-715	55677-99GR1		PANEL	
P5-716	55677-98GR2		PANEL	
P5-717	55677-98GR3		PANEL	

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CAT.NO.	DRAWING NO.	QTY	NAME	PG.
P5-718	55677-98GR1		PANEL	
P5-719	55677-87GR1		PANEL	
P5-720	55677-93GR1		PANEL	
P5-721	55677-94GR1		PANEL	
P5-722	55090-37		PANEL	
P5-723	55090-38		PANEL	
P5-724	55677-88GR2		PANEL	
P5-725	55677-105GR1		PANEL	
P5-726	55677-97GR1		PANEL	
P5-727	55943-2		RIVET	
P5-730			PLATE COMP	
	305-744		PLATE	
	03615-16	2	SCREW	
	01250-12	2	WASHER	
P5-731			PLATE WITH SCREWS AND WASHERS	
	305-745		PLATE	
	03615-16	2	SCREWS	
	01250-12	2	WASHERS	
P5-732	58278-13GR1		TRAY	
P5-735			BRACKETS WITH HARDWARE	
	34418-175	2	BRACKETS	
	34418-174	2	BRACKETS	
	35090-43	6	BOLTS	
	01250-17	6	WASHERS	
	01273-8	6	WASHERS	
	1156-13	6	NUTS	
	03415-16	4	SCREWS	
	53029-75	4	WASHERS	
	65849 GR1	24	NYLON TAPE (INCHES)	
P5-736			HARDWARE	118
	01250-10	4	WASHERS	
	03610-16	4	SCREWS	
	57295-24	4	NUTS	
P5-737			HARDWARE	118
	35090-43	2	BOLTS	
	01250-17	2	WASHERS	
	01273-8	2	WASHERS	
	1156-13	2	NUTS	
P5-738	41824-41GR1		SUPPORT	118
P5-739	34418-261		BRACKET	118
P5-740	34418-260		BRACKET	118
P5-741	34418-269		BRACKET	118
P5-742	34418-270		BRACKET	118
P5-743	34418-271		BRACKET	118
P5-750	17169 GR1		BASE	125
P5-751	17169-23GR1		BASE	125
P5-752	17169-11GR1		BASE	125
P5-753	17169-12GR1		BASE	125
P5-754			BASES	125
	17169-11GR1		BASE	
	17169-23GR1		BASE	
P5-755			BASES	125
	17169-11GR1	2	BASES	
P5-756			BASES	125
	17169-11GR1		BASE	
	17169-12GR1		BASE	
P5-757			BASES	125
	17169-12GR1	2	BASES	
P5-758			BASES	125
	17169-11GR1	3	BASES	
P5-759			BASES	125
	17169-12GR1	2	BASES	
	17169-23GR1		BASE	
P5-763	17169-1GR1		BASE	125
P5-764	17169-4GR1		BASE	125
P5-765			BASES	125
	17169-1GR1	2	BASES	
P5-766			BASES	125
	17169-1GR1		BASE	
	17169-4GR1		BASE	
P5-767			BASES	125
	17169-4GR1	2	BASES	
P5-768			BASES	125
	17169-1GR1	2	BASES	
	17169-4GR1		BASE	
P5-771	54310-797		ANGLE	125
P5-772	54310-666		ANGLE	125
P5-773	54310-724		ANGLE	125
P5-774	54310-704		ANGLE	125
P5-775			ANGLES	
	54310-666		ANGLE	
	54310-724		ANGLE	
P5-776			ANGLES	
	54310-724	2	ANGLES	
P5-777			ANGLES	125
	54310-704		ANGLE	
	54310-724		ANGLE	
P5-778			ANGLES	125
	54310-704	2	ANGLES	

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CATALOG SECTION A05

CROSS - INDEX

CASES AND HOUSINGS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
P5-779			ANGLES	125
	54310-724	3	ANGLES	
P5-780			ANGLES	125
	54310-704	2	ANGLES	
	54310-666		ANGLE	
P5-783	59791-188		ANGLE	125
P5-784	59791-190		ANGLE	125
P5-785	59791-191		ANGLE	125
P5-786			ANGLES	126
	59791-190	2	ANGLES	
P5-787			ANGLES	126
	59791-190		ANGLE	
	59791-191		ANGLE	
P5-788			ANGLES	126
	59791-191	2	ANGLES	
P5-789			ANGLES	126
	59791-190	2	ANGLES	
	59791-191		ANGLE	
P5-792	51072-785		CHANNEL	126
P5-796			CHANNELS	126
	51072-785	2	CHANNELS	
P5-800	51072-784		CHANNEL	126
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	51072-784	2	CHANNELS	
P5-807	35845-575		PLATE	126
P5-820	18481-23		MOUNTING BAR	126
P5-821	18481-15		MOUNTING BAR	126
P5-822	18481-14		MOUNTING BAR	126
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P5-824	34496-25		RIVET	126
P5-825	41824-72GR1		CABLE SUPPORT	126
P5-826	17494-28GR5		CABLE SUPPORT	126
P5-827	17494-28GR4		CABLE SUPPORT	126
P5-829	57228-72GR1		WIRE CHASE	126
P5-830	57228-63GR1		WIRE CHASE	126
P5-831	57228-49GR1		WIRE CHASE	126
P5-832	50253-101		COVER	126
P5-833	50253-86		COVER	126
P5-835	42333-59		NUT	126
P5-836	34418-177		BRACKET	126
P5-837	34418-179		BRACKET	126
P5-838	34418-179		BRACKET	
P5-839	34418-178		BRACKET	127
P5-840			SCREW & NUT	127
	0441-6		SCREW	
	42333-49		NUT	
P5-841			SCREW & WASHER	127
	03415-12		SCREW	
	53029-75		WASHER	
P5-842	305-728		END PLATE	127
P5-843			BOARD COMPLETE WITH HARDWARE	127
	18149-22		BOARD	
	29757-39	10	SCREWS	
	01250-12	10	WASHERS	
	42333-48	10	NUTS	
P5-844			BOARD COMPLETE WITH HARDWARE	
	18149-23		BOARD	
	29757-39	10	SCREWS	
	01250-12	10	WASHERS	
	42333-48	10	NUTS	
P5-845	29407-1GR1		TERM.BOARD	127
P5-846	29407-1GR3		TERM.BOARD	127
P5-847	29407-1GR2		TERM.BOARD	127
P5-848	35845-486		DESIGNATION PLATE	127
P5-849	35845-487		DESIGNATION PLATE	127
P5-850	59681-4GR1		TERM.BLOCK	127
P5-854			HARDWARE FOR EQUIPMENT RACKS	127
	03310-20	4	SCREWS	
	57295-24	4	SPEED NUTS	
	22539-16	4	CUP WASHERS	

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CASES AND HOUSINGS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
P5-855			HARDWARE FOR EQUIPMENT RACKS	127
	34418-228		BRACKET (R.H.)	
	34418-229		BRACKET (L.H.)	
	03310-116	4	SCREWS	
	22539-16	4	CUP WASHERS	
	29757-38	4	SCREWS	
	42333-48	4	NUTS	
P5-858			HARDWARE FOR EQUIPMENT RACKS	127
	41825-528	2	SUPPORTS	
	42333-59	4	NUTS	
	0712-5	4	SCREWS	
	55470-12	2	SCREWS	
	01250-11	4	WASHERS	
	01273-6	4	WASHERS	
	38281-343		SUPPORTS	
P5-859			HARDWARE FOR EQUIPMENT RACKS	
	41825-515	2	SUPPORTS	
	42333-59	4	NUTS	
	0712-5	4	SCREWS	
	55470-12	2	SCREWS	
	01250-11	4	WASHERS	
	01273-6	4	WASHERS	
	38281-118		SUPPORTS	
P5-860			HARDWARE FOR EQUIPMENT RACKS	127
	17494-52GR1	2	BARS	
	17689-98		ROD	
	29407-1GR3		TERM.BLOCK	
	35845-486		PLATE	
	35845-487		PLATE	
	42333-59	4	NUTS	
P5-861			HARDWARE FOR EQUIPMENT RACKS	127
	17494-48GR3	2	BARS	
	17689-97		ROD	
	29407-1GR3		TERM.BLOCK	
	35845-486		PLATE	
	35845-487		PLATE	
	42333-59	4	NUTS	
P5-862	42560-10GR1		PLATE	127
P5-863	42560-28GR1		PLATE	127
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P5-865	45456-9GR4		FUSE BOARD	127
P5-366	45456-18GR1		RESISTOR BOARD	127
P5-867	56118-202		CHANNEL	
P5-868	41825-686		SUPPORT	
P5-869	56398-1		BOLT	

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CATALOG SECTION 10

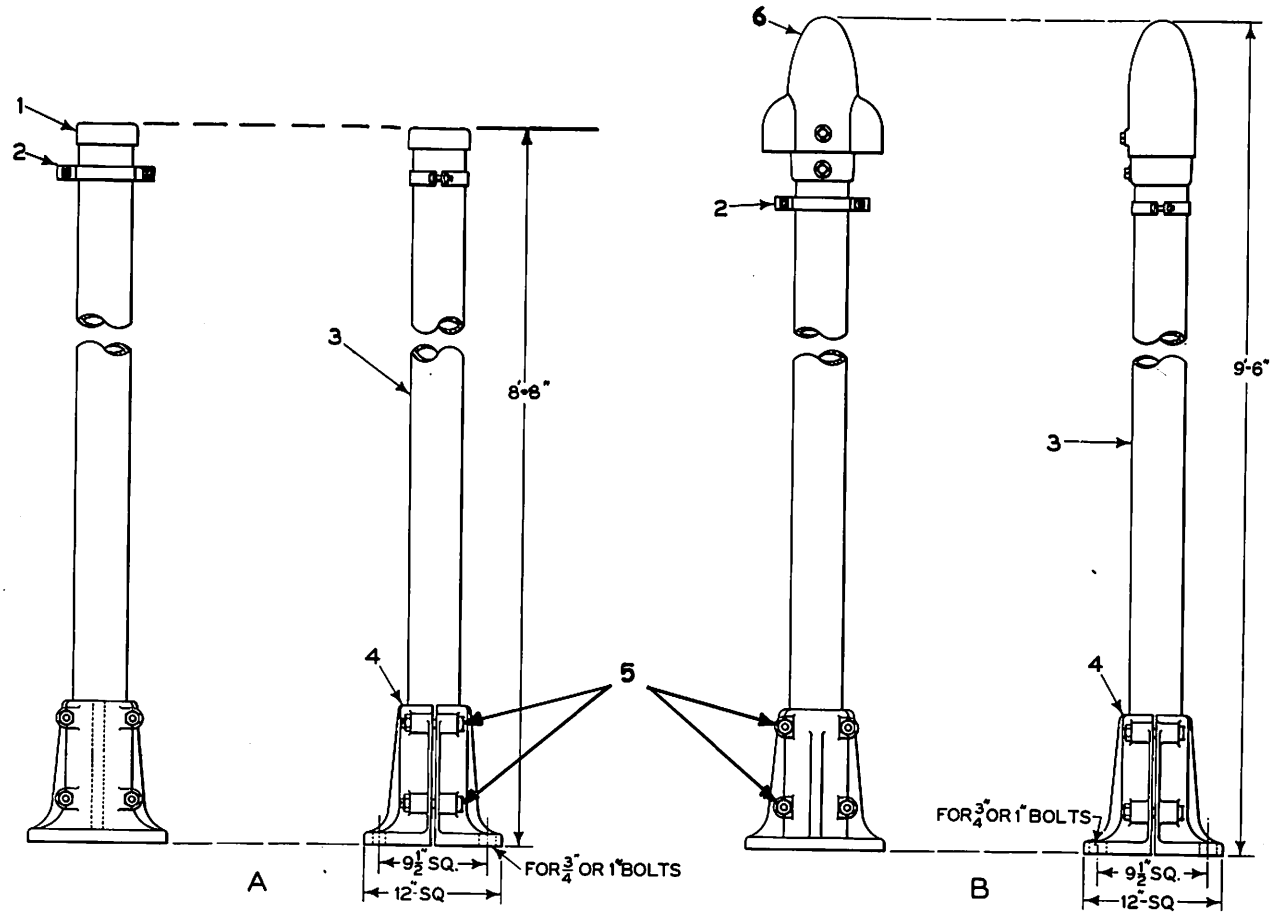
Cable Posts

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A UNIT OF GENERAL SIGNAL
ROCHESTER NEW YORK 14602

PRINTED IN U.S.A.

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March 1979



CABLE POSTS

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
A	CABLE POST, 4" dia., with cap, 8'- 8" overall	A10-100
B	CABLE POST, 4" dia., with pinnacle, 9'- 6" overall	A10-105
1	CAP, for 4" dia. mast	A30-520
2	CLAMP, complete with bolts, nuts and washers, for fastening messenger wire to 4" dia. mast	P5-372
3	PIPE, steel, 4" dia., 8'- 7" long	P10-100
4	SPLIT BASE, aluminum, for 4" dia. mast, includes nuts and bolts	A30-534
5	NUTS AND BOLTS, set of 4, for attaching base to mast	A30-550
6	PINNACLE, steel, complete with cap and set screws, for 4" dia. mast, used as wire inlet	P5-370

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CATALOG SECTION A10

CROSS - INDEX

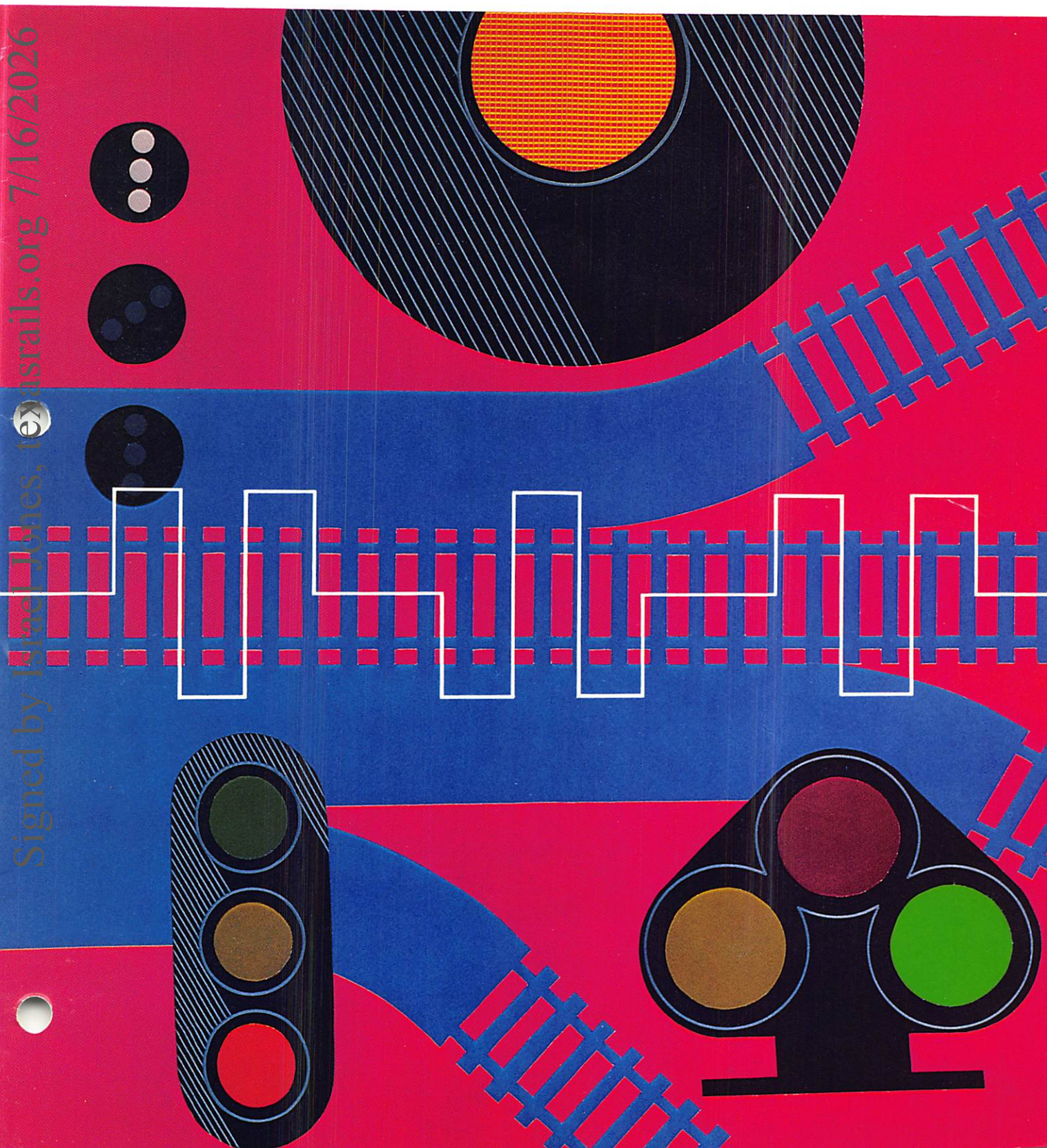
CABLE POSTS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.	CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A10-100			CABLE POST	2					
	82015-30GR5		PIPE						
	43956-3GR2		CAP						
	36291 GR1		CLAMP						
A10-105			CABLE POST	2					
	82015-30GR5		PIPE						
	30391		PINNACLE						
	36288-2		CAP						
	36291 GR1		CLAMP						

TRAKODE® II

MICROPROCESSOR-BASED TRACK CIRCUIT
AND SIGNAL CONTROL SYSTEM

GRS CATALOG **18-1**



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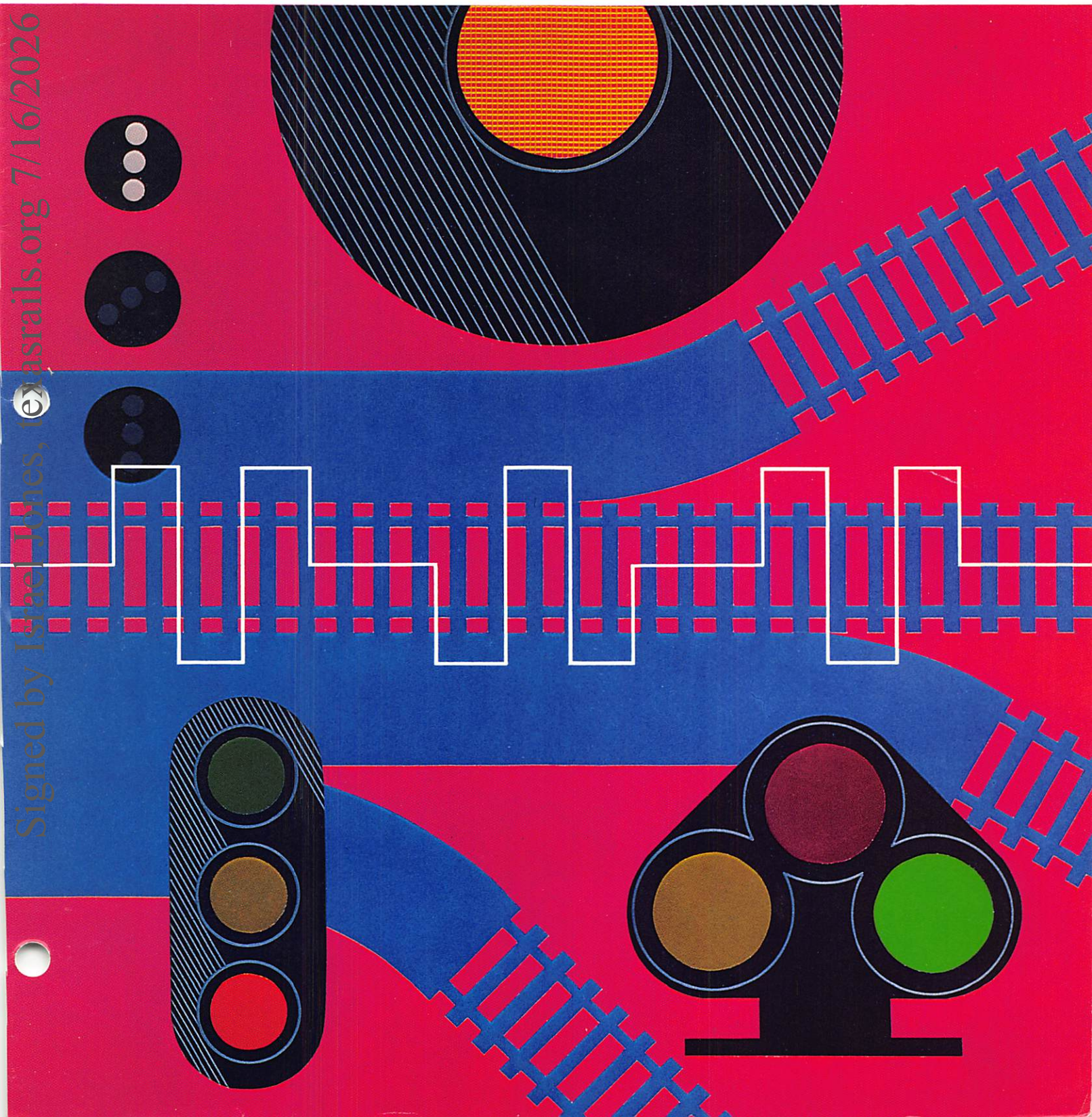
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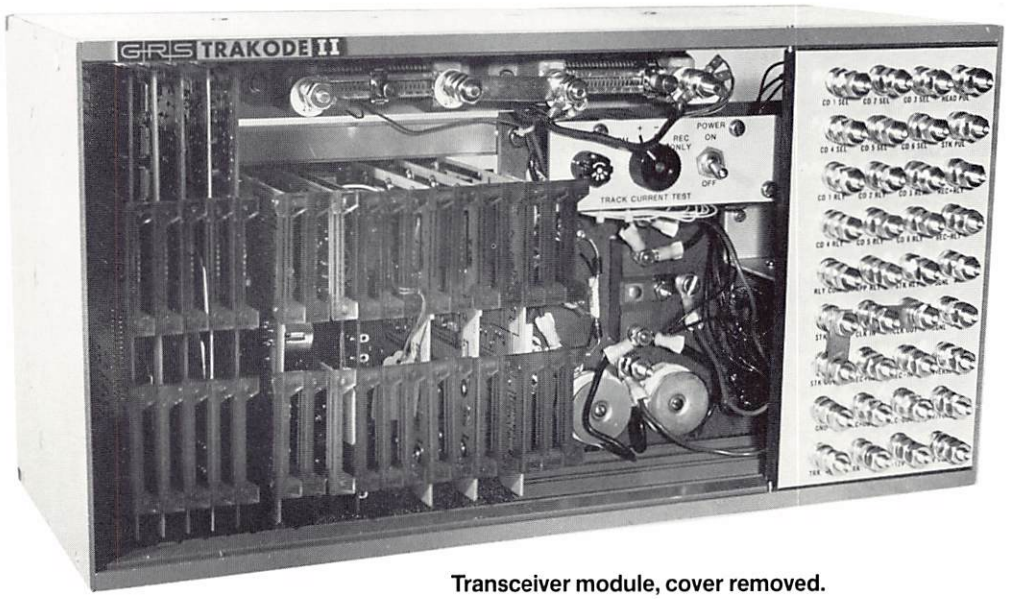
GRS CATALOG **18-1**



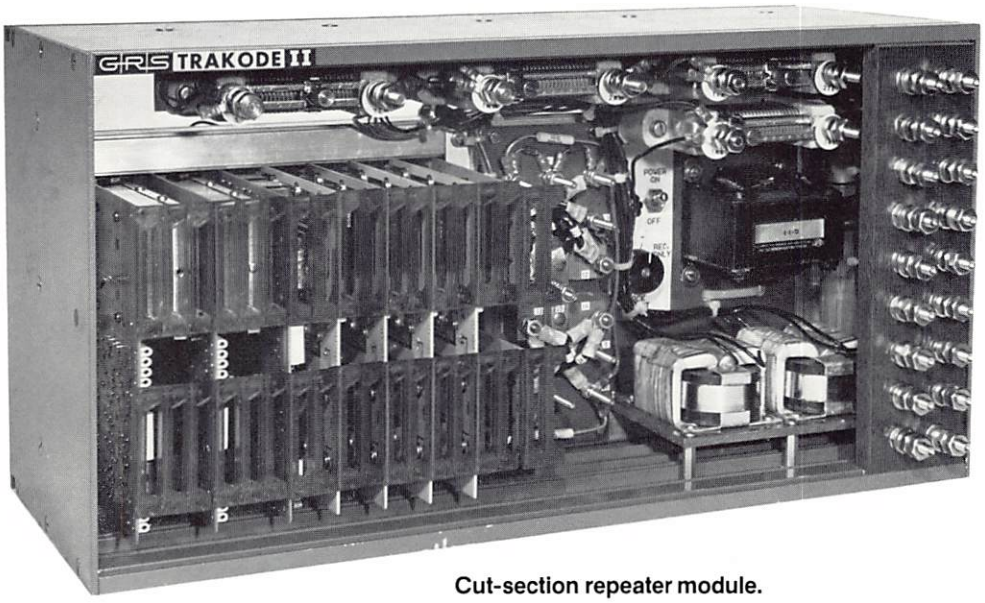
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TRAKODE® II

- Versatile, microprocessor-based track signaling system replaces track relays, eliminates track batteries
- Provides wayside signal control for absolute permissive block and cTc territories
- Handles approach-detection, traffic-stick and switch-locking functions
- Additional vital codes expedite train movements in longer track blocks
- Handles up to 40,000-foot track lengths with 15-ohm ballast and welded rail
- Vital functions protected by GRS Safety Assurance Logic™ system



Transceiver module, cover removed.



Cut-section repeater module.

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MICROPROCESSOR CONTROL... GRS KNOW-HOW

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Trakode II is a flexible, high-performance track signaling system, using a field-proven 8-bit microprocessor plus additional logic to perform necessary functions, such as coding, decoding, safety assurance, timing and control.

It is, in fact, the latest advance in the 78-year series of GRS innovations in track-circuit equipment and systems, including the original Trakode relay system for bidirectional signal control without line wires. Trakode II is fully compatible with all existing Trakode installations and can be used for expansion or replacement without changing your present signaling concepts.

With hardware and software reflecting GRS signaling knowledge and microprocessor/applications experience, the Trakode II system offers the many advantages of processor-based equipment.

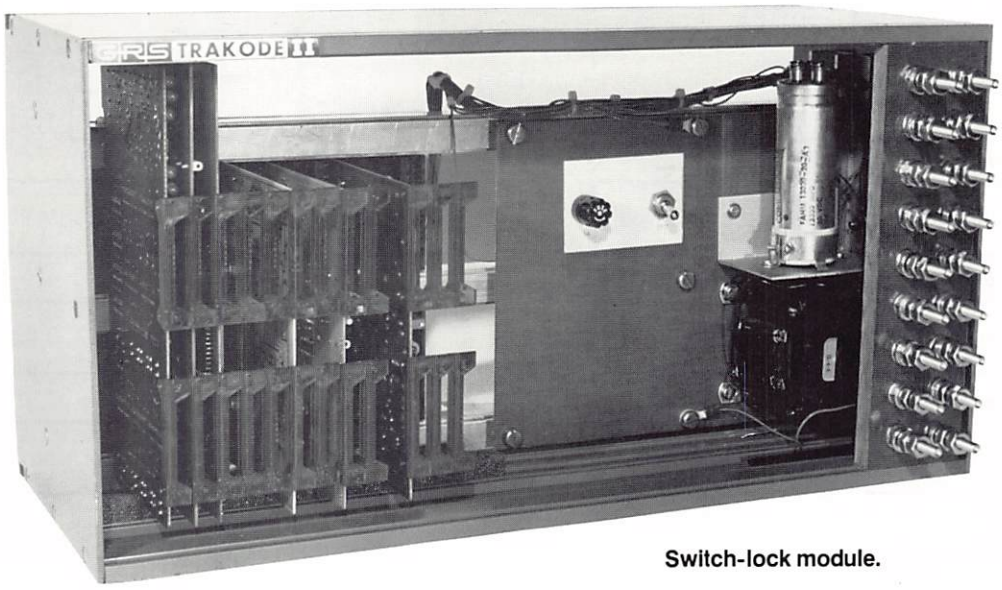
Flexibility. The independent logic and solid-state circuitry permit handling more functions and more vital codes at negligible extra cost. And modular design adds two special-purpose units to the system: a switch-lock module with vital timing from 1 second to 20 minutes and a cut-section repeater to pass codes around insulated joints where there are no intermediate signals. In addition, a microprocessor-based Trakode II test set permits both field and shop testing of all system printed circuit (PC) boards.

Lower Cost. The lower cost of microprocessors and their peripherals makes the improved capabilities of Trakode II cost-effective in comparison with all but the simplest of relay systems. Additional savings come from the ease of installation, reduced space requirements and easier maintenance.

Less Power. The lower power requirements of the microprocessor and solid-state circuitry make it possible to operate from the signal battery only, eliminating track batteries entirely. Track current transmitters and receivers use transformer coupling to maintain track-to-circuit isolation.

Compact. Rugged. Maintainable. The standard case for all Trakode II modules is only 12" high, 20" wide and 9" deep and can be rack- or shelf-mounted. The case and components are designed in accordance with AAR practices to withstand rough handling and high-vibration environments. All modules operate over the full AAR temperature range and have built-in surge protection.

Components are selected and circuits are designed for high reliability, and GRS Safety Assurance Logic makes the design fail-safe. Modular packaging on PC boards with LED indicators facilitates troubleshooting and maintenance with the Trakode II test set.



Switch-lock module.

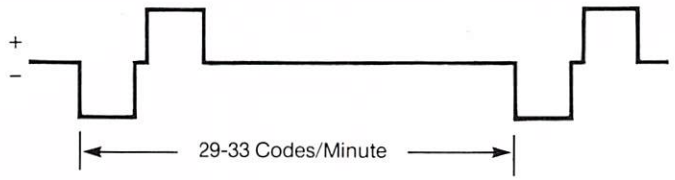


Figure 1. Basic Trakode track-circuit coding.

The original Trakode relay system, in use for more than thirty years, was one of the earliest coded systems capable of controlling wayside signals in both directions without line wires. It is used extensively to control APB signaling and automatic signals in cTc territory.

The coding method used by the original Trakode system is the same method used by Trakode II. It is a slow-pulsed, bipolar format, shown in Figure 1. The codes are brief positive or negative pulses, or combinations that alternate in polarity. The circuitry recognizes pulse polarity and pulse-polarity sequence and is very tolerant of pulse distortions and ballast variations that occur in long track circuits.

Trakode II Signal Control

The basic Trakode II system, as used for APB signal control, appears in Figure 2.

With no train in the block, a clear indication at signal 31 is interpreted by the coding circuit of the Trakode II module at the west end, and the corresponding code is transmitted. This code is received, decoded and simultaneously retransmitted at each intermediate location to the east module, resulting in a control output to clear signal 37, or hold it clear. (Timing for the entire block is controlled by the head blocks.)

In response, the east module codes and transmits the clear indication from signal 38 and this, in turn, is decoded by the west module to control or maintain signal 32 clear.

When a train enters the block, the shunting effect slots signal 32 and cuts off the transmission of codes to the opposite end. After a few seconds, the absence of received codes causes a tumbledown of all opposing signals in the block to red. No special tumbledown codes are required due to the unique timing of Trakode II.

The module at the opposite end, after failing to receive codes for a few seconds, begins sending out codes to give

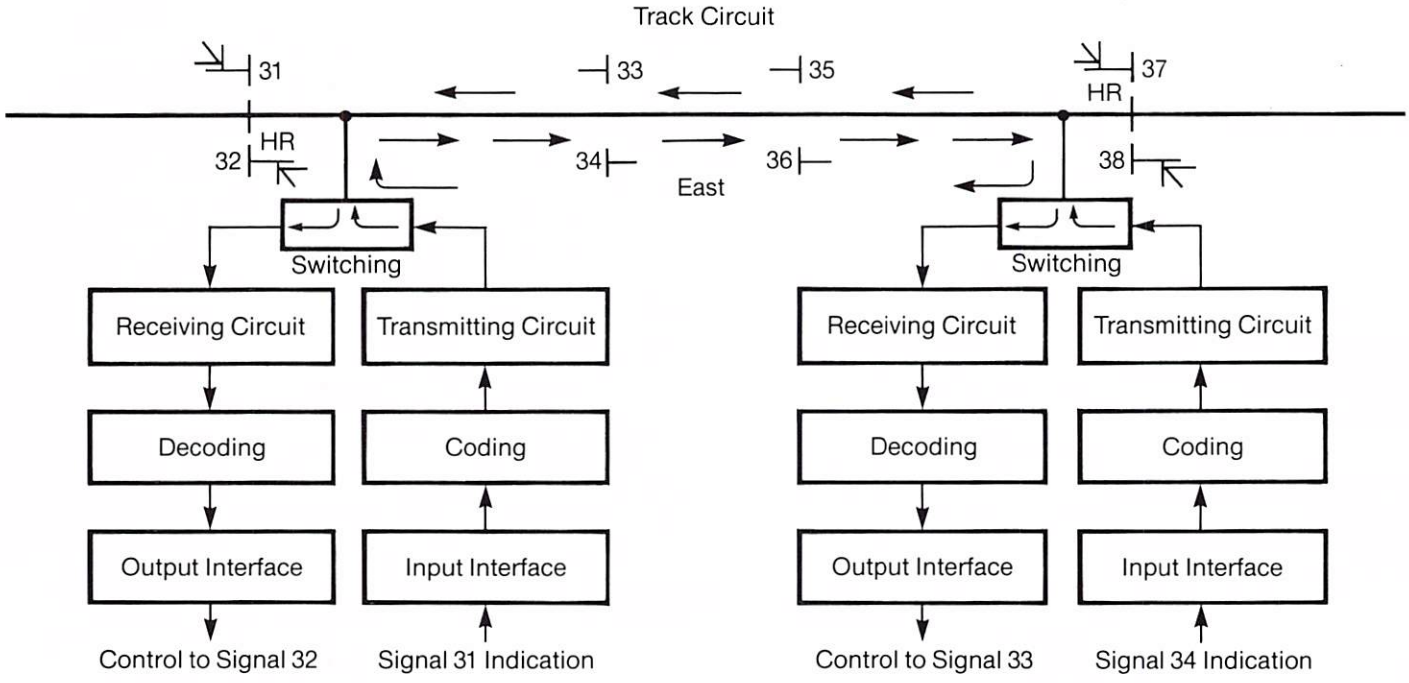


Figure 2. Elements of Trakode signaling.

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the correct indications at intermediate signals ahead of the train.

Operation in centralized traffic control territory is similar, except that the entering signals are also controlled by the cTc console operator.

The Trakode II microprocessor-based system provides greater capacity and performance at much lower cost than the original relay system, plus the reliability and ease of maintenance of solid-state circuitry.

Safe, Error-Free Control

System logic and decision-making are concentrated in the central processing unit (CPU), which consists of a standard ID8085 microprocessor with associated memory and control elements.

However, as indicated in the head-block module shown in Figure 3, the CPU is "surrounded" by the GRS Safety Assurance Logic™ in the sense that no vital outputs are released until performance has been completely checked and certified correct. This safety check is performed continually during system operation to guard against any incorrect transmissions or local outputs by causing a safe shutdown if any failure should occur.

Operational Versatility

The head-block and intermediate signal locations shown in Figure 3 are part of a typical application between sidings (Figure 4). The Trakode II modules at the head blocks and intermediates are identical, but are easily configured for different modes of operation and special functions by connections to the front panel AAR terminals.

The head-block module in Figure 3, configured for control, initiates its own transmissions through the A track circuit. The code sent eastward is determined by external logic indicating such data as the westbound signal position,

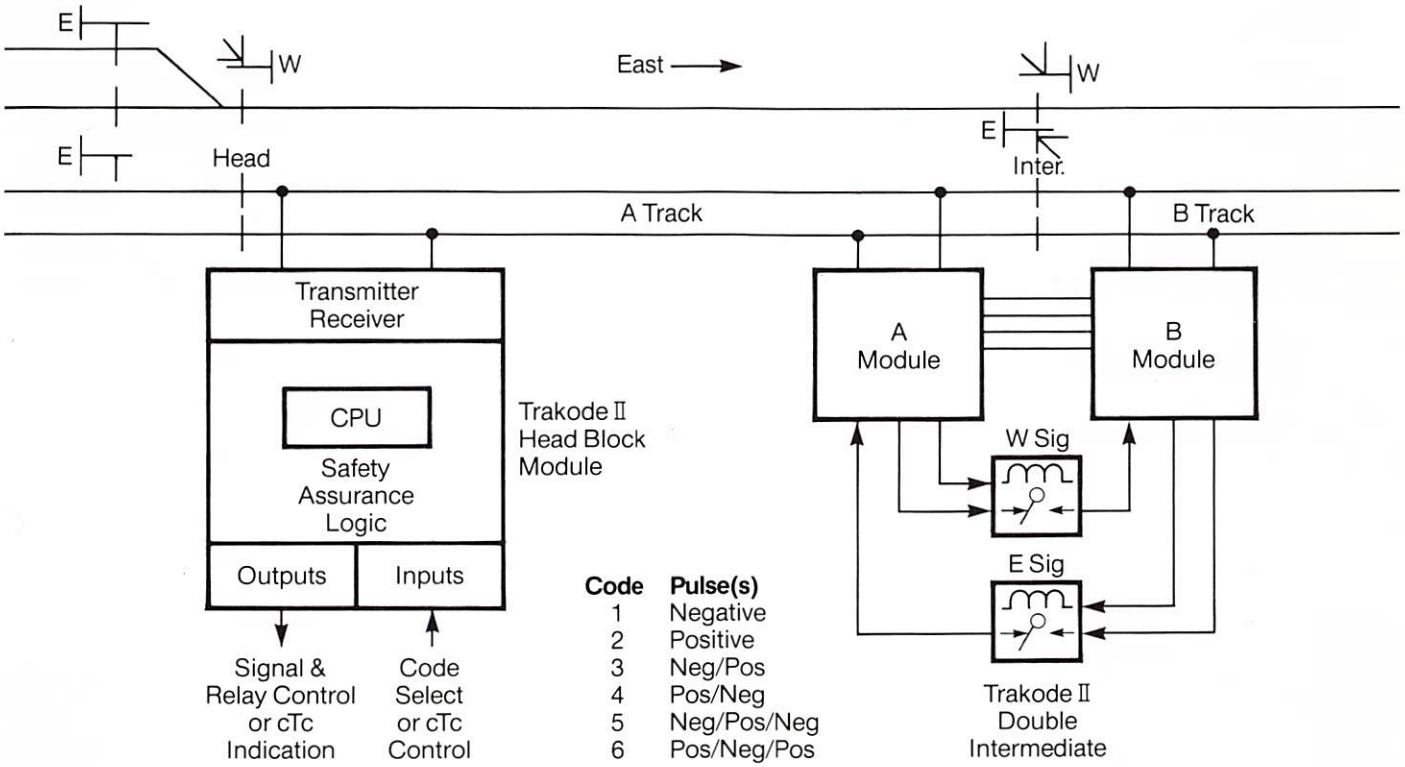


Figure 3. Functional operation of Trakode II system.

occupancy of the OS track, or an instruction from a central control office.

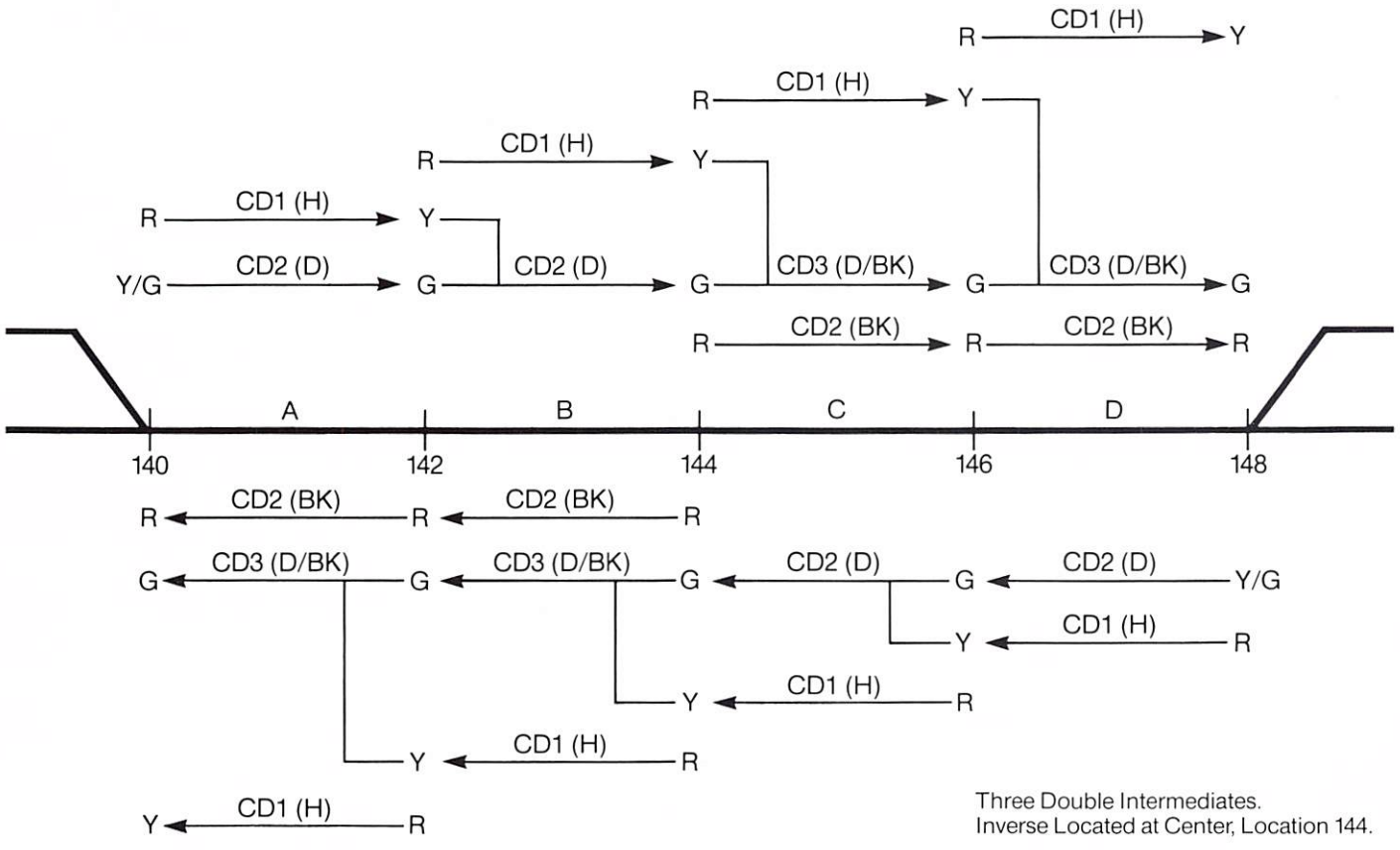
The coding format shown in the diagram is the original bipolar Trakode format, with the addition of codes 5 and 6. These extra codes allow you to expand your signaling capability, if desired. This established format has proven itself over long track lengths (up to 40,000 feet with 15-ohm ballast and welded rail) and in adverse conditions (14,000 feet with 3-ohm ballast, welded rail).

The double intermediate modules (Figure 3) serve a dual function: controlling the intermediate signals and repeating a code received from either direction across the insulated joints.

Thus, a code received from the head block immediately causes the A module to pulse the westbound signal contacts (or other external relay logic) to select the code to be sent eastward from the B module. The exact selection depends upon local and block conditions.

Fast Tumbledown

In APB operation, an eastbound train entering the A track circuit cuts off transmissions from the head-block module. When the reception of valid eastbound codes stops, the corresponding decoders throughout the block begin timing a 12.5-second delay, then drop the opposing signals to red. Tumbledown time is not cascaded in Trakode II; all opposing signals go to red almost simultaneously.



Three Double Intermediates.
Inverse Located at Center, Location 144.

Figure 4. Typical coding for dual block indication.

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Integral Approach and Stick

As the train travels through the block, approach indications for following moves can be controlled by an optional approach-detection and stick function. For example, when the train nears the A module in Figure 3, its approach is detected through the increased shunting effect, and this activates the stick function.

As a result, the A module independently begins transmitting to the west a code selected by an AAR terminal connection. This is normally a code to upgrade the eastbound entering signal from red to yellow. When the train moves into the B track, the transmissions from the A module are able to reach the head block and the eastbound signal is then upgraded. The stick is cleared shortly after the train leaves the B track.

Added cTc Functions

For cTc operation, external traffic stick (FSR) relays are used with Trakode II to eliminate any possibility of trains entering opposite ends of the block simultaneously during the tumbledown delay period. In response to a signal call by an operator, this traffic stick permits the normally red entering signal to be cleared, but prevents clearing the entering signal at the opposite end.

An inverse coding function is also available to indicate to a cTc operator which section of the block a train is in.

With the center intermediate in Figure 4 configured as an inverse location, the inverse coding for an eastbound move begins when the opposing signal goes to red. Normal eastbound transmissions having stopped, Location 144 begins sending inverse code to the east head-block module. This code does not clear signals; it simply shows that the train is not located in the C or D track section.

Compatible with Cab Signaling

Trakode II can operate in territories with low-frequency a-c cab signaling, overlay track circuits or motion detectors. In all such cases, filtering of both systems is necessary to prevent mutual interference. For cab signaling applications, block signal designs must be consistent with the cab signal requirements.

TRAKODE II...SAFETY AND FLEXIBILITY

The units of the Trakode II system are designed to meet the primary concern of safety in every respect, while providing reliable, versatile and cost-effective track circuit and signal control.

The functional block diagram of Figure 5 shows the major elements of the basic Trakode II module for signal control.

Safe Interfacing

Input and output interfaces provide isolation from possible damage to the equipment. Lightning and surge protection from the rails is included and all inputs and outputs are transformer-coupled to the track circuit. The receiver is switched into the sense line only during the receive cycle, and incoming pulses are detected by a Hall-effect device that is cycle-checked by the CPU.

Inputs to the CPU from the front panel AAR terminals and nonvital outputs for local use are both coupled through opto-isolators. Vital outputs are provided by solid-state relay drivers that are activated by transformer-isolated vital power from the vital driver, which is the key element of safe system control.

Safety Assurance Logic™

To ensure safe operation, the Trakode II module uses the GRS Safety Assurance Logic technique to prove:

- CPU inputs are correct

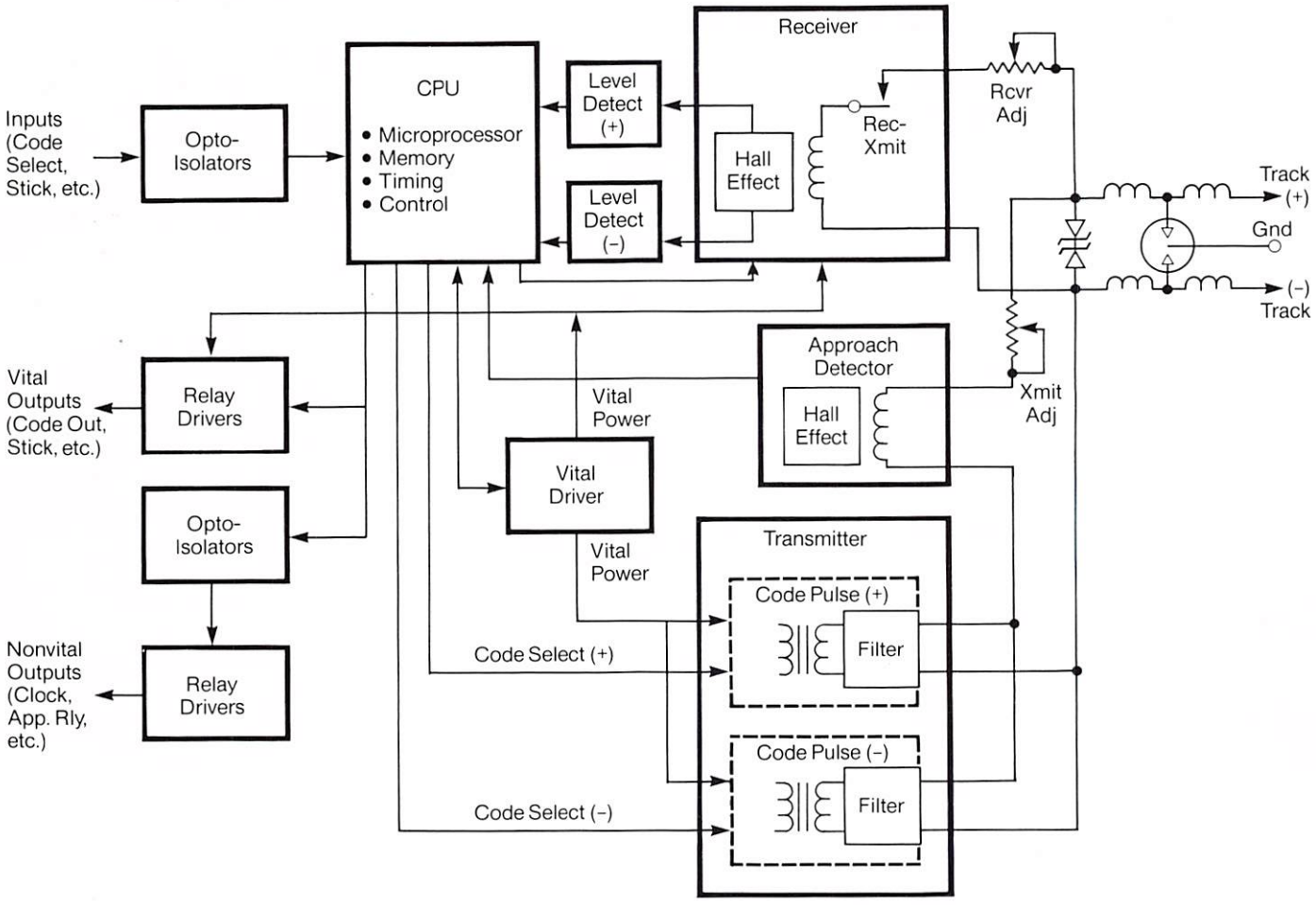


Figure 5. Trakode II module, functional block diagram.

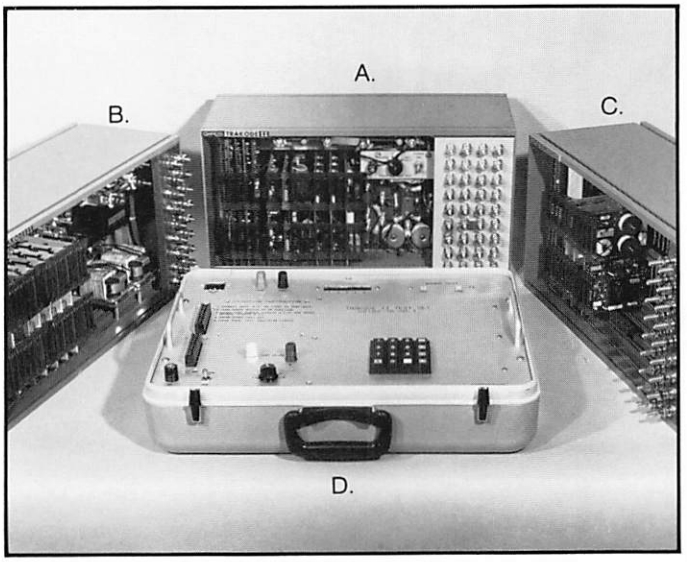
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- Program is executed correctly
  - -Program has not changed
  - -Data tables have not changed
  - -Inputs and variable data are current
- Outputs are correct
- Device failures have not changed outputs

Prescribed tests are performed by the primary logic *during every operational cycle* to reveal any hard or soft failures that could lead to an incorrect output. Each test generates a check word that, if correct, certifies that the test was successfully completed. The CPU memory does not retain check words between tests, so a full set of correct check words is assurance that all vital tests have been made and passed during the current cycle.

The check words are sent to the vital driver logic, which independently verifies that all words are present and correct. If so, the vital driver generates a dynamic signal for a vitally limited time, then destroys all check words. The dynamic signal becomes the vital power required to energize the outputs. Therefore, any failure mode stops all vital outputs and has the same fail-safe effect as a power-off condition.

Versatile System Units



Units of the Trakode II system.
A. Basic signal-control module
B. Cut-section repeater
C. Switch-lock module
D. Test set

To accommodate at minimum cost the special needs of some territories, such as long stretches without intermediate signals, the Trakode II system includes specialized modules, plus a microprocessor-based test set for field and shop troubleshooting. (The test set is described on the next page.)

Cut-Section Repeater. The basic cut-section repeater module consists of a pair of transmitter-receivers (transceivers), interfaced to pass codes around the insulated joints between track circuits at cuts where no signals are located. A receiver connected to each track circuit controls a transmitter connected to the opposite circuit to pass on codes in each direction.

A second function of this module is supplying received codes to a switch-lock module which has no receivers of its own.

Another version of the cut-section repeater module contains only the receivers and interface circuits. Its sole purpose is receiving codes for a switch-lock module at locations where repeating is not necessary.

Switch-Lock Module. This microprocessor-based module controls one or two electric switch locks in cTc territories. Used with a cut-section repeater, it controls the repeating action to provide indications to the cTc operator.

The module includes logic to determine when a train is approaching on the main line and whether or not to unlock a switch. A series overlay track circuit allows immediate unlocking if a train is waiting on the main line to enter a siding.

Timing is provided by an integral vital timer that can be adjusted from 1 second to 20 minutes in 1-second increments, or disabled if timing is not desired.

EASY MAINTENANCE...BY DESIGN

The Trakode II system takes advantage of design techniques to provide high reliability as well as safety and to make any required maintenance as simple as possible.

The use of LSI circuitry minimizes the number of components in the modules and thereby reduces the potential failure rate. The circuits are designed to operate at low voltage, current and power levels to minimize stress on the parts.

In addition, components are prescreened by effective environmental and electronic tests, and all modules undergo 100-percent testing before shipment.

Circuit construction on PC boards with LED indicators monitoring major signals provides the type of diagnostic aid now familiar to most maintainers and permits quick replacement.

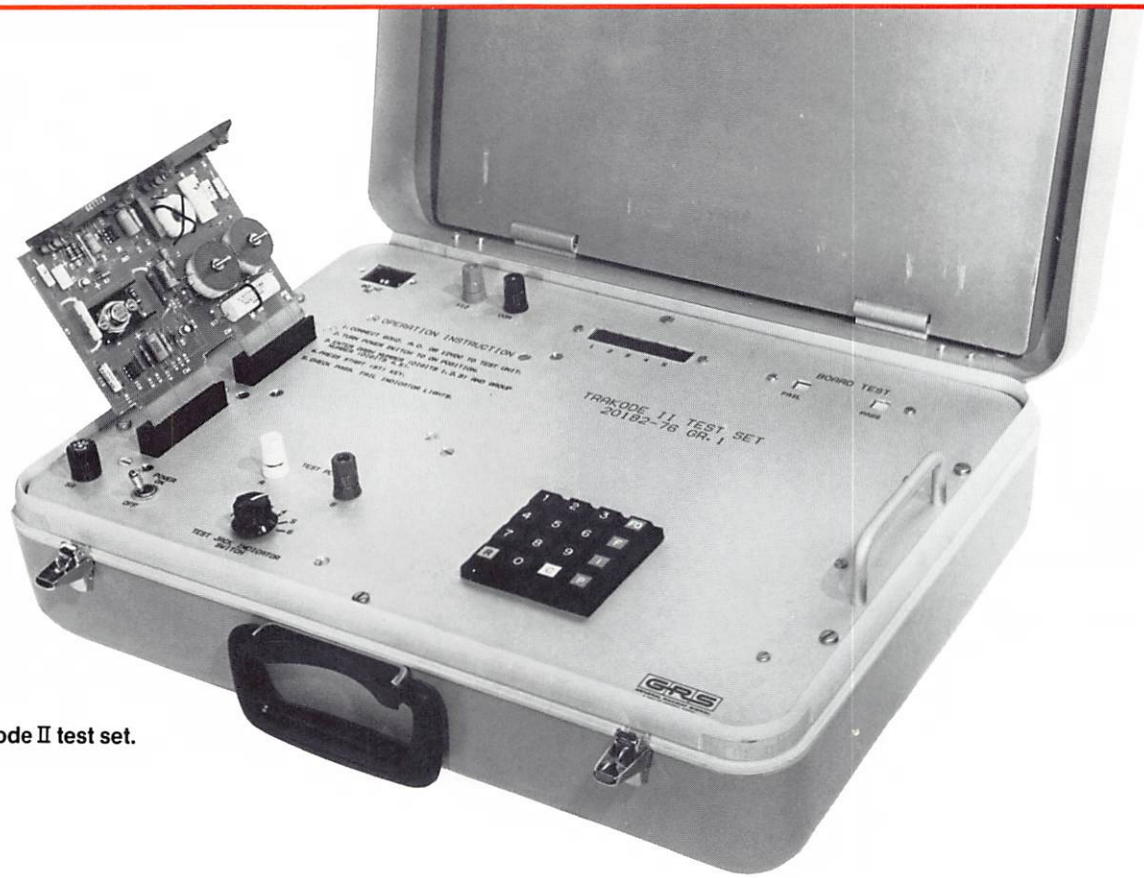
Overall safety, of course, is maintained by the GRS Safety Assurance Logic.™

Trakode II Test Set

Field and shop maintenance is considerably simplified by this microprocessor-based test set, which is capable of testing all the PC boards used in any Trakode II module. The test set operates on both 115 volts a-c and 12 volts d-c.

The board to be tested is plugged into the connector on the test-set panel, and testing is initiated by entering the board number on the keypad and pressing the start key. In automatic testing, used in the field, one of two LEDs lights to give a pass-fail indication.

In the shop, diagnostic testing first determines which area of the board has failed, identifying it by an error number on the five-digit alphanumeric display. Looking up the error number in the test-set manual shows which section of the board failed and gives keyboard instructions for exercising that portion of the circuit to help pinpoint the trouble.



Trakode II test set.

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PLEASE ORDER BY CATALOG NUMBER AND NAME.

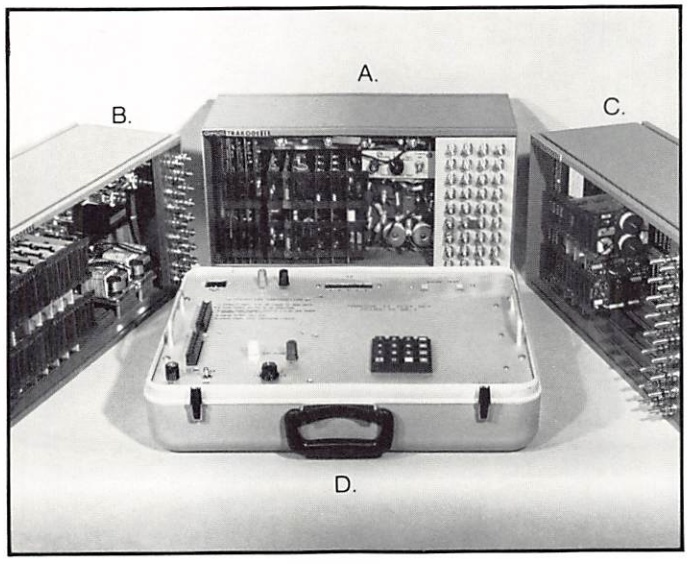
REFERENCE	NAME	CATALOG NUMBER
A	TRANSCEIVER MODULE, for signal control	A18-300
A1	Same as above except has integral stick and approach function	A18-301
B	CUT SECTION REPEATER MODULE	A18-302
B1	Same as above except for nonrepeating cut	A18-303
C	SWITCH-LOCK MODULE	A18-304
D	TEST UNIT	A18-308

PRINTED CIRCUIT BOARDS

For Replacement Purposes Only

NAME	CATALOG NUMBER
LEVEL DETECTOR BOARD (31049-379 Gr. 2)	A18-310
FILTER BOARD (31049-419 Gr. 1)	A18-311
CODE PULSE CONVERTER BOARD (59473-594 Gr. 1)	A18-312
APPROACH DETECTOR BOARD (59473-595 Gr. 1)	A18-328
RECEIVER BOARD (59473-596 Gr. 1)	A18-313
CPU-B BOARD (59473-598 Gr. 1)	A18-314
CPU-C BOARD (59473-599 Gr. 1)	A18-315
CPU-D BOARD (59473-600 Gr. 1)	A18-316
CPU-E BOARD (59473-601 Gr. 1)	A18-317
VITAL-DRIVER BOARD (59473-603 Gr. 1)	A18-318

NAME	CATALOG NUMBER
SWITCH-LOCK VITAL-DRIVER BOARD (59473-603 Gr. 2)	A18-329
RECEIVER BOARD (59473-631 Gr. 1)	A18-319
CPU-A BOARD (59473-632 Gr. 1)	A18-320
SWITCH-LOCK CPU-A BOARD (59473-632 Gr. 2)	A18-321
INTERFACE BOARD (59473-633 Gr. 1)	A18-322
SWITCH-LOCK INTERFACE BOARD (59473-634 Gr. 1)	A18-323
SWITCH-LOCK TIMER BOARD (59473-635 Gr. 1)	A18-324
SWITCH-LOCK OVERLAY BOARD (59473-636 Gr. 1)	A18-325
5-V REGULATOR BOARD (59473-643 Gr. 1)	A18-326
SWITCH-LOCK COUNTER BOARD (59473-651 Gr. 1)	A18-327



GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL

GRS is a full-line supplier of signal and control systems and equipment to railroads all over the world. We provide a full range of planning, research, engineering, installation and service capabilities backing every GRS product and system.

For more information about the TRAKODE II system, or any other GRS components, systems or capabilities, contact your GRS sales office.

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CATALOG SECTION 18

Coded Track and Trakode® Equipment

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Decoder Units	5
Master Decoding Transformers	3
Reactors	8 & 11
Rectifier	10
Resistors	10
Suppressors	10

GENERAL RAILWAY SIGNAL COMPANY

A UNIT OF GENERAL SIGNAL CORPORATION

ROCHESTER NEW YORK 14602

PRINTED IN U.S.A.

July 1967

Coded Track and Trakode® Equipment

GENERAL INFORMATION

The equipment shown is used exclusively with coded track and Trakode.® For other resistors, terminal blocks, etc., see Catalog Section 3.

For relays and code transmitters used with coded track and Trakode, see Catalog Sections 62 and 65.

For more details, see the following GRS Development Sheets:

CODED TRACK
Coded Track Circuit Control - D21.3103

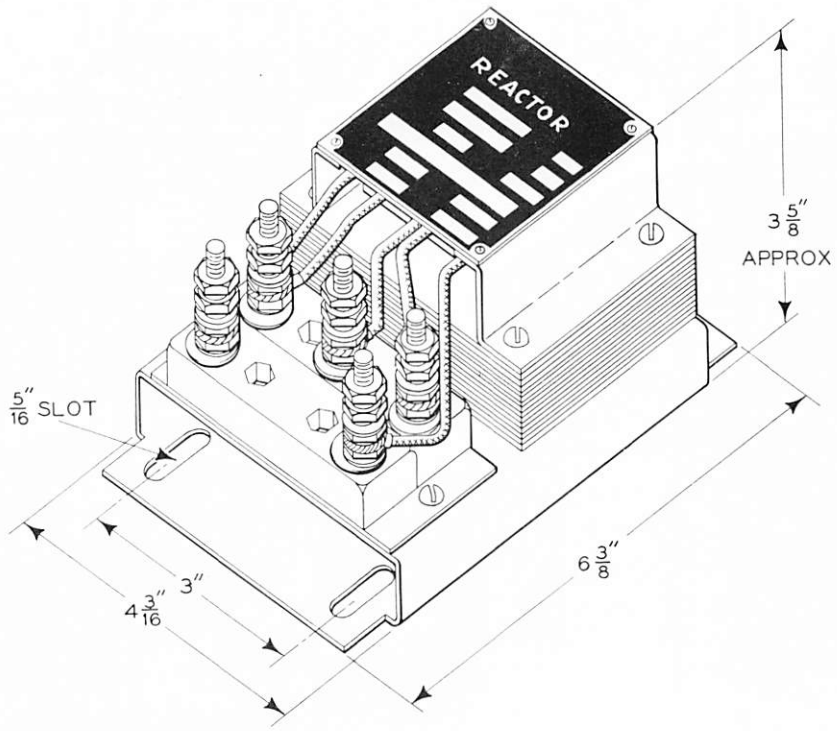
TRAKODE®
For APB and cTc - D21.3105

CAPACITOR UNITS

To order, specify "Capacitor" and give catalog number

REF.	NAME	CATALOG NUMBER
A	CAPACITOR UNIT, 1000 mfd., 30 volts d-c, with 18 ohm resistor. For mounting in B1 relay space	A18-130
B	As above, except for wall or shelf mounting	A18-133
C	CAPACITOR UNIT, 2000 mfd., 30 volts, d-c, with 18 ohm resistor, for mounting in B1 relay space	A18-140
D	CAPACITOR UNIT. 1000 mfd., 30 volts d-c, with 18 ohm resistor, 270 ohm fixed resistor also 3000 ohm variable resistor, for mounting in B1 relay space.	A18-145
E	CAPACITOR UNIT, 2000 mfd., + 1000 mfd., 30 volts d-c, with 18 ohm resistor, for mounting in B1 relay space	A18-150

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A

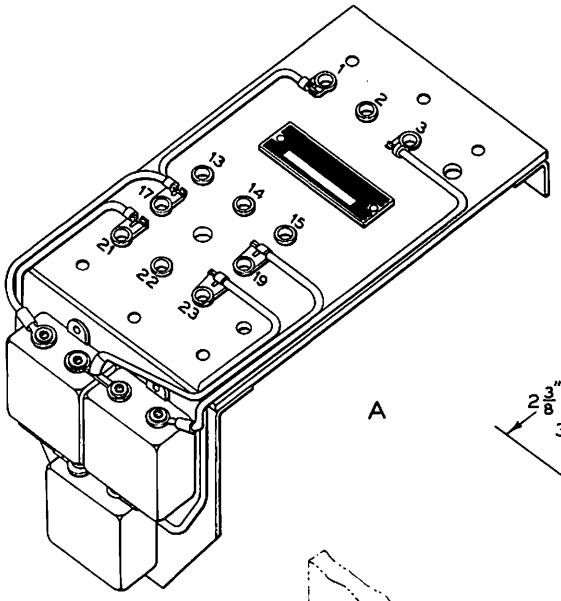
Reactors.

REACTORS

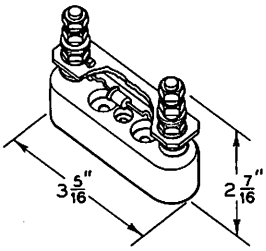
To order, specify "Reactor" and give catalog number

REF.	NAME	CATALOG NUMBER
A	REACTOR, tapped, for controlling timing of inverse pulse length on rate code, for use with Type K relays	A18-161
A1	As above, except for use with Type B relays.	A18-166
A2	REACTOR, tapped, for controlling timing of inverse pulse length on Trakode, for use with Type VTB relays	A18-170
A3	As above, except not tapped, for controlling pickup time of code repeater relay (TRAKODE ®)	A18-175

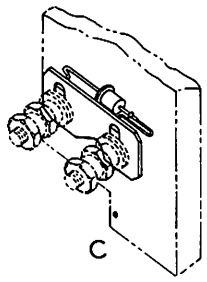
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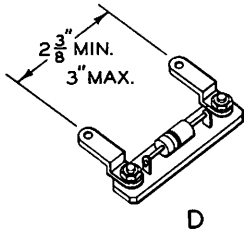


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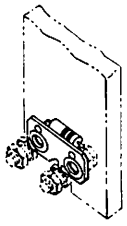


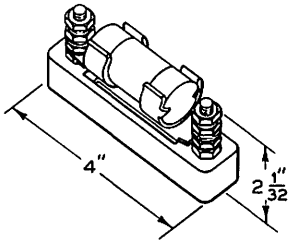
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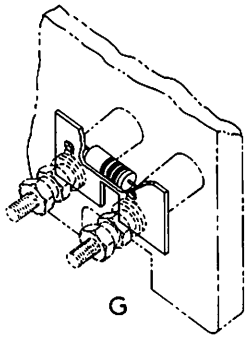


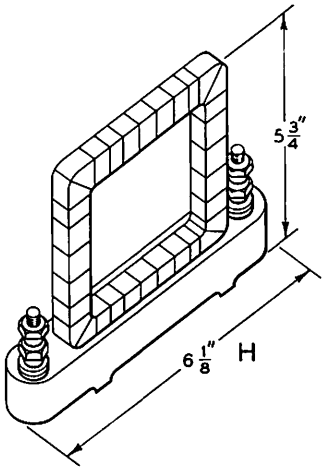
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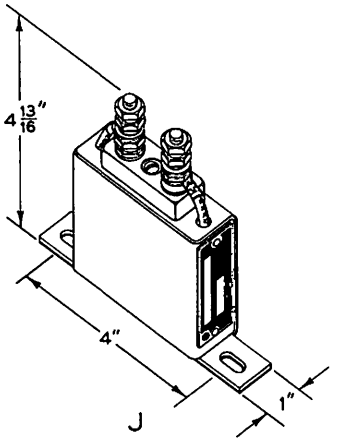


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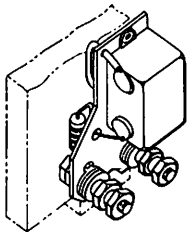

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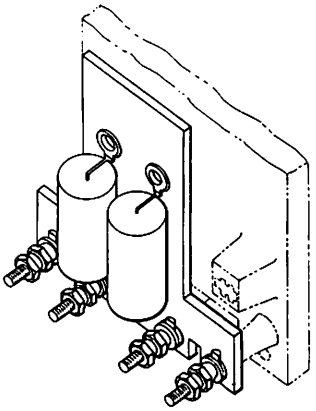


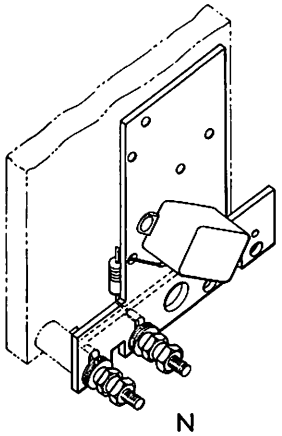
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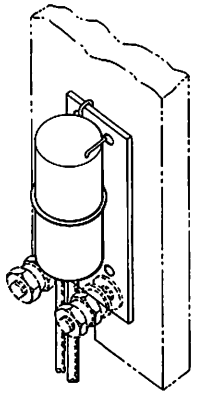


J


K


M


N


P

Suppressors, resistors and reactors.

SUPPRESSORS, RESISTORS AND REACTORS for Coded Track and Trakode®

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
A	SUPPRESSOR UNIT, for use with master decoding transformer, Catalog No. A18-100	A18-180
A1	As above, except for use with master decoding transformer, Catalog No. A18-103	A18-183
B	RECTIFIER, maximum d. c. output 0. 250 amps. at 125° C; 0. 750 amps. at 25° C	A53-120
C	RECTIFIER, maximum d. c. output 0. 250 amps. at 125° C; 0. 750 amps. at 25° C	A53-115
D	RESISTOR, 1000 ohms, for mounting on Type K relay	A18-190
E	RESISTOR, 1000 ohms, for mounting on "E" post of Type B relay plugboard	A18-197
E1	As above, except 510 ohms	A18-199
E2	Same as Ref. E, except 270 ohms	A18-198
F	RESISTOR, 12. 5 ohms, ± 20%, to connect across track circuit, for arc suppression	A18-185
G	RESISTOR, 1000 ohms, for mounting on "E" post of Type VTB relay plugboard	A18-196
H	REACTOR, high frequency, radio interference choke	A18-193
J	SUPPRESSOR, has one 0. 05 mfd. capacitor and a 12 ohm resistor	A18-195
J1	As above, except has one 1 mfd. capacitor and one 12 ohm resistor, includes insulated mounting	A18-177
J2	Same as Ref. F, except has one 1 mfd. capacitor and one 250 ohm resistor, includes insulated mounting	A18-178
K	SUPPRESSOR, has one 0. 5 mfd. condenser and a resistor, for mounting on "E" post of Type B relay plugboard, for arc suppression	A18-200
M	SUPPRESSOR, has two 250 mfd. capacitors and two resistors, for mounting on Type VTB relay, for arc suppression	A18-205
M1	As above, except with single capacitor and resistor	A18-207
N	SUPPRESSOR, has 0. 5 mfd. condenser and a resistor, for mounting on Type VTB relay plugboard, for arc suppression	A18-210
P	SUPPRESSOR UNIT, 250 mfd., with 33 ohm resistor, for Type B relay plugboard	A18-107

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Memoranda

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CODED TRACK & TRAKODE EQUIPMENT

CAT.NO.	DRAWING NO. QTY	NAME	PG.
A18-100	54940-103 GR21	U1 TRANS 13AU-140	3
A18-107	17558-6GR3	SUPPRESSOR	
A18-110	18671-1GR1	CODE DETECT	4
A18-118	56860-6GR3	DECODER	5
A18-121	56860-7GR3	DECODER	
A18-130	47630-11GR1	CAPACITOR	7
A18-133	47630-12GR1	CAPACITOR	7
A18-140	47630-14GR1	CAPACITOR	7
A18-145	47630-13GR1	CAPACITOR	7
A18-150	47630-17GR1	CAPACITOR	7
A18-161	42100-4GR5	REACTOR	9
A18-166	42100-4GR6	REACTOR	9
A18-170	42100-4GR2	REACTOR	
A18-175	42100-4GR3	REACTOR	9
A18-178	57066 GR5	SUPPRESSOR	
A18-180	57066-14GR1	SUPPRESSOR	11
A18-183	57066-14GR2	SUPPRESSOR	11
A18-185	50037-4GR2	RESISTOR BLOCK	
	57609	RESISTOR	
A18-190	57474-6GR1	RESISTOR	11
A18-193	58235-1GR1	REACTOR	11
A18-195	57066-4GR1	SUPPRESSOR	11
A18-196	57831-21GR4	RESISTOR	11
A18-197	57831-18GR4	RESISTOR	11
A18-198	57831-18GR2	RESISTOR	11
A18-199	57831-18GR3	RESISTOR	11
A18-200	17558-6GR1	SUPPRESSOR	11
A18-205	57066-8GR1	SUPPRESSOR	11
A18-207	57066-8GR2	SUPPRESSOR	11
A18-210	57066-7GR1	SUPPRESSOR	11
A18-300	27359-10GR3	TRANSCEIVER	
A18-301	27359-10GR2	TRANSCEIVER	
A18-302	27359-13GR1	TRANSCEIVER	
A18-303	27359-13GR2	TRANSCEIVER	
A18-304	31506-6GR1	TRAKODE II MODULE	
A18-308	20182-76GR1	TEST UNIT	
A18-309	54781-10GR1	CASE PC BRD CARRY	
A18-310	31049-379GR2	LEVEL DETECTOR BOARD	
A18-311	31049-419GR1	FILTER BOARD	
A18-312	59473-594GR1	CODE PULSE CONV.BOARD	
A18-313	59473-596GR1	RECEIVER BOARD	
A18-314	59473-598GR1	CPU-B BOARD	
A18-315	59473-599GR1	CPU-C BOARD	
A18-316	59473-600GR1	CPU-D BOARD	
A18-317	59473-601GR1	CPU-E BOARD	
A18-318	59473-603GR1	VITAL-DRIVER BOARD	
A18-319	59473-631GR1	RECEIVER BOARD	
A18-320	59473-632GR1	CPU-A BOARD	
A18-321	59473-632GR2	SW.LOCK CPU-A BOARD	
A18-322	59473-633GR1	INTERFACE BOARD	
A18-323	59473-634GR1	SW.LOCK INTERFACE BD.	
A18-324	59473-635GR1	SW.LOCK TIMER BOARD	
A18-325	59473-636GR1	SW.LOCK OVERLAY BOARD	
A18-326	59473-643GR1	5-V REGULATOR BOARD	
A18-327	59473-651GR1	SW.LOCK COUNTER BOARD	
A18-328	59473-595GR1	APPROACH DETECTOR BD.	

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CATALOG SECTION A18

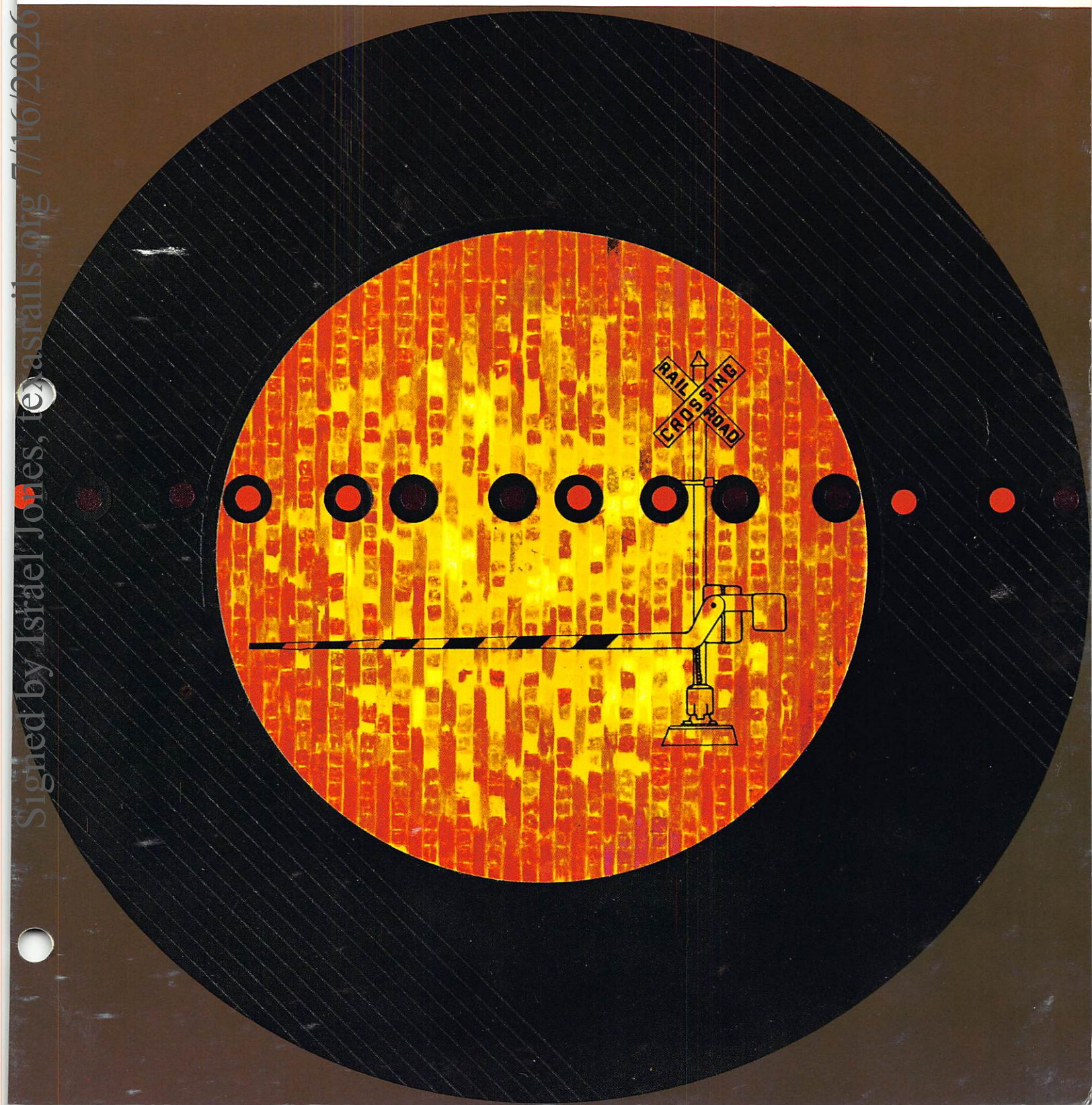
CROSS - INDEX

CODED TRACK & TRAKODE EQUIPMENT

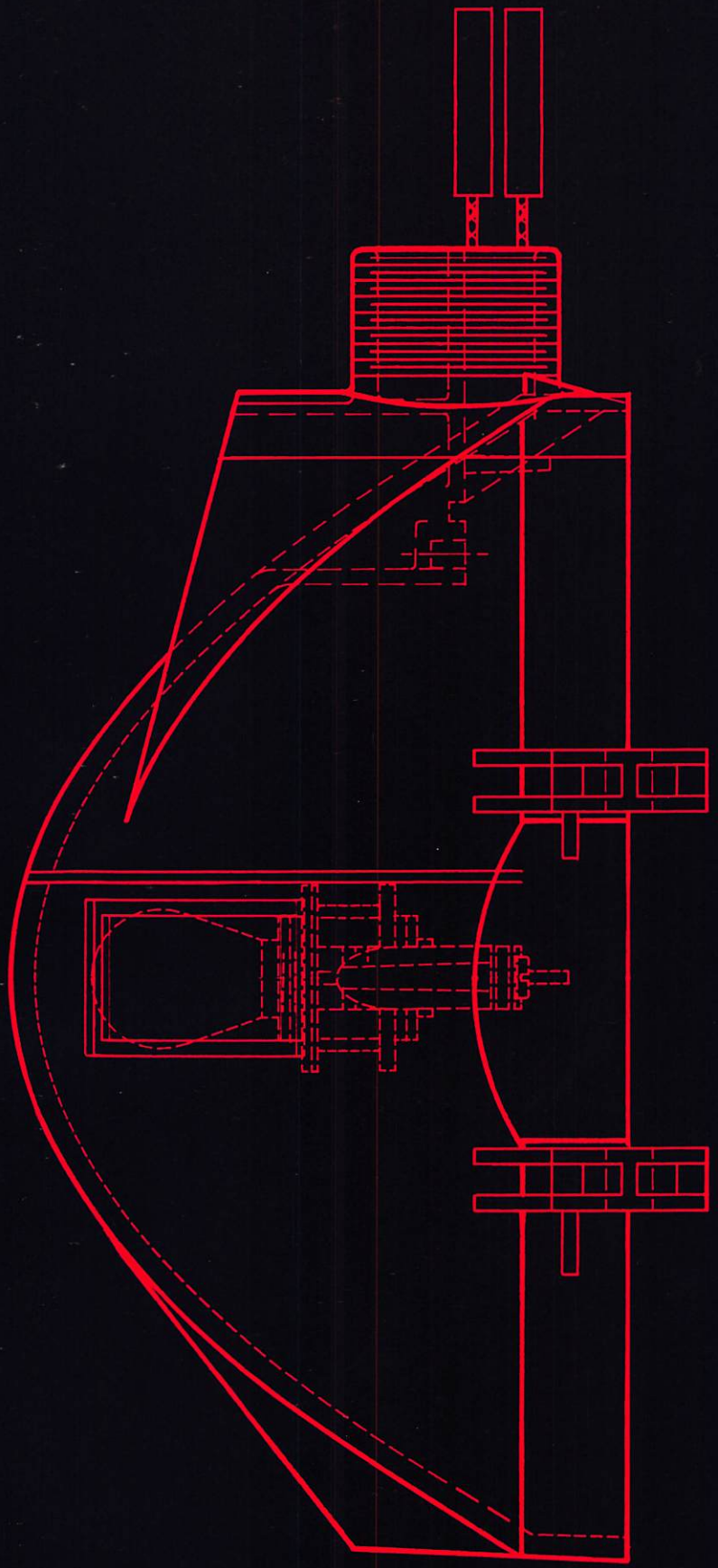
CAT.NO.	DRAWING NO.	QTY	NAME	PG.	CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A18-329	59473-603GR2		SW.LK.VITA L DRIVER BD						

HIGHWAY CROSSING WARNING SYSTEMS

GRS CATALOG **30-1**



Signed by Israel Jones, le@asrails.org 7/16/2026



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A3071 10-85

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Printed in U.S.A.

INTRODUCTION

GRS highway crossing equipment provides complete warning on an around-the-clock basis. The powerful LEX-C® flashing signal units have high efficiency optics, superior to those of any conventional highway crossing signal, and they are lightweight, virtually maintenance-free and vandal resistant. The flashers, coupled with reflective sheeting signs, time-proven control equipment and the GRS Type D gate mechanism, provide the ultimate in grade crossing warning systems.

SIGNAL ASSEMBLIES

A typical highway crossing signal, Figure 1, is equipped with four LEX-C flashing light units. Two signals like this are used for single-track crossings. For multiple-track crossings, a track sign may be added to indicate to the motorist that he is about to cross more than one track and that he should be alert to anticipate the possibility of more than one train approaching or occupying the crossing. Two sets of flashing lights, set back-to-back on each signal, not only present a more arresting warning, but also furnish an important warning in situations where a train approaching on the farther track from the motorist may be obscured by another train just clearing the crossing on the nearer track.

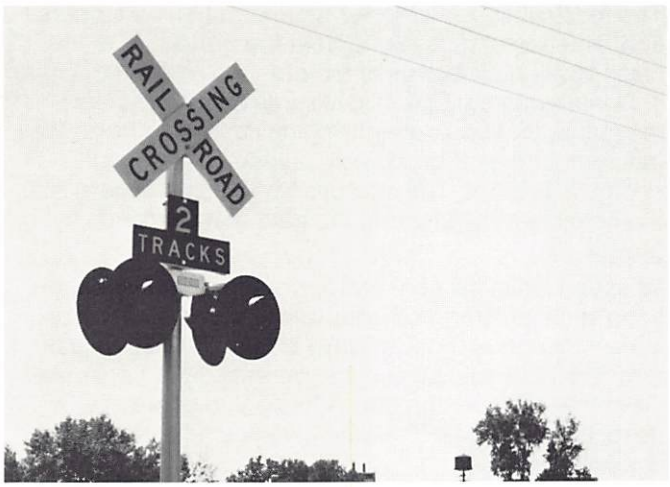


Figure 1. Typical highway crossing signal.

For special applications, the signals may be equipped with only two flashing light units, or where streets converge at the crossing, with additional sets of flashers to warn all approaches.

Figure 2 shows a typical highway crossing signal equipped with a Type D gate mechanism, which provides reliable, high speed operation with a minimum of maintenance. It is capable of handling gate arms up to 38 feet in length with a maximum clearing time of 10 seconds. Wood gate arms are available in lengths up to 38 feet; fiberglass arms, up to 32 feet.

Highway crossing signal assemblies include a 4- or 5-inch diameter aluminum pole, cast aluminum junction box base, cast aluminum crossarm with LEX-C flashers (8 or 12 inch), and signs constructed of reflective sheeting permanently bonded to an aluminum base.

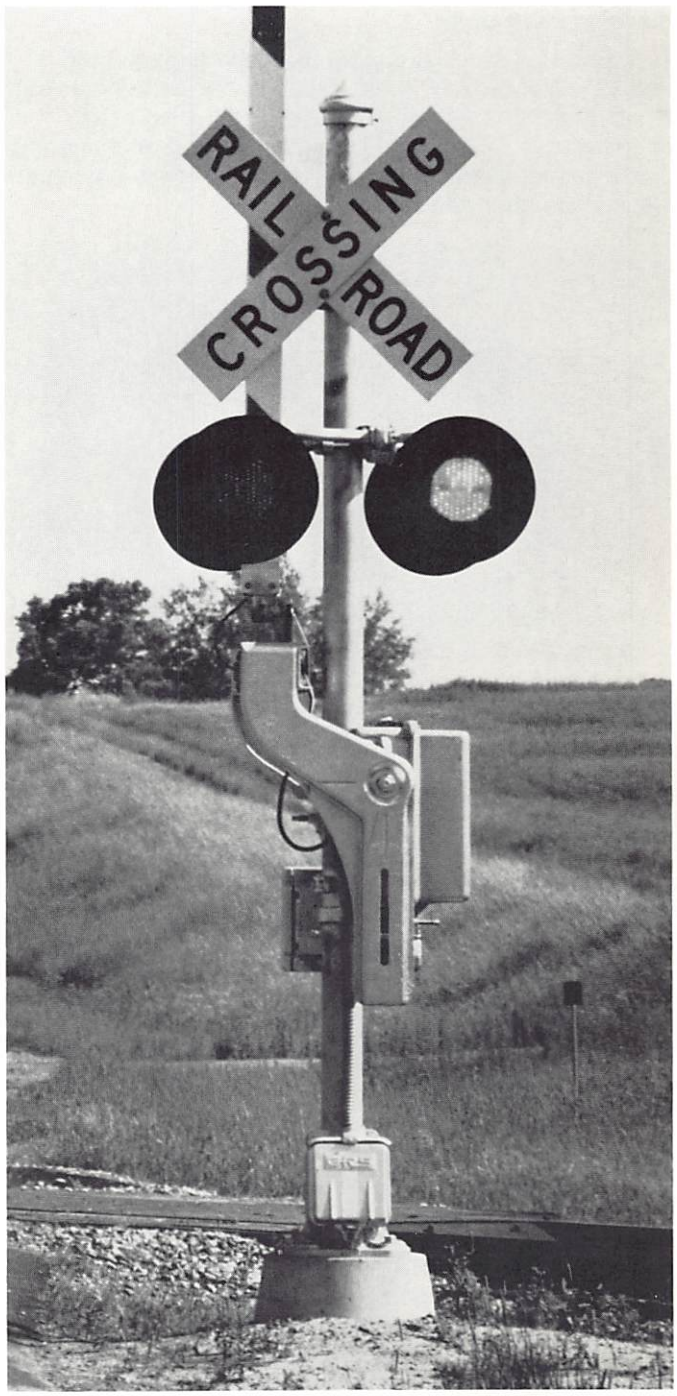


Figure 2. Highway crossing signal equipped with a Type D gate mechanism.

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Flashing Light Units

The GRS LEX-C flashing light units, available in both 8″ and 12″ sizes (Figure 3), are made of polycarbonate resin which maintains its high impact strength even at low temperatures. LEX-C signals resist cracking or shattering under impact; there is no glass to smash. They are impervious to weather and resist vandalism.

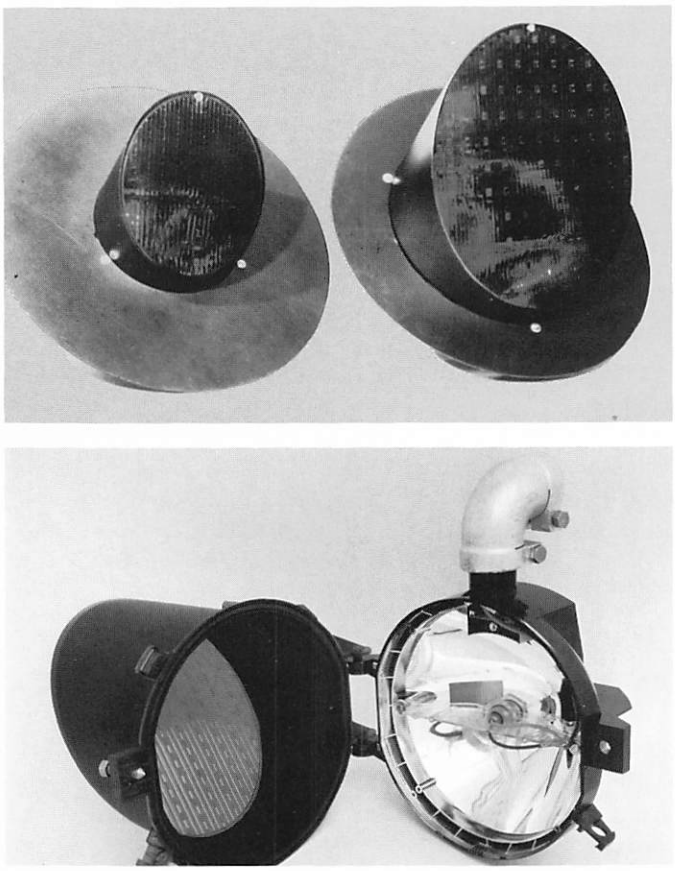


Figure 3. LEX-C flashing light units.

The high efficiency optics of the 8″ LEX-C include a reflector and lens area which are 50% larger than conventional crossing signals. Using a 10 volt, 18 watt lamp calibrated for 250 lumen output, a main beam of more than 3400 candlepower for the 8″ LEX-C and more than 5000 candlepower for the 12″ LEX-C is produced by a single lens, incorporating front light, back light, and cantilever patterns. An optional Phankill is available for installation where sunlight causes beam dilution.

LEX-C signals are 80% lighter in weight than conventional metal units. The light weight makes installation much easier as does having only two wire connections (for either Faston or AAR terminals) and a prefocused lampholder. Also, they have only a fraction of the parts of a conventional signal, hence a lower parts inventory is possible.

Conventional GRS Type XC crossing signals can be retrofitted with 8″ LEX-C lens assemblies to provide the benefits of LEX-C lens design at a reasonable cost.

Type D Crossing Gate Mechanism

Prelubricated, shielded or sealed bearings are used throughout the mechanism. The only lubrication required is the occasional application of grease to the gear teeth.

The mechanism is designed for low-voltage, d-c operation. The gate arm is raised from the horizontal to the clear position by means of a motor and gear train, Figure 4. Continuous protection is assured by a hold-clear magnet and associated locking device which holds the gate arm in the clear position as long as the supply energy is present. The approach of a train deenergizes the hold clear magnet and the gate arm descends by gravity.

To speed initial descent and to counter unusual conditions such as strong adverse winds, a combination of dynamic snub and power drive is utilized until the gate arm descends to a position 50 degrees from horizontal. From this position, the counterweighted gate arm descends by gravity. The rate of descent is retarded by dynamic snubbing.

Available as options are a digital counter to record the number of gate operations, a heater, and a sidewalk arm conversion kit.

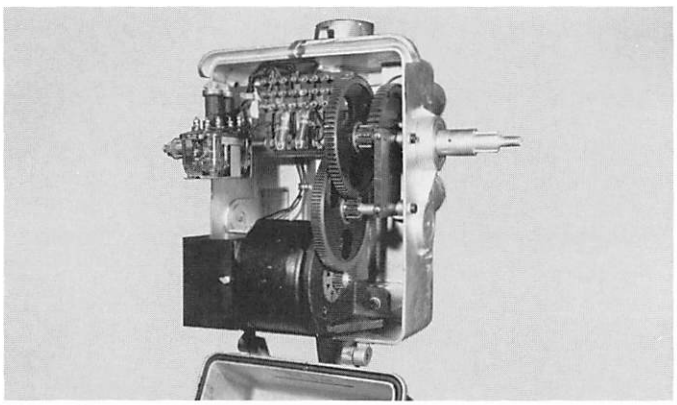
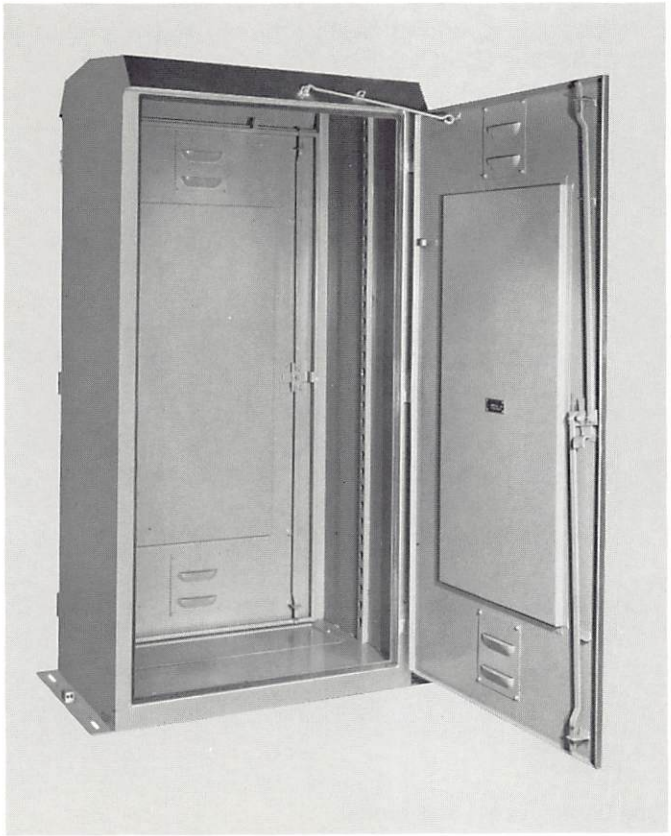


Figure 4.

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Equipment Cases

GRS equipment cases offer a great variety of adjustable fixtures to permit arranging equipment to fit the needs of a particular highway crossing. These cases are available in either maintenance free aluminum or corrosion resistant, welded steel.



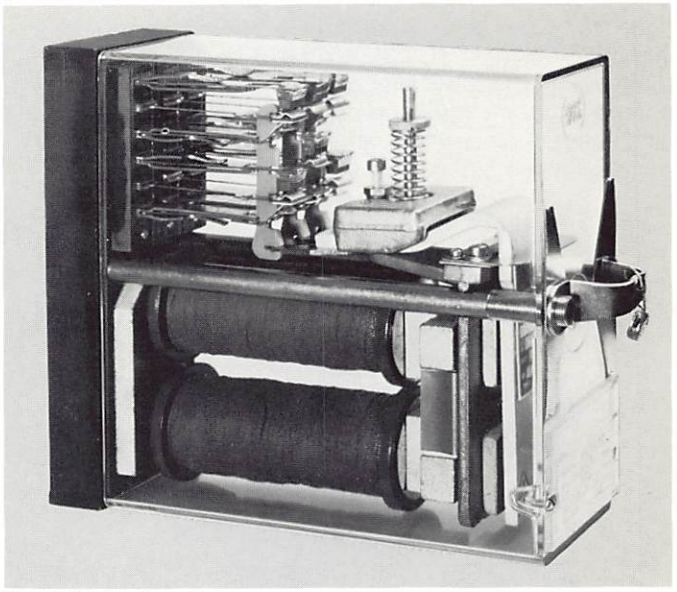
High single steel instrument case.

Permanently installed keyhole channels in the sides of the case provide for mounting shelves, backboards, and relay support bars for the best arrangement of the relays, batteries, transformers, rectifiers, etc.

For more information about GRS equipment cases, see GRS Assemblies Catalog, Section 5.

Plug-In Relays

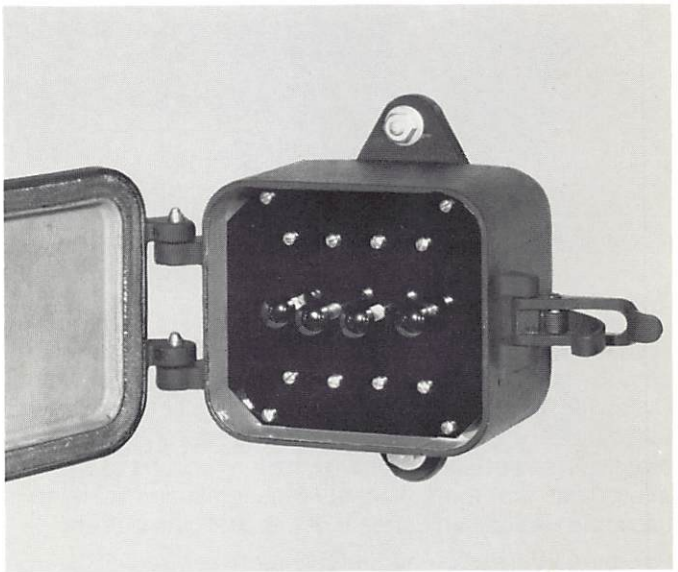
GRS Type B vital relays are designed for plug-in mounting on individual plugboards which are rack-installed in the equipment case. For more information, see GRS Catalog 62-1 and Pamphlet 1457.



Type B1 plug-in relay.

Test Box

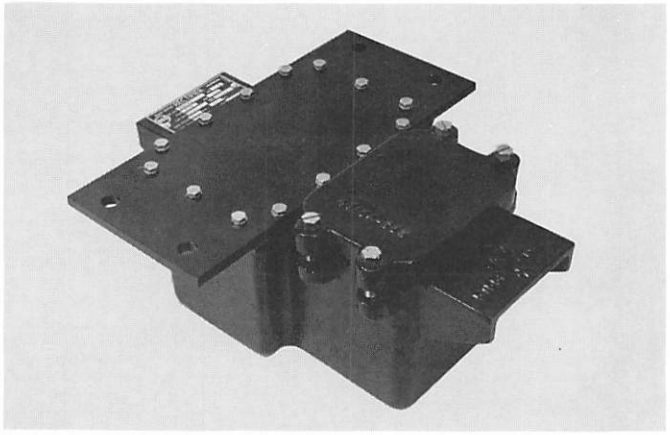
An optional test box is available for mounting on the equipment case or other convenient location. Switches, mounted in this weatherproof cast aluminum box, provide an easy way of checking the operation of the crossing warning devices.



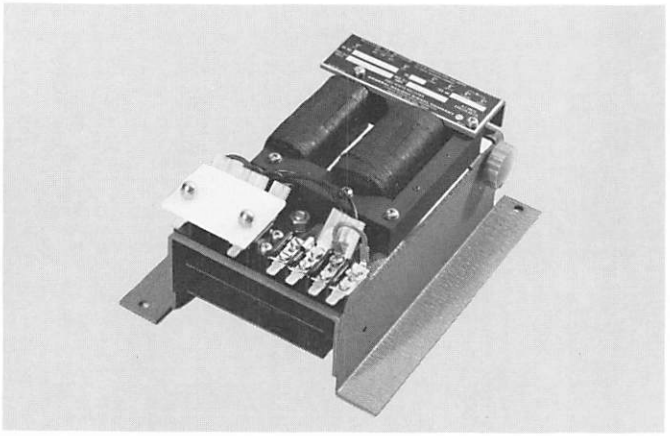
Cast-aluminum test box.

Rectifiers

Type SVA selenium rectifiers are used with a-c rectified track circuits. One rectifier is located at the far end of each approach circuit and one in the island circuit, thus eliminating the need for batteries, line drops, and battery boxes at these points.



Type SVA track rectifier.



Type ST selenium rectifier.

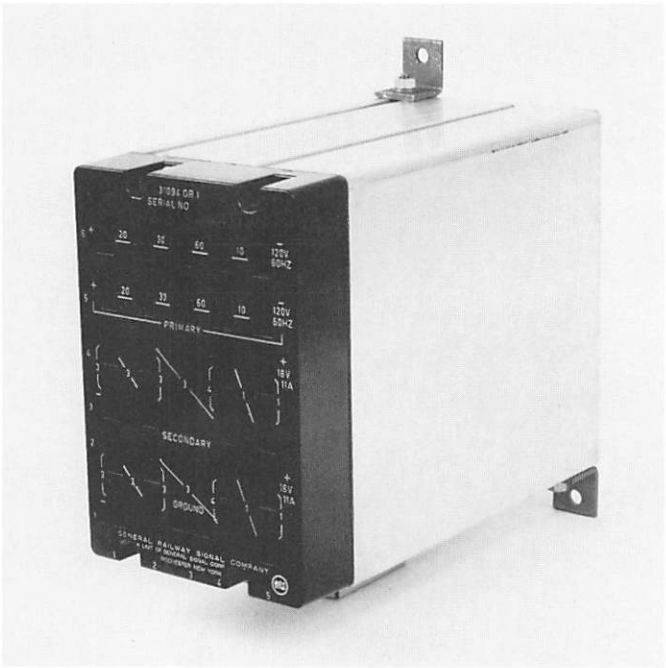
A GRS Type ST selenium rectifier is used for charging the standby batteries. It operates at uniform high efficiency over wide load variations, requires little maintenance, and takes up very little space. The rectifier has an adjustable, reactive transformer which provides, by means of a micrometer screw adjustment of the laminated yoke, an easy and gradual adjustment of the charging current.

For more information about GRS rectifiers, see GRS Assemblies Catalog, Section 53.

Transformer

The GRS Type UT transformer is engineered to provide years of trouble-free service, complete reliability, and a minimum of maintenance. It is designed expressly for use in railway signaling circuits.

The Type UT is an air-cooled transformer which has high insulation strength and provides good regulation with low core loss. It is wound to Association of American Railroad Signal Section Specifications. For more information, see GRS Catalog 95-1.



Type UT air-cooled transformer.

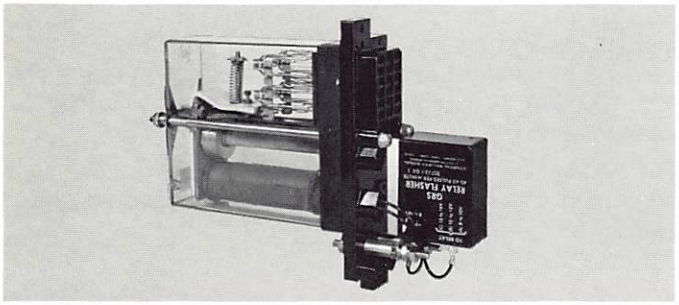
Flasher Module and Relay

The electronic flasher module mounts on the back of the Type B relay plugboard. The module uses the latest component technology which provides a high level of reliability and enables it to withstand surges of at least 1500 volts d-c.

The module, enclosed in a high impact-resistant poly-carbonate case and cover, drives its associated neutral relay at a constant flashing rate of 48 to 54 flashes per minute through a voltage range of 8 to 16 volts d-c. The flashing rate is determined solely by the circuit constants of the module and is not affected by the relay—there is nothing to adjust.

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Two input terminals provide the means of mechanically mounting and electrically coupling the module to the relay. The relay has a single operating coil for rapid pickup, and four dependent, front-back, heavy-duty, nonfusing lamp control contacts.

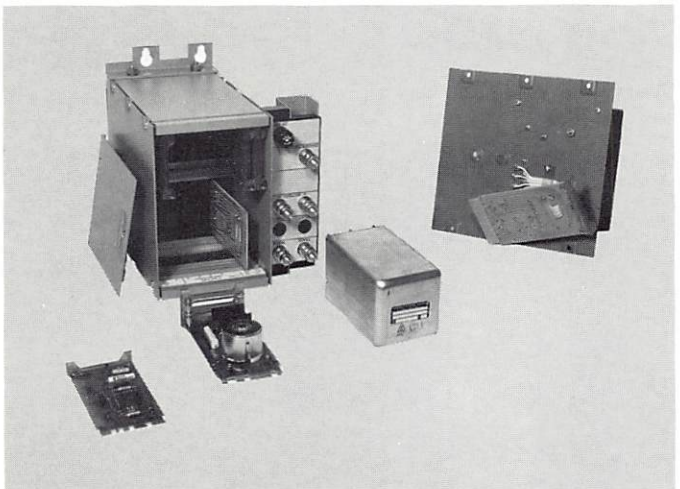


Type B1 flasher relay.

Approach FSO

GRS approach Frequency Shift Overlay (FSO) track circuits provide high noise immunity train detection for highway crossing protection, without using insulated joints, on single or multiple track with single or double-direction traffic. Approach FSO track circuits can be up to 6000 feet long.

FSO equipment is available for 15 mutually compatible operating frequency channels. These frequencies reduce the possibility of interference from harmonics of power line frequencies, or from the combined effects of power line harmonics and other FSO equipment.



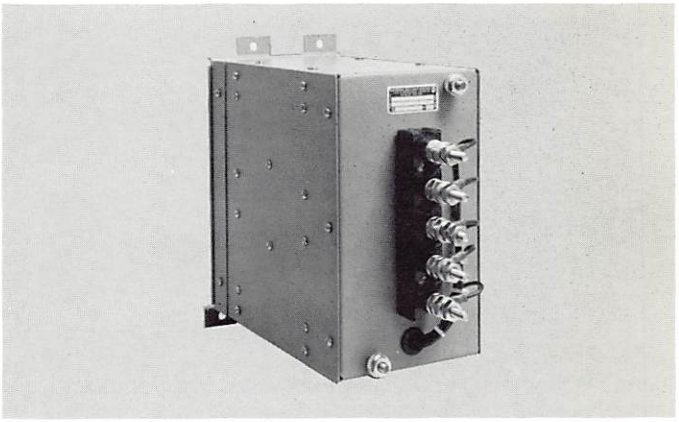
Approach FSO transmitter, with cover removed to show plug-in, modular design. To alter frequency, only the three starred items are changed. The power amplifier, an option, is shown on the right.

The FSO equipment for a basic track circuit consists of a transmitter, receiver, and biased-neutral track relay. Options include: a capacitor kit and a power amplifier for use under unusual noise conditions, facilities for centralized operation over line wires, and an insulated joint bypass unit.

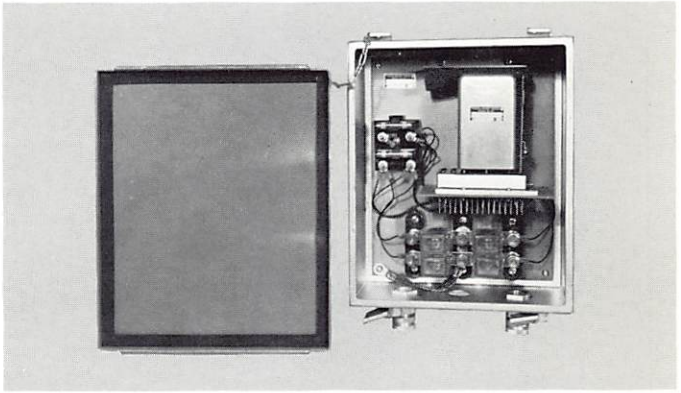
The optional insulated joint bypass unit effectively passes approach FSO frequencies around insulated joints, with a small reduction (typically 20%) in track circuit length. It has a minimum attenuation of 20 db at 100 Hz. The unit can be rack mounted or wall mounted.

The weatherproof remote coupling case comes wired complete with lightning and surge protection equipment.

For more information about approach FSO, see GRS Catalog 92-2 and GRS Pamphlet 1416.



Insulated joint bypass unit.



Remote coupling case.

Island FSO

GRS island Frequency Shift Overlay (FSO) track circuit equipment is similar to that used for GRS approach frequency shift overlay (FSO) track circuits, except that it is available in three higher frequencies. These frequencies, ideal for short track circuits, provide high shunting sensitivity.

The three mutually compatible frequencies are also compatible with the fifteen frequencies available with approach FSO equipment.

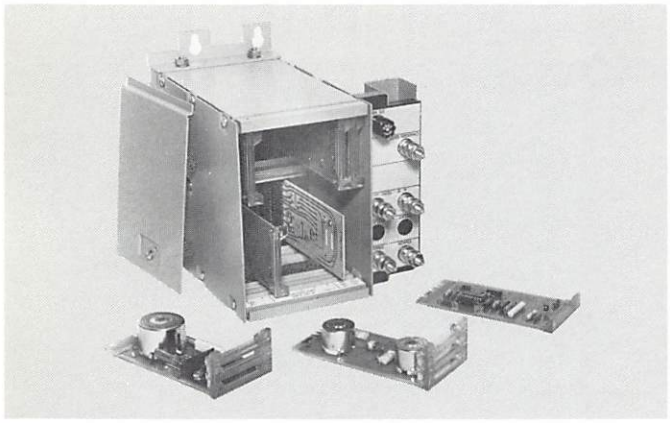
The equipment for an island FSO track circuit consists of a solid-state transmitter and receiver, and a biased neutral track relay. For more information, see GRS Catalog 92-2 and GRS Pamphlet 1503.

Coded FSO

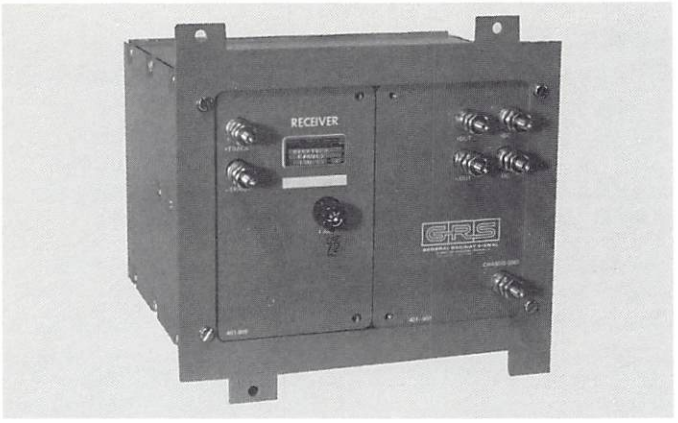
GRS coded frequency shift overlay (FSO) track circuits are used at highway crossings in electric propulsion territory. These circuits, similar to standard FSO track circuits, provide additional security against transient interference.

Coded FSO equipment is available with a choice of six mutually compatible operating frequency channels. The carrier frequencies are frequency shift coded at a rate of 120, 180, 270, or 410 pulses per minute to provide the needed security.

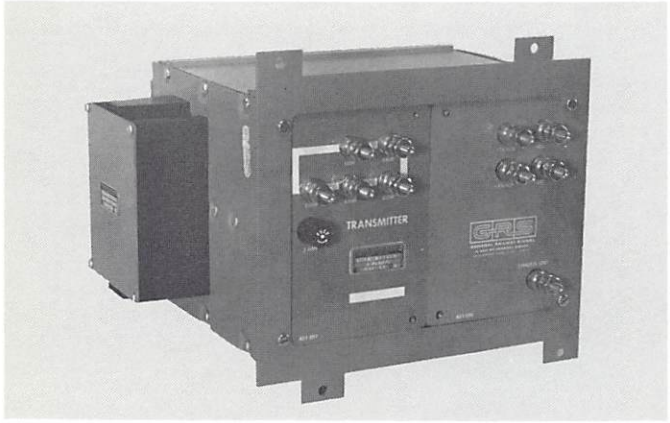
The coded FSO equipment for a basic track circuit consists of a transmitter, receiver, passive decoders, and biased-neutral track relay.



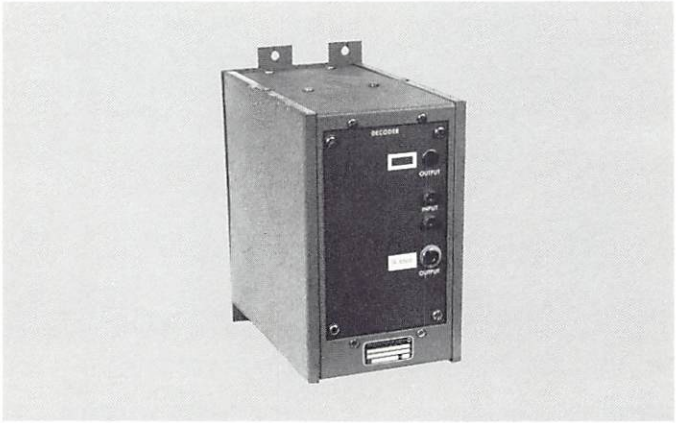
Island FSO transmitter, with cover removed and frequency selective circuit boards removed.



Coded FSO receiver.



Coded FSO transmitter.



Coded FSO decoder.

PRINCIPLES OF TRAIN DETECTION AND CONTROL CIRCUITRY

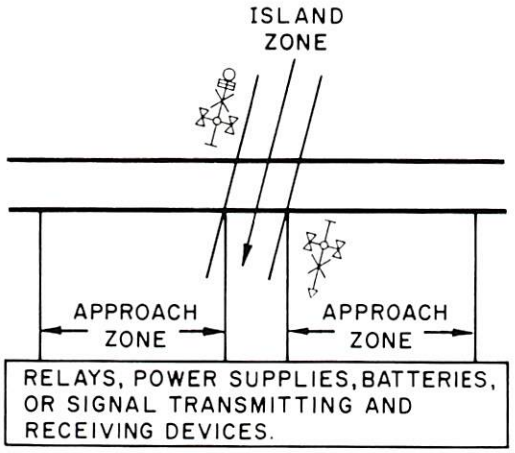
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Although highway crossing warning circuits must be based on approved principles of operation, they are subject to a wide range of variations. It is often necessary to design the control circuits in accordance with local conditions of track layout, highway configurations, nature of available power supply, type of other signaling which may be in service in the area, character of rail traffic (for example, substantial variations in speeds of trains using the crossing, switching moves in the area, diesel or electric propulsion, etc.) pedestrian traffic, and other variables.

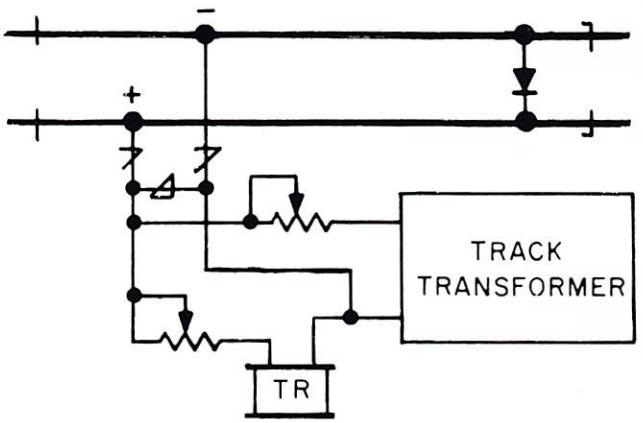
The crossing area is divided into zones for control purposes. A track circuit in each of these zones provides for train detection. Approach track circuits (see upper left diagram) start the warning devices—lights flashing at 48-54 FPM, bells ringing, and gates driven down. This is done by shunting energy, or a signal, in the rails, thereby deenergizing the track relay which, in turn, deenergizes the crossing relay and energizes the flasher relay.

An island circuit establishes a more positive directional control and deactivates the warning devices when the last car of the train clears the highway crossing.

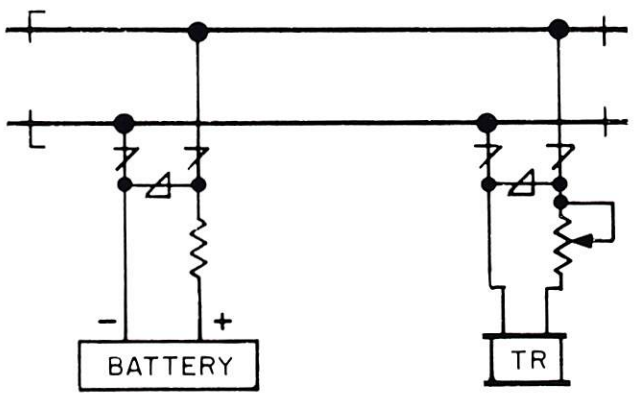
Simplified diagrams of three basic types of track circuits used for train detection at highway crossings are shown below.



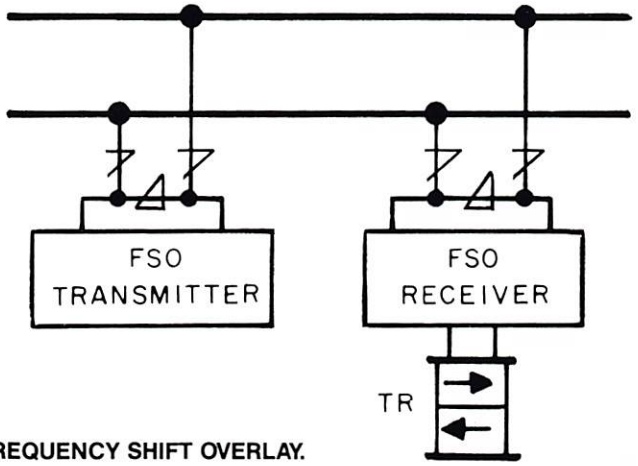
ISLAND ZONE



A-C RECTIFIED.



DIRECT CURRENT.



FREQUENCY SHIFT OVERLAY.

Lamp Lighting

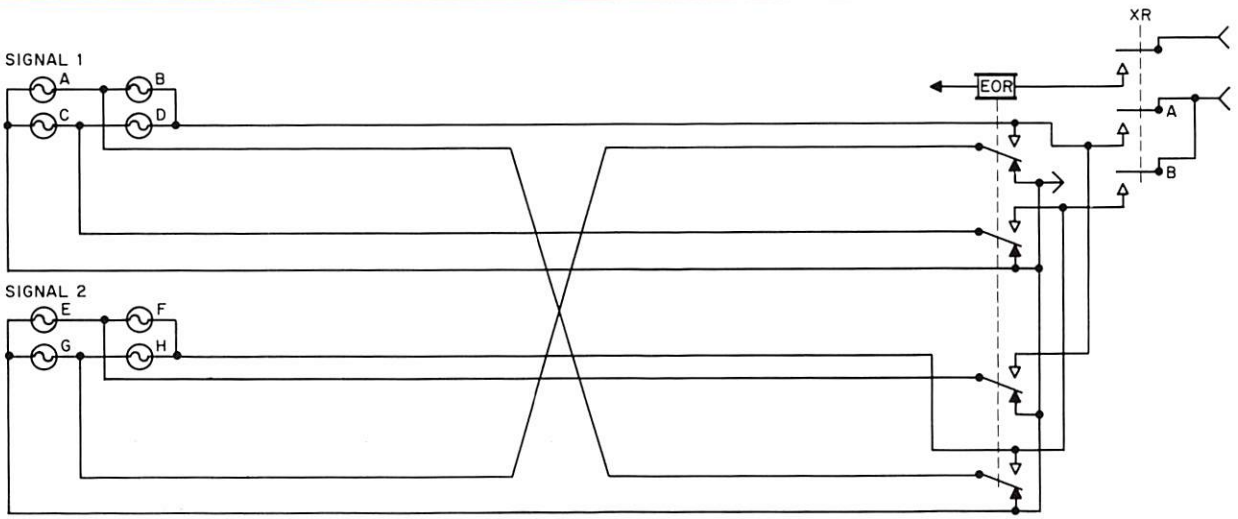
A signal rectifier provides a source of 10 volts d-c from 110 volts a-c, which is used to light the flasher lamps as well as charge the storage battery. Thus, lights are lit directly from the battery during a failure of commercial power.

Directional Control

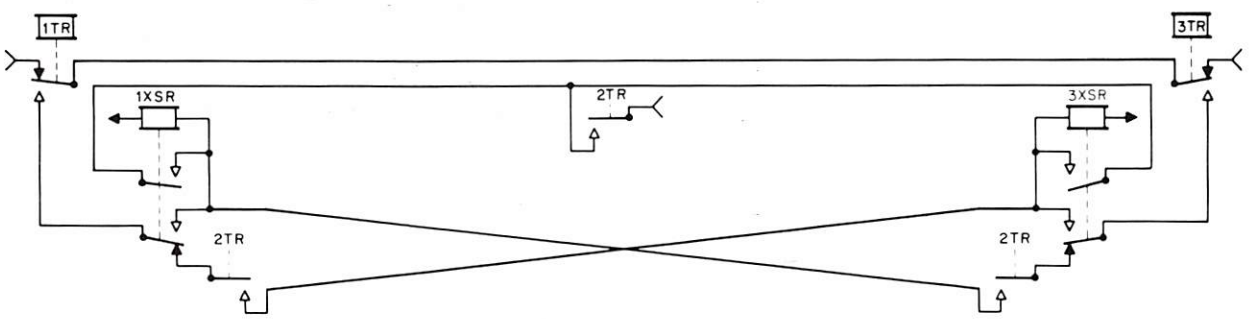
By the use of a third, or island, track circuit and directional stick relays, more positive directional control is established. The island track circuit provides a confirmation of track occupancy as first established by entry of a train into the approach section. If, for any reason, the approach circuit should fail to detect the train and activate the warning devices, the train can slowly enter the island detection area, activate the devices, and then proceed through the crossing area. The devices stop when the rear of the train clears the crossing.

Power

Storate battery capacity is maintained by a battery charger so that when the commercial power fails, the d-c and FSO track circuit systems and warning devices are completely supported by the standby battery until commercial power is restored. With a-c rectified (Type C) track circuits, the failure of commercial power results in an activation of the lights and bells, on a continuous basis, and gates are driven down where they remain until power is restored. In all installations, periodic maintenance of batteries and checks of power status are recommended.



TYPICAL FLASHING LIGHT CONTROL CIRCUIT.



TYPICAL DIRECTIONAL CONTROL CIRCUIT.

TYPICAL ARRANGEMENTS

The typical arrangements of highway crossing warning equipment, shown below, use various track circuits for train detection and warning device control.

A-c Rectified (Type "C")

This arrangement, primarily for private and nonsignaled crossings, uses a-c rectified track circuits. All equipment, except a small wayside package at the start of each approach, is housed at the crossing. During commercial power failures, a 10-volt circuit is provided for automatic and continuous operation of the audible and visual devices, which serves as a notification that the failure has occurred.

A-c Rectified with D-c Island

This arrangement is similar to a-c rectified, as described above, except for a d-c island section.

Direct Current

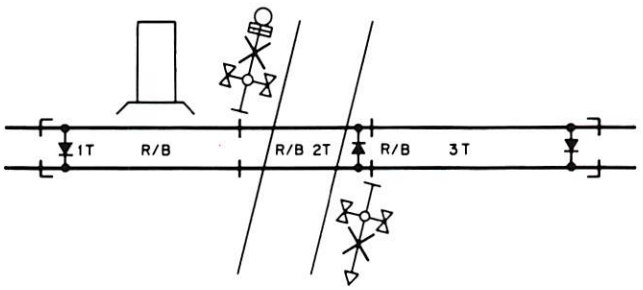
This arrangement, for railroads equipped with automatic block signals, uses d-c track circuits, which require additional insulated joints and rail bonding. All equipment, except track battery, is housed at the crossing.

Frequency Shift Overlay

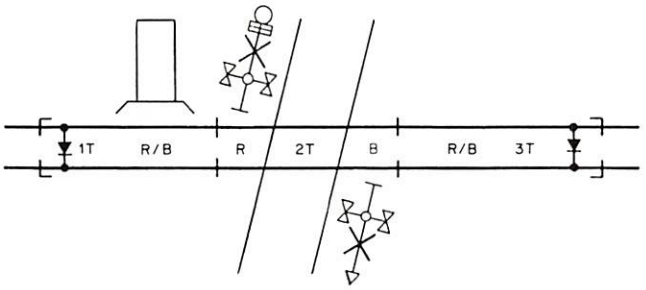
These arrangements, for railroads equipped with automatic block signals, use FSO track circuits, which do not require insulated joints. All equipment, except a small coupling unit, is housed at the crossing.

The FSO transmitters can be housed in separate cases at the approaches to the crossing.

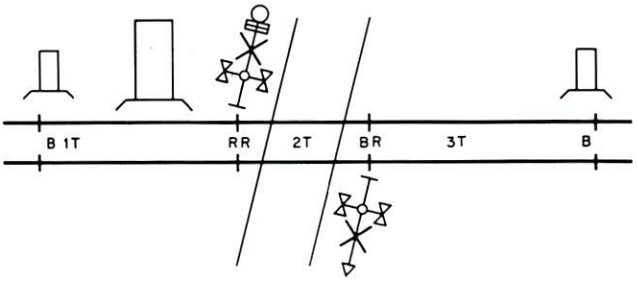
A-C RECTIFIED (TYPE "C")



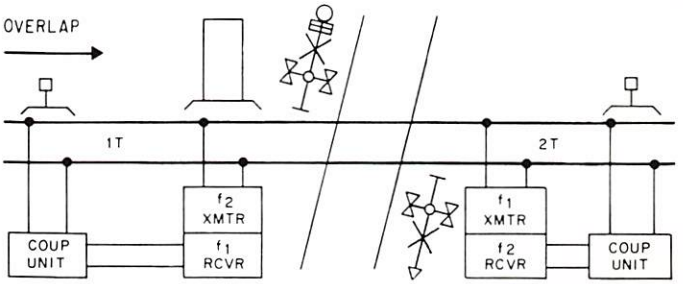
A-C RECTIFIED WITH D-C ISLAND

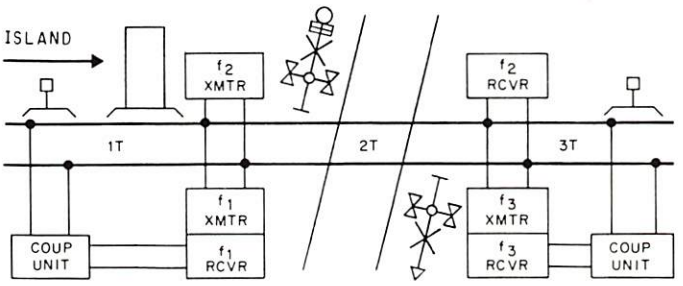


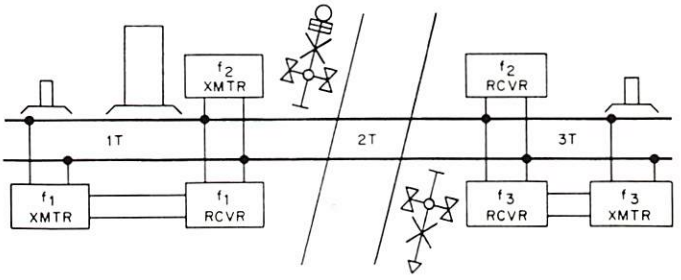
DIRECT CURRENT



FREQUENCY SHIFT OVERLAY



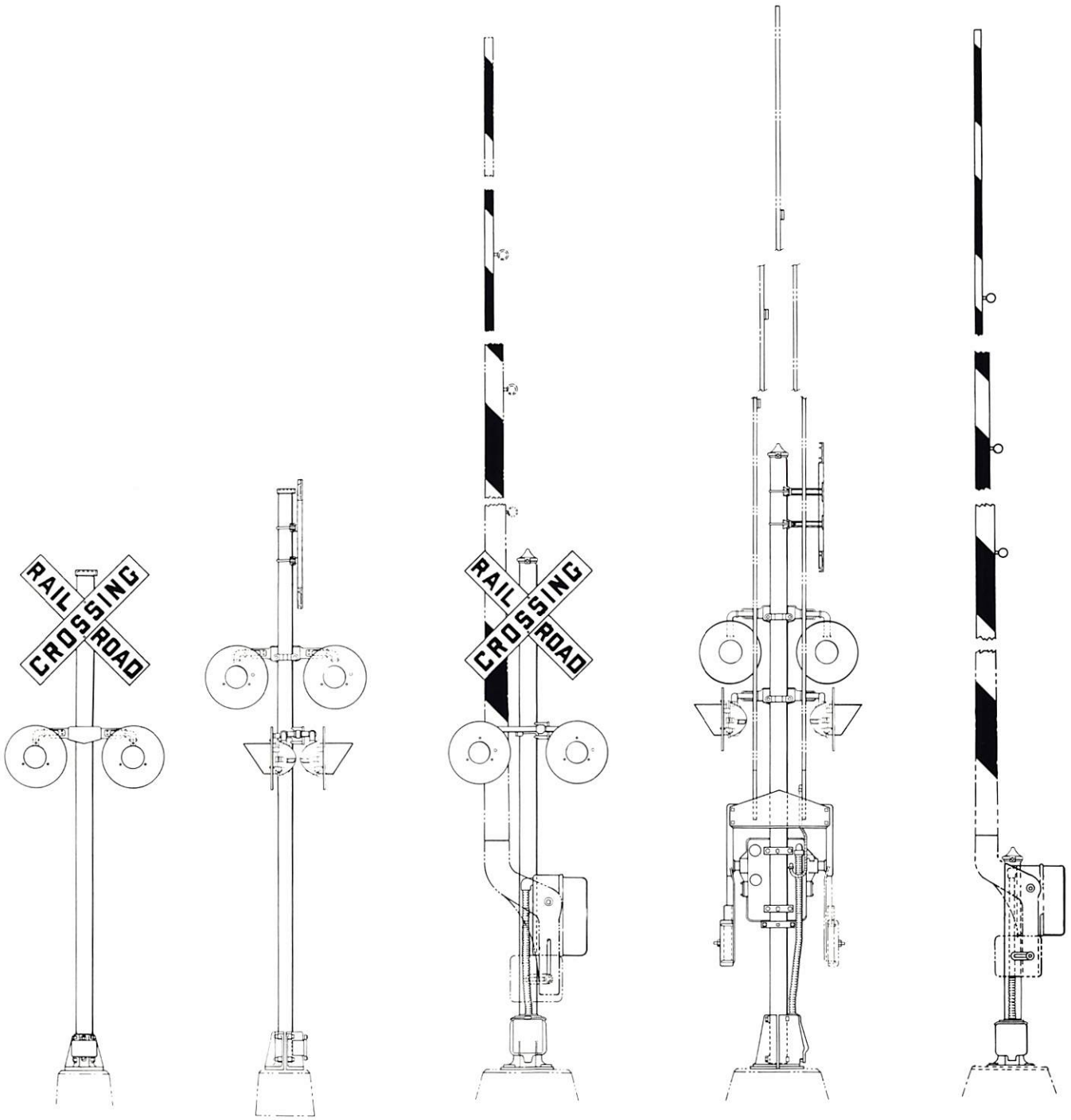




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ORDERING INFORMATION

The ordering information contained on these pages is for basic signal assemblies and accessories. For special assemblies, please order from the GRS Parts List Catalog, Section P30.



A B C D E

SIGNAL ASSEMBLIES

Basic signal assemblies (shipped unassembled) INCLUDE the parts listed below. The assemblies DO NOT INCLUDE the following; please order separately:

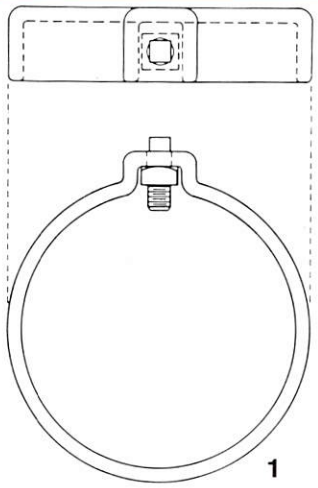
- **Bell and Phankill; see page 15.**
- **Track sign; see page 15.**
- **Gate Arm Assembly; see page 17.**
- **Test Box; see pages 20 and 22.**

PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE

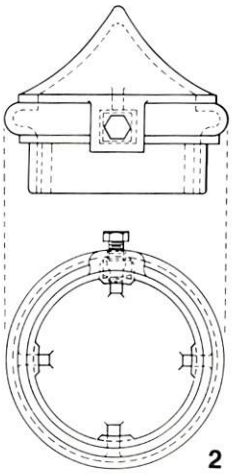
REFERENCE	NAME	CATALOG NUMBER With 8″ LEX-Cs	CATALOG NUMBER With 12″ LEX-Cs
A	**BASIC SIGNAL ASSEMBLY** 4″ dia. x 13′ high aluminum pole with cap, crossing sign, junction box base, and crossarm with four LEX-C flashing light units with 10V, 18W lamps	**A30-500**	**A30-920**
A1	**BASIC SIGNAL ASSEMBLY** same as A except crossarm with two flashing light units	**A30-501**	**A30-921**
B	**BASIC SIGNAL ASSEMBLY** 4″ dia. x 15′ high aluminum pole with cap, crossing sign, junction box base, and two crossarms each with four LEX-C flashing light units with 10V, 18W lamps.	**A30-502**	**A30-922**
B1	**BASIC SIGNAL ASSEMBLY** same as B except upper crossarm with two flashing light units	**A30-503**	**A30-923**
C	**BASIC SIGNAL ASSEMBLY** for crossing gate, 5″ dia. x 13′ high aluminum pole with pinnacle, crossing sign, junction box base, crossarm with four LEX-C flashing light units with 10V, 18W lamps, and Type D gate mechanism only	**A30-504**	**A30-924**
C1	**BASIC SIGNAL ASSEMBLY** same as C except crossarm with two flashing light units	**A30-505**	**A30-925**
C2	**BASIC SIGNAL ASSEMBLY** same as C except without gate mechanism	**A30-506**	**A30-926**
C3	**BASIC SIGNAL ASSEMBLY** same as C except crossarm with two flashing light units and without gate mechanism	**A30-507**	**A30-927**
D	**BASIC SIGNAL ASSEMBLY** for crossing gate, 5″ dia. x 16′ high aluminum pole with pinnacle, crossing sign, junction box base, two crossarms, each with four LEX-C flashing light units with 10V, 18W lamps, and Type D gate mechanism only	**A30-508**	**A30-928**
D1	**BASIC SIGNAL ASSEMBLY** same as D except upper crossarm with two flashing light units	**A30-509**	**A30-929**
D2	**BASIC SIGNAL ASSEMBLY** same as D except without gate mechanism	**A30-510**	**A30-930**
D3	**BASIC SIGNAL ASSEMBLY** same as D except upper crossarm with two flashing light units and without gate mechanism	**A30-511**	**A30-931**
E	**CROSSING GATE ONLY ASSEMBLY** 5″ dia. x 6′ high aluminum pole with pinnacle, junction box base, and Type D gate mechanism only		**A30-512**

Signed by Israel Jones, texasrails.org 7/16/2026

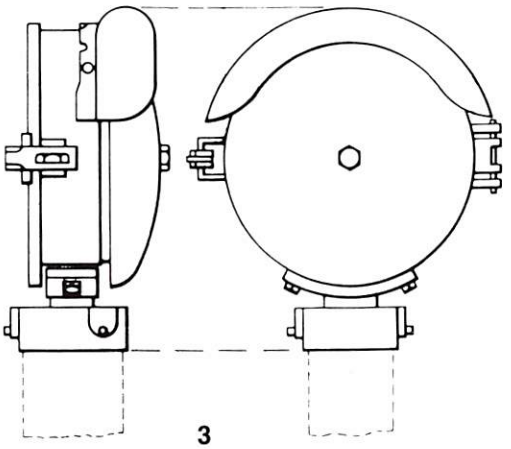
ACCESSORIES FOR SIGNAL ASSEMBLIES



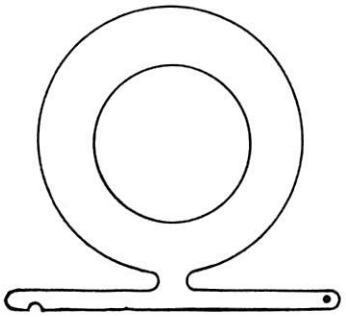
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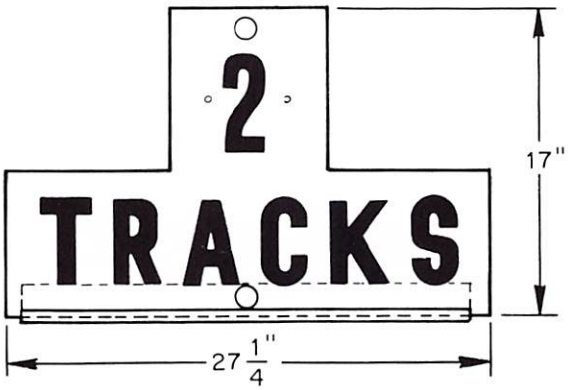
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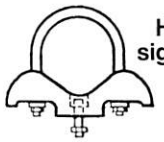
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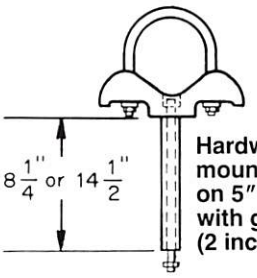
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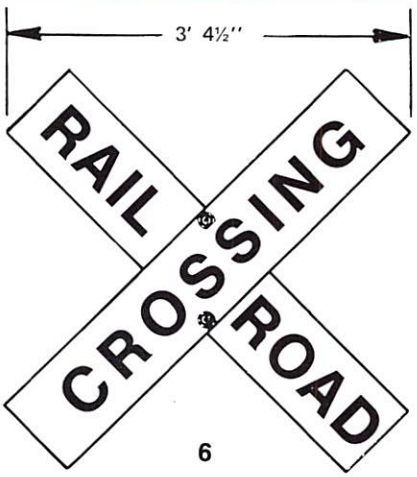
5



Hardware for mounting signs on 4″ or 5″ dia. pipe (2 included).



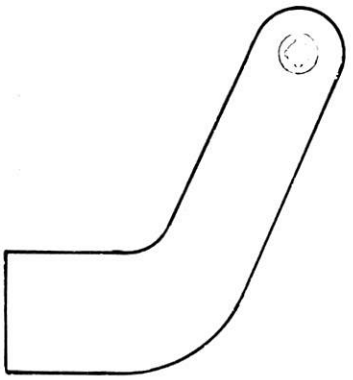
Hardware for mounting signs on 5″ dia. pipe with gate arm (2 included).



6



7



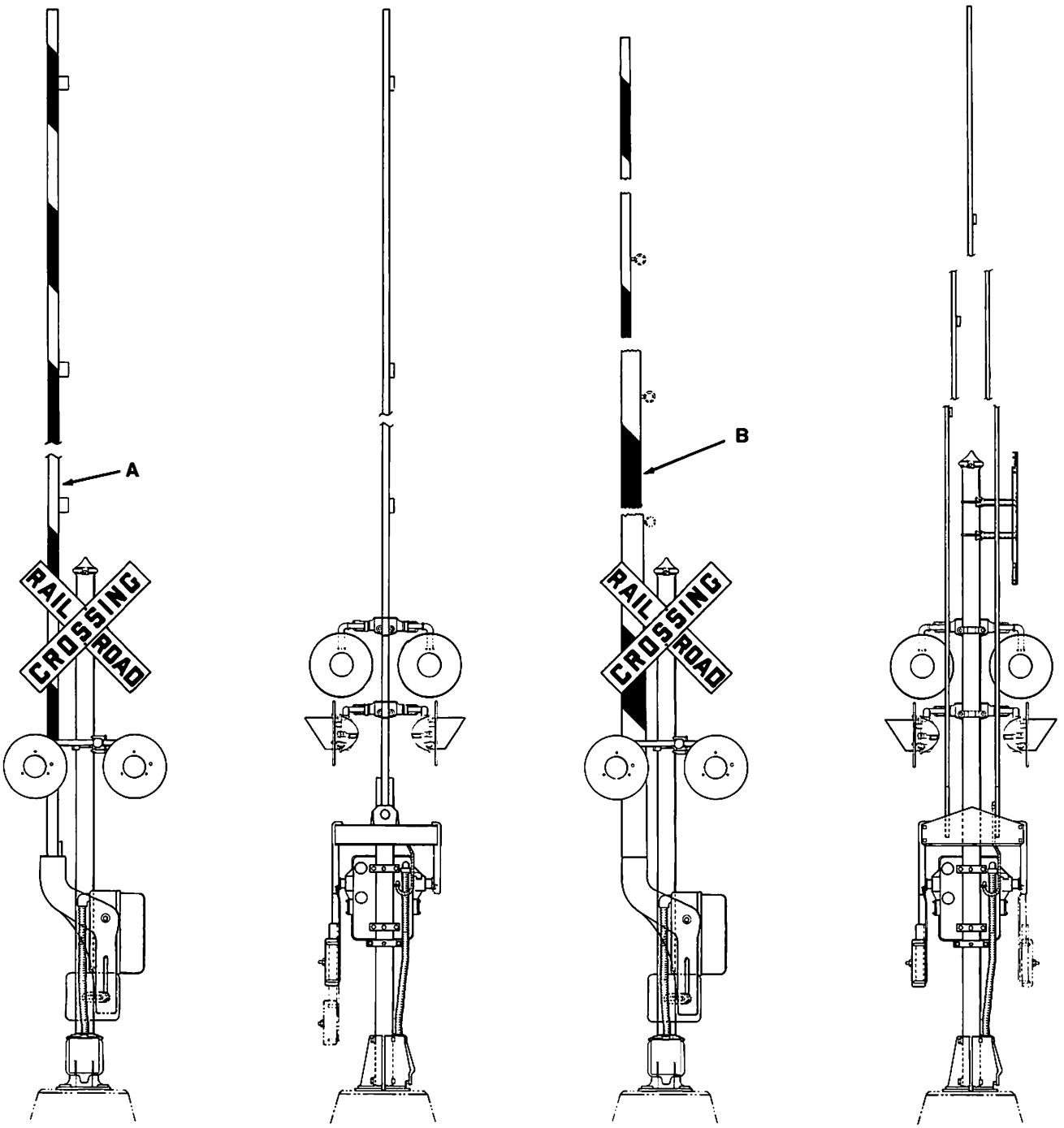
8

Signed by Israel Jones, texasrails.org 7/16/2026

PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE

REFERENCE NUMBER	NAME	CATALOG NUMBER
1	**FLAT CAP** for 4″ dia. pole	**A30-520**
2	**PINNACLE CAP** for 5″ dia. pole	**A30-521**
3	**BELL** for 4″ dia. pole	**A30-522**
3a	Same as above, except for 5″ dia. pole	**A30-523**
4	**PHANKILL** for newer style 8″ LEX-C units with two point lamp suspension, includes mounting hardware	**A30-937**
4a	Same as above, except for older style units with single point lamp suspension	**A30-935**
4b	Same as above except for 12″ LEX-C units	**A30-936**
5	**TRACK SIGN** 2 tracks, with mounting hardware for 4″ dia. pole	**A30-558**
5a	Same as above, except for 5″ dia. pole	**A30-559**
5b	**TRACK SIGN** 3 tracks, with mounting hardware for 4″ dia. pole	**A30-560**
5c	Same as Ref 5b, except for 5″ dia. pole	**A30-561**
5d	**TRACK SIGN** 4 tracks, with mounting hardware for 4″ dia. pole	**A30-562**
5e	Same as Ref 5d, except for 5″ dia. pole	**A30-563**
5f	**TRACK SIGN** 5 tracks, with mounting hardware for 4″ dia. pole	**A30-564**
5g	Same as Ref 5f, except for 5″ dia. pole	**A30-565**
5h	**TRACK SIGN** 6 tracks, with mounting hardware for 4″ dia. pole	**A30-566**
5i	Same as Ref 5h, except for 5″ dia. pole	**A30-567**
6	**RAILROAD CROSSING SIGN** with mounting hardware for 4″ dia. pole	**A30-552**
6a	Same as above, except for 5″ dia. pole	**A30-553**
7	**RAILWAY CROSSING SIGN** with mounting hardware for 4″ dia. pole	**A30-554**
7a	Same as above, except for 5″ dia. pole	**A30-555**
8	**ARM** sidewalk arm support	**A30-657**

ACCESSORIES
FOR SIGNAL ASSEMBLIES (Cont'd)



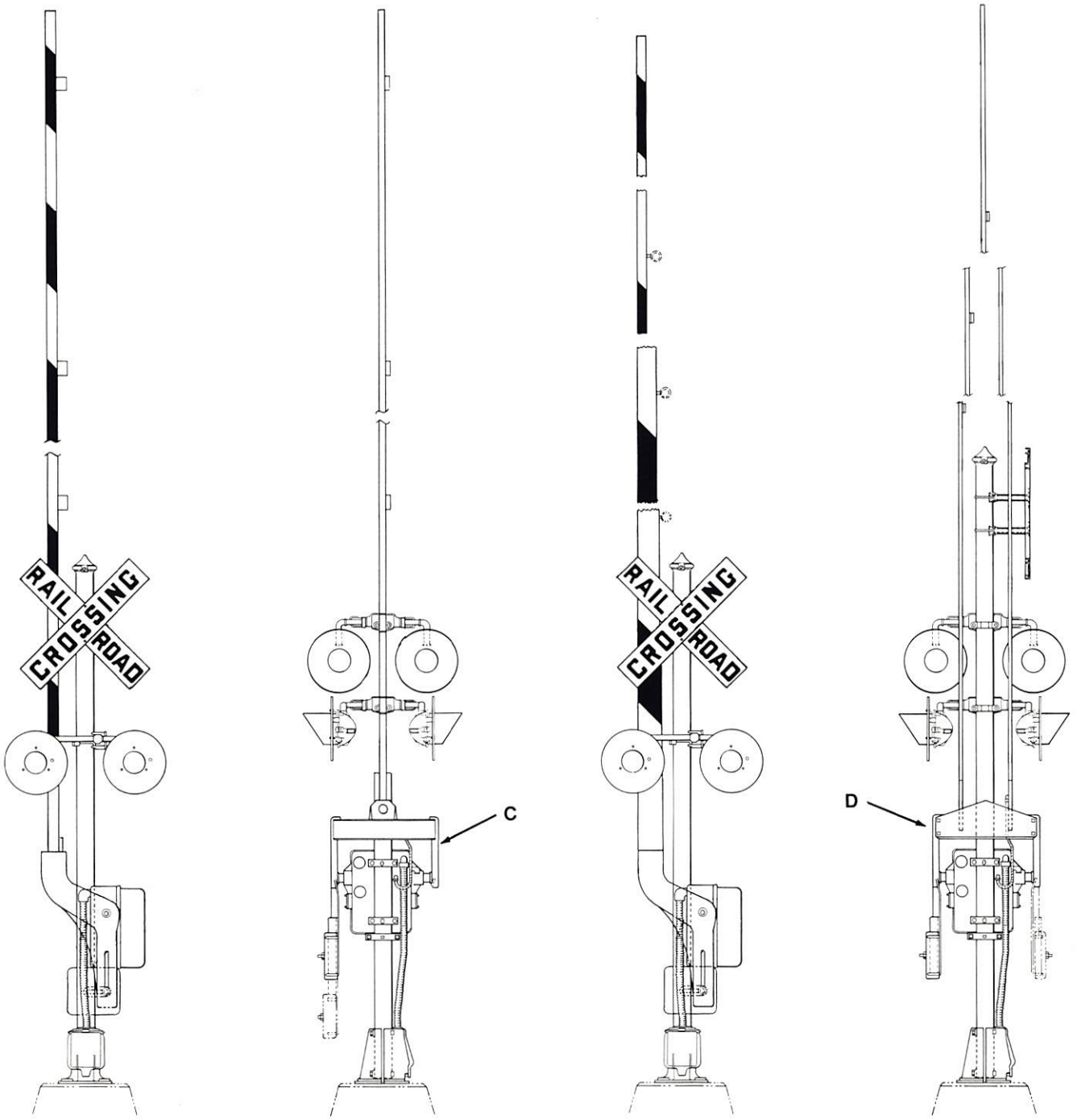
Signed by Israel Jones, texasrails.org 7/16/2026

PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE

REFERENCE NUMBER	NAME	CATALOG NUMBER
A	**FIBERGLASS GATE ARM,** with red and white stripes of reflex-reflecting sheet material, complete with lights, 14′ long*	**A30-635**
A1	**FIBERGLASS GATE ARM,** same as A except 16′ long*	**A30-636**
A2	**FIBERGLASS GATE ARM,** same as A except 18′ long*	**A30-637**
A3	**FIBERGLASS GATE ARM,** same as A except 20′ long*	**A30-638**
A4	**FIBERGLASS GATE ARM,** same as A except 22′ long*	**A30-639**
A5	**FIBERGLASS GATE ARM,** same as A except 24′ long*	**A30-640**
A6	**FIBERGLASS GATE ARM,** same as A except 26′ long*	**A30-641**
A7	**FIBERGLASS GATE ARM,** same as A except 28′ long*	**A30-642**
A8	**FIBERGLASS GATE ARM,** same as A except 30′ long*	**A30-643**
A9	**FIBERGLASS GATE ARM,** same as A except 32′ long*	**A30-644**
B	**WOODEN GATE ARM,** with red and white stripes of reflex-reflecting sheet material, complete with lights, adjustable from 16′ to 22′ long*	**A30-630**
B1	**WOODEN GATE ARM,** same as B except adjustable from 24′ to 30′ long*	**A30-631**
B2	**WOODEN GATE ARM,** same as B except adjustable from 32′ to 38′ long*	**A30-632**

*Arm length is measured from centerline of signal mast with gate lowered—actual length of arm will be approx. 2 feet less.

ACCESSORIES
FOR SIGNAL ASSEMBLIES (Cont'd)



Signed by Israel Jones, texasrails.org 7/16/2026

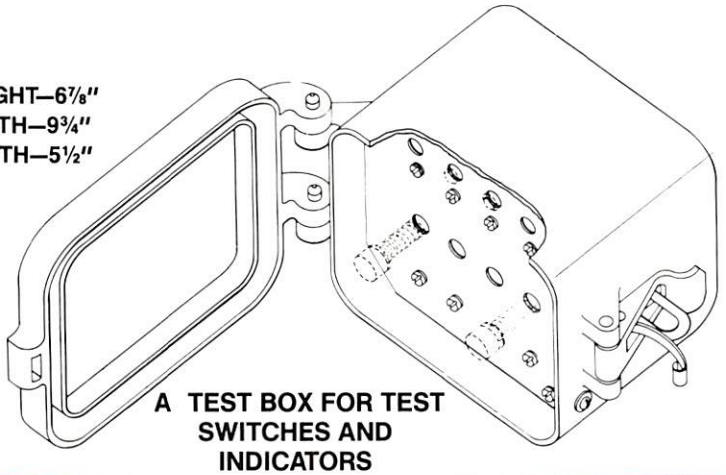
PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE

REFERENCE NUMBER	NAME	CATALOG NUMBER
C	**GATE ARM MOUNTING ASSEMBLY** for 14′ long fiberglass gate arm, complete with all counterweights and field hardware	**A30-670**
C1	**GATE ARM MOUNTING ASSEMBLY** same as C except for a 16′ long fiberglass gate arm	**A30-671**
C2	**GATE ARM MOUNTING ASSEMBLY** same as C except for an 18′ long fiberglass gate arm	**A30-672**
C3	**GATE ARM MOUNTING ASSEMBLY** same as C except for a 20′ long fiberglass gate arm	**A30-673**
C4	**GATE ARM MOUNTING ASSEMBLY** same as C except for a 22′ long fiberglass gate arm	**A30-674**
C5	**GATE ARM MOUNTING ASSEMBLY** same as C except for a 24′ long fiberglass gate arm	**A30-675**
C6	**GATE ARM MOUNTING ASSEMBLY** same as C except for a 26′ long fiberglass gate arm	**A30-676**
C7	**GATE ARM MOUNTING ASSEMBLY** same as C except for a 28′ long fiberglass gate arm	**A30-677**
C8	**GATE ARM MOUNTING ASSEMBLY** same as C except for a 30′ long fiberglass gate arm	**A30-678**
C9	**GATE ARM MOUNTING ASSEMBLY** same as C except for a 32′ long fiberglass gate arm and with extension arm	**A30-679**
D	**GATE ARM MOUNTING ASSEMBLY** for 16′ to 22′ adjustable wooden gate arm, complete with all counterweights and field hardware	**A30-683**
D1	**GATE ARM MOUNTING ASSEMBLY** same as D except for a 24′ to 30′ long adjustable wooden gate arm	**A30-684**
D2	**GATE ARM MOUNTING ASSEMBLY** same as D except for a 32′ to 38′ adjustable wooden gate arm	**A30-685**
—	**CONVERSION KIT** all parts necessary to convert Type D gate mechanism for use with a sidewalk arm	**A30-660**

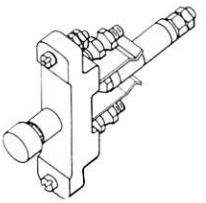
TEST BOXES

PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE

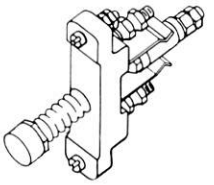
HEIGHT—6⅞"
WIDTH—9¾"
DEPTH—5½"



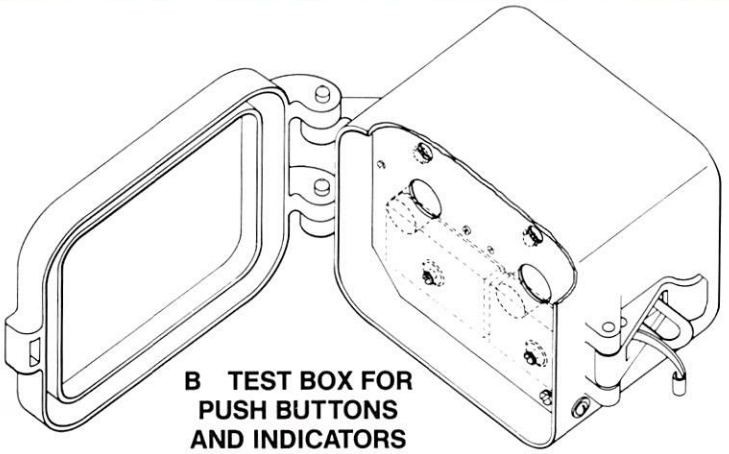
A TEST BOX FOR TEST SWITCHES AND INDICATORS



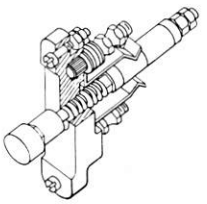
C TEST SWITCH PUSH-PULL TYPE



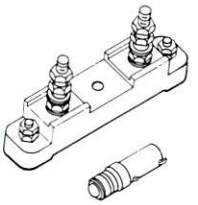
D TEST SWITCH PUSH TYPE SPRING RETURN



B TEST BOX FOR PUSH BUTTONS AND INDICATORS (MAX. 2 EACH)



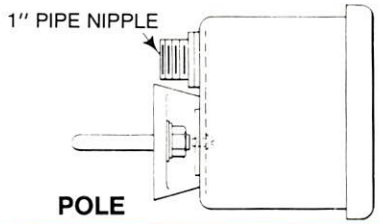
E TEST SWITCH PULL TYPE SPRING RETURN



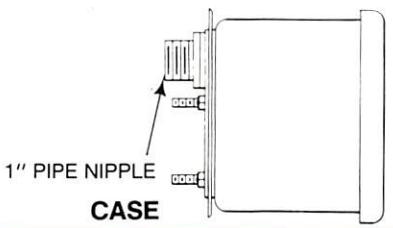
F LAMP SOCKET (INDICATOR) AND TERMINAL BLOCK

MAXIMUM CAPACITY OF LIGHTS AND SWITCHES		
REF.	LIGHTS	SWITCHES
A	2 — 4	2 4 —
B	2	2

MOUNTING METHODS



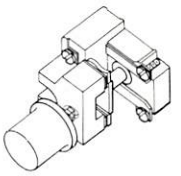
POLE



CASE



G LAMP SOCKET (INDICATOR)



H PUSH BUTTON

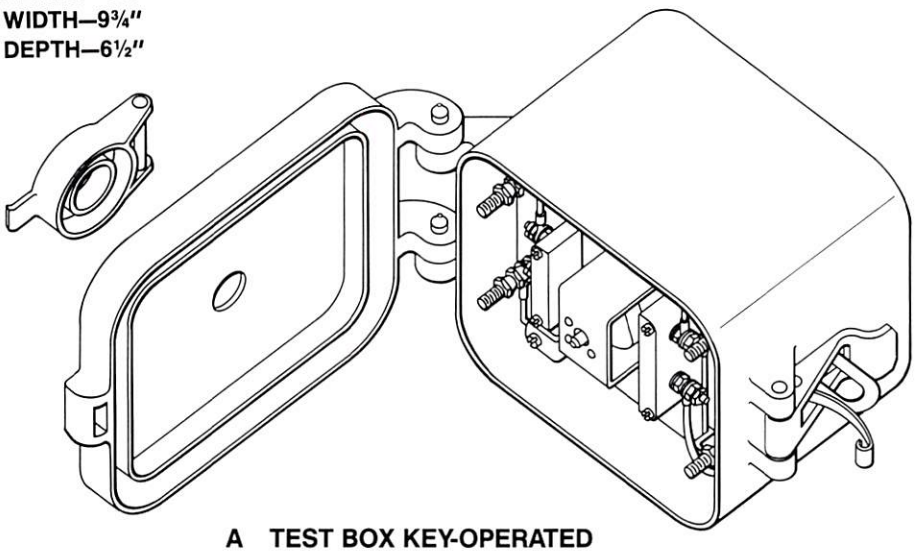
PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE

REFERENCE	NAME	CATALOG NUMBER
A	**TEST BOX** for bolting on case. Panel drilled for test switches and indicating lamps. Order test switches and indicating lamps separately. Includes 1″ pipe nipple and all mounting hardware	**A30-400**
A1	As above, except for fastening to 4″ dia. pole	**A30-403**
A2	Same as above, except for fastening to 5″ dia. pole	**A30-404**
B	**TEST BOX** for bolting on case. Panel drilled for two push buttons and two indicating lamps. Order push buttons and indicating lamps separately. Includes 1″ pipe nipple and all mounting hardware	**A30-409**
B1	As above, except for fastening to 4″ dia. pole	**A30-412**
B2	Same as above, except for fastening to 5″ dia. pole	**A30-413**
C	**TEST SWITCH** push-pull type, fits test box, ref. A	**A30-418**
D	**TEST SWITCH** push-type spring-return, controlled by cover. Shown in cover-open position, fits test box, ref. A	**A30-420**
E	**TEST SWITCH** pull-type, spring-return, fits test box, ref. A	**A30-423**
F	**LAMP SOCKET** with red bullseye. Takes telephone type, slide base lamp, includes terminal block and connectors for use in text box, ref. A	**A30-426**
F1	As above, except with green bullseye	**A30-427**
F2	Same as above, except with white bullseye	**A30-428**
G	**LAMP SOCKET** with red bullseye. Takes telephone type, slide base lamp, includes connectors for use in text box, ref. B.	**A30-434**
G1	As above, except with green bullseye	**A30-435**
G2	Same as above, except with white bullseye	**A30-436**
H	**PUSH BUTTON** one contact normally open and one normally closed, includes all mounting hardware, fits test box, ref. B	**A30-431**

Signed by Israel Jones, texasrails.org 7/16/2026

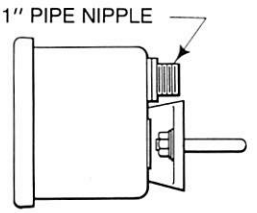
TEST BOXES (cont'd)

HEIGHT—6⅞"
WIDTH—9¾"
DEPTH—6½"

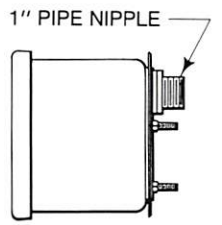


A TEST BOX KEY-OPERATED

MOUNTING METHODS



POLE



CASE

PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE

REFERENCE	NAME	CATALOG NUMBER Case Mounting	Pole Mounting 4" Dia.	Pole Mounting 5" Dia.
A	**TEST BOX, KEY-OPERATED** with two single-pole single-throw contacts operated by clockwise turn of standard railroad key.* Left contact normally closed; right contact normally open	**A30-450**	**A30-453**	**A30-454**
A1	As above, except both contacts normally closed	**A30-460**	**A30-463**	**A30-464**
A2	Same as above, except both contacts normally open	**A30-470**	**A30-473**	**A30-474**
A3	Same as above, except contacts operated both by clockwise and counterclockwise turn of key. Left contact normally closed; right contact normally open. In CW position, both contacts closed; in CCW position, both contacts open	**A30-480**	**A30-483**	**A30-484**
A4	Same as A3, except both contacts normally open. In CW position, left contact closed, right contact open. In CCW position, left contact open, right contact closed	**A30-490**	**A30-493**	**A30-494**

*Send sample or drawing of your key, if not previously supplied.

DESIGN QUESTIONNAIRE

RAIL-HIGHWAY GRADE CROSSING WARNING SYSTEM

Completion of this questionnaire will enable GRS engineers to process your inquiry/order and begin work on your crossing needs immediately.

In addition to this questionnaire, please provide a scaled track plan with all existing switches, signals, and/or any other electric/electronic device(s), and insulated joints. Orders, especially, should be provided with current tie-in plans.

Signed by Israel Jones, texasrails.org 7/16/2026

Railroad or company name:_____ Date:_____

Operations:

1. Length of approaches_____
2. Speed of trains_____
3. Direction of traffic_____
4. Number of trains in 24 hours_____
5. Motive power: diesel_____ electric_____
   If electric, give particulars about voltage, frequency, return current through rails and whether track circuits are single or double rail.

   _____

   _____
6. Describe all special moves made or to be made in approaches, particularly over switches:

   _____

   _____

Track Circuit Preferred (check one):

1. _____ A-c rectified with island
2. _____ A-c rectified with d-c island
3. _____ D-c with island
4. _____ Frequency shift overlay (FSO)
   a. _____ Overlap _____ Island
   b. _____ Central _____ Remote transmitters
   c. If you have channel preferences please list frequencies:

      Track 1: _____ approach _____ approach _____ island

      Track 2: _____ approach _____ approach _____ island

      Additional tracks—list as above_____
   d. If there are existing electronic track circuits, please state frequencies:

      _____ _____ _____ and manufacturer_____
   e. Please list FSO options desired (See GRS Catalog 92-2):_____

      _____

      _____

(over)

Cases:

1. Size preferred_____ or GRS engineer's choice_____
2. Steel_____ aluminum_____
3. Prewired_____ unwired_____

Power:

1. Is 110V 60Hz available? _____ yes _____ no. If not, state power_____
2. Whatever your track circuit preference, please state if standby battery is required.

   _____ yes _____ no

   If yes, hours required _____
3. Nickel cadmium _____ lead acid _____
4. In case _____ separate box _____

Signal Assemblies:

1. Flashers only _____

   Flashers with gates: wood _____ fiberglass _____ length of gate _____

   NOTE: Wood gate arms are available up to 38 feet and fiberglass up to 32 feet.
2. Cantilever:

   Length of arm _____ ft fixed _____ adjustable _____

   Walkout _____ yes _____ no

   Locking guards for ladder _____ yes _____ no

   Unless otherwise requested, base mounting holes will be on 19-inch centers.
3. Signal units per main road arm _____ 2 _____ 4

   When required: signal units per roadway arm facing to left _____ or right _____

   Lamp: _____ voltage _____ wattage

   Lamp lit from _____ d-c _____ a-c
4. Signs: _____ railroad _____ railway crossing

   _____ 2 _____ 3 _____ 4 track _____ Other
5. Bell: _____ none _____ one _____ two

Test Box: _____ yes _____ no Where mounted?_____

Please include any pertinent information that will assist GRS with the design of your crossing system.

_____

_____

_____

_____

DESIGN QUESTIONNAIRE

RAIL-HIGHWAY GRADE CROSSING WARNING SYSTEM

GRS CATALOG **30-1**

Completion of this questionnaire will enable GRS engineers to process your inquiry/order and begin work on your crossing needs immediately.

In addition to this questionnaire, please provide a scaled track plan with all existing switches, signals, and/or any other electric/electronic device(s), and insulated joints. Orders, especially, should be provided with current tie-in plans.

Signed by Israel Jones, texasrails.org 7/16/2026

Railroad or company name:_____ Date:_____

Operations:

1. Length of approaches_____
2. Speed of trains_____
3. Direction of traffic_____
4. Number of trains in 24 hours_____
5. Motive power: diesel_____ electric_____
   If electric, give particulars about voltage, frequency, return current through rails and whether track circuits are single or double rail.

   _____

   _____
6. Describe all special moves made or to be made in approaches, particularly over switches:

   _____

   _____

Track Circuit Preferred (check one):

1. _____ A-c rectified with island
2. _____ A-c rectified with d-c island
3. _____ D-c with island
4. _____ Frequency shift overlay (FSO)
   a. _____ Overlap _____ Island
   b. _____ Central _____ Remote transmitters
   c. If you have channel preferences please list frequencies:

      Track 1: _____ approach _____ approach _____ island

      Track 2: _____ approach _____ approach _____ island

      Additional tracks—list as above_____
   d. If there are existing electronic track circuits, please state frequencies:

      _____ _____ _____ and manufacturer_____
   e. Please list FSO options desired (See GRS Catalog 92-2):_____

      _____

      _____

(over)

Cases:

1. Size preferred_____ or GRS engineer's choice_____
2. Steel_____ aluminum_____
3. Prewired_____ unwired_____

Power:

1. Is 110V 60Hz available? _____ yes _____ no. If not, state power_____
2. Whatever your track circuit preference, please state if standby battery is required.

   _____ yes _____ no

   If yes, hours required _____
3. Nickel cadmium _____ lead acid _____
4. In case _____ separate box _____

Signal Assemblies:

1. Flashers only _____

   Flashers with gates: wood _____ fiberglass _____ length of gate _____

   NOTE: Wood gate arms are available up to 38 feet and fiberglass up to 32 feet.
2. Cantilever:

   Length of arm _____ ft fixed _____ adjustable _____

   Walkout _____ yes _____ no

   Locking guards for ladder _____ yes _____ no

   Unless otherwise requested, base mounting holes will be on 19-inch centers.
3. Signal units per main road arm _____ 2 _____ 4

   When required: signal units per roadway arm facing to left _____ or right _____

   Lamp: _____ voltage _____ wattage

   Lamp lit from _____ d-c _____ a-c
4. Signs: _____ railroad _____ railway crossing

   _____ 2 _____ 3 _____ 4 track _____ Other
5. Bell: _____ none _____ one _____ two

Test Box: _____ yes _____ no Where mounted?_____

Please include any pertinent information that will assist GRS with the design of your crossing system.

_____

_____

_____

_____

GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL

Signed by Israel Jones, texasrails.org 7/16/2026

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REPRESENTATIVES AND LICENSEES THROUGHOUT THE WORLD

CATALOG SECTION A30

CROSS - INDEX

HIGHWAY CROSSING WARNING

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-229			JUNCTION BOX	
	43920-6GR5		BOX	
	3584		BOLT	
	35382	2	BUSHING	
	1048-6	2	NUT	
	01273-10	2	WASHER	
	01250-21	2	WASHER	
A30-230			JUNCTION BOX	
	43920-6GR5		BOX	
	5676-14	2	BOLT	
	1048-6	3	NUT	
	35382	2	BUSHING	
	01273-10	3	WASHER	
	01250-21	2	WASHER	
	0645-1		BOLT	
A30-231			JUNCTION BOX COMPLETE	
	43920-6GR1		JUNCTION BOX	
	5183-2GR1		U BOLT	
	35382		BUSHING	
A30-232			JUNCTION BOX COMPLETE	
	43920-6GR1		JUNCTION	
	19032		U BOLT	
	35382		BUSHING	
A30-239	20416-8GR3		STEP	
A30-240	20416-8GR2		STEP	
A30-241	20416-8GR4		STEP	
A30-243	20416-8GR5		STEP	
A30-310			PHANKILL W/CLIP	
	56629		PHANKILL	
	18547-62	3	CLIP	
A30-315	38040-18		GUARD	
A30-400			TEST BOX COMPLETE	
	56820-20GR2		BOX	
	55997-574		PANEL	
	13014-356		GASKET	
	3955-7	4	SCREW	
	0383-1	4	NUT	
	01250-12	4	WASHER	
	53029-75	4	WASHER	
	41885-128		PLATE PRINT 52998-119	
A30-403			TEST BOX	19
	56820-20GR2		BOX	
	55997-574		PANEL	
	48678-2		ADAPTER	
	50357-28		U BOLT	
	1156-12	2	NUT	
	01273-8	2	WASHER	
	01250-17	2	WASHER	
	3955-6	4	SCREW	
	53029-75	4	WASHER	
A30-404			TEST BOX	19
	56820-20GR2		BOX	
	55997-574		PANEL	
	48678-2		ADAPTER	
	50357-24		U BOLT	
	1156-12	2	NUT	
	01273-8	2	WASHER	
	01250-17	2	WASHER	
	3955-6	4	SCREW	
	53029-75	4	WASHER	
A30-405			TEST BOX	
	56820-20GR2		BOX	
	55997-574		PANEL	
	48678-2		ADAPTER	
	50357-32		U BOLT	
	1156-12	2	NUT	
	01273-8	2	WASHER	
	01250-17	2	WASHER	
	3955-6	4	SCREW	
	53029-75	4	WASHER	

CATALOG SECTION A30

CROSS - INDEX

HIGHWAY CROSSING WARNING

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-406			TEST BOX	
	56820-20GR2		BOX	
	55997-574		PANEL	
	48678-2		ADAPTER	
	50357-35		U BOLT	
	1156-12	2	NUT	
	01273-8	2	WASHER	
	01250-17	2	WASHER	
	3955-6	4	SCREW	
	53029-75	4	WASHER	
A30-409			TEST BOX	19
	56820-20GR2		BOX	
	55999-265GR1		PANEL	
	13014-356		GASKET	
	3955-7	4	SCREW	
	0383-1	4	NUT	
	01250-12	4	WASHER	
	53029-75	4	WASHER	
	41885-128		PLATE	
			BLUE PRINT	
			52998-119	
A30-412			TEST BOX	19
	56820-20GR2		BOX	
	55999-265GR1		PANEL	
	48678-2		ADAPTER	
	50357-28		U BOLT	
	1156-12	2	NUT	
	01273-8	2	WASHER	
	01250-17	2	WASHER	
	3955-6	4	SCREW	
	53029-75	4	WASHER	
A30-413			TEST BOX	19
	56820-20GR2		BOX	
	55999-265GR1		PANEL	
	48678-2		ADAPTER	
	50357-24		U BOLT	
	1156-12	2	NUT	
	01273-8	2	WASHER	
	01250-17	2	WASHER	
	3955-6	4	SCREW	
	53029-75	4	WASHER	
A30-414			TEST BOX	
	56820-20GR2		BOX	
	55999-265GR1		PANEL	
	48678-2		ADAPTER	
	50357-32		U BOLT	
	1156-12	2	NUT	
	01273-8	2	WASHER	
	01250-17	2	WASHER	
	3955-6	4	SCREW	
	53029-75	4	WASHER	
A30-415			TEST BOX	
	56820-20GR2		BOX	
	55999-265GR1		PANEL	
	48678-2		ADAPTER	
	50357-35		U BOLT	
	1156-12	2	NUT	
	01273-8	2	WASHER	
	01250-17	2	WASHER	
	3955-6	4	SCREW	
	53029-75	4	WASHER	
A30-418	58229-4GR1		SWITCH	19
A30-420	58229-4GR2		SWITCH	19
A30-423	58229-4GR3		SWITCH	19
A30-426			LAMP	19
			SOCKET	
	54603-33GR1		SOCKET	
	46048-71GR1		BLOCK	
	42760-80GR5	2	CONNECTOR	
A30-427			LAMP	19
			SOCKET	
	54603-33GR2		SOCKET	
	46048-71GR1		BLOCK	
	42760-80GR5	2	CONNECTOR	
A30-428			LAMP	19
			SOCKET	
	54603-33GR3		SOCKET	
	46048-71GR1		BLOCK	
	42760-80GR5	2	CONNECTOR	
A30-431	5376-2GR1		PUSH BUTTON	19
A30-434			LAMP	19
			SOCKET	
	54603-33GR1		SOCKET	
	42760-80GR5	2	CONNECTOR	

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HIGHWAY CROSSING WARNING

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-435			LAMP	19
			SOCKET	
	54603-33GR2		SOCKET	
	42760-80GR5	2	CONNECTOR	
A30-436			LAMP	19
			SOCKET	
	54603-33GR3		SOCKET	
	42760-80GR5	2	CONNECTOR	
A30-450			KEY TEST	20
			BOX WITH	
			SWITCH KEY	
	56820-20GR1		BOX	
	5393		PLATE	
	13014-356		GASKET	
	3955-7	4	SCREW	
	0383-1	4	NUT	
	01250-12	4	WASHER	
	53029-75	4	WASHER	
	41885-128		PLATE	
			BLUE PRINT	
			52998-119	
A30-453			KEY TEST	20
			BOX WITH	
			SWITCH KEY	
	56820-20GR1		BOX	
	5393		PLATE	
	48678-2		ADAPTER	
	50357-28		U BOLT	
	1156-12	2	NUT	
	01273-8	2	WASHER	
	01250-17	2	WASHER	
	3955-6	4	SCREW	
	53029-75	4	WASHER	
A30-454			KEY TEST	20
			BOX WITH	
			SWITCH KEY	
	56820-20GR1		BOX	
	5393		BOX	
	48678-2		ADAPTER	
	50357-24		U BOLT	
	1156-12	2	NUT	
	01273-8	2	WASHER	
	01250-17	2	WASHER	
	3955-6	4	SCREW	
	53029-75	4	WASHER	
A30-460			KEY TEST	20
			BOX WITH	
			SWITCH KEY	
	56820-20GR1		BOX	
	5393		PLATE	
	13014-356		GASKET	
	3955-7	4	SCREW	
	0383-1	4	NUT	
	01250-12	4	WASHER	
	53029-75	4	WASHER	
	41885-128		PLATE	
			BLUE PRINT	
			52998-119	
A30-463			KEY TEST	20
			BOX WITH	
			SWITCH KEY	
	56820-20GR1		BOX	
	5393		PLATE	
	48678-2		ADAPTER	
	50357-28		U BOLT	
	1156-12	2	NUT	
	01273-8	2	WASHER	
	01250-17	2	WASHER	
	3955-6	4	SCREW	
	53029-75	4	WASHER	
A30-464			KEY TEST	20
			BOX WITH	
			SWITCH KEY	
	56820-20GR1		BOX	
	5393		PLATE	
	48678-2		ADAPTER	
	50357-24		U BOLT	
	1156-12	2	NUT	
	01273-8	2	WASHER	
	01250-17	2	WASHER	
	3955-6	4	SCREW	
	53029-75	4	WASHER	

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HIGHWAY CROSSING WARNING

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-470			KEY TEST BOX WITH SWITCH KEY	20
	56820-20GR1		BOX	
	5393		PLATE	
	13014-356		GASKET	
	3955-7	4	SCREW	
	0383-1	4	NUT	
	01250-12	4	WASHER	
	53029-75	4	WASHER	
	41885-128		PLATE	
			BLUE PRINT 52998-119	
A30-473			KEY TEST BOX WITH SWITCH KEY	20
	56820-20GR1		BOX	
	5393		PLATE	
	48678-2		ADAPTER	
	50357-28		U BOLT	
	1156-12	2	NUT	
	01273-8	2	WASHER	
	01250-17	2	WASHER	
	3955-6	4	SCREW	
	53029-75	4	WASHER	
A30-474			KEY TEST BOX WITH SWITCH KEY	20
	56820-20GR1		BOX	
	5393		PLATE	
	48678-2		ADAPTER	
	50357-24		U BOLT	
	1156-12	2	NUT	
	01273-8	2	WASHER	
	01250-17	2	WASHER	
	3955-6	4	SCREW	
	53029-75	4	WASHER	
A30-480			KEY TEST BOX WITH SWITCH KEY	20
	56820-20GR1		BOX	
	5393		PLATE	
	13014-356		GASKET	
	3955-7	4	SCREW	
	0383-1	4	NUT	
	01250-12	4	WASHER	
	53029-75	4	WASHER	
	41885-128		PLATE	
			BLUE PRINT 52998-119	
A30-483			KEY TEST BOX WITH SWITCH KEY	20
	56820-20GR1		BOX	
	5393		PLATE	
	48678-2		ADAPTER	
	50357-28		U BOLT	
	1156-12	2	NUT	
	01273-8	2	WASHER	
	01250-17	2	WASHER	
	3955-6	4	SCREW	
	53029-75	4	WASHER	
A30-484			KEY TEST BOX WITH SWITCH KEY	20
	56820-20GR1		BOX	
	5393		PLATE	
	48678-2		ADAPTER	
	50357-24		U BOLT	
	1156-12	2	NUT	
	01273-8	2	WASHER	
	01250-17	2	WASHER	
	3955-6	4	SCREW	
	53029-75	4	WASHER	

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HIGHWAY CROSSING WARNING

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-490			KEY TEST BOX WITH SWITCH KEY	20
	56820-20GR1		BOX	
	5393		PLATE	
	13014-356		GASKET	
	3955-7	4	SCREW	
	0383-1	4	NUT	
	01250-12	4	WASHER	
	53029-75	4	WASHER	
	41885-128		PLATE	
			BLUE PRINT 52998-119	
A30-493			KEY TEST BOX WITH SWITCH KEY	20
	56820-20GR1		BOX	
	5393		PLATE	
	48678-2		ADAPTER	
	50357-28		U BOLT	
	1156-12	2	NUT	
	01273-8	2	WASHER	
	01250-17	2	WASHER	
	3955-6	4	SCREW	
	53029-75	4	WASHER	
A30-494			KEY TEST BOX WITH SWITCH KEY	20
	56820-20GR1		BOX	
	5393		PLATE	
	48678-2		ADAPTER	
	50357-24		U BOLT	
	1156-12	2	NUT	
	01273-8	2	WASHER	
	01250-17	2	WASHER	
	3955-6	4	SCREW	
	53029-75	4	WASHER	
A30-500			SIGNAL ASSEMBLY	13
	55050-12GR1	4	LEX-C UNIT	
	48870-48GR1		ARM COMPLETE	
	11560-121		POLE	
	43951-27GR1		BASE	
	43956-3GR2		CAP	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-4	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	0502-1	2	BOLT & NUT	
	626-215	2	WASHER	
A30-501			SIGNAL ASSEMBLY	13
	55050-12GR1	2	LEX-C UNIT	
	48870-48GR2		ARM COMPLETE	
	11560-121		POLE	
	43951-27GR1		BASE	
	43956-3GR2		CAP	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-4	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	0502-1	2	BOLT & NUT	
	626-215	2	WASHER	
A30-502			SIGNAL ASSEMBLY	13
	55050-12GR1	8	LEX-C UNIT	
	48870-48GR1	2	ARM COMPLETE	
	11560-125		POLE	
	43951-27GR1		BASE	
	43956-3GR2		CAP	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-4	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	0502-1	2	BOLT & NUT	
	626-215	2	WASHER	

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HIGHWAY CROSSING WARNING

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-503			SIGNAL ASSEMBLY	13
	55050-12GR1	6	LEX-C UNIT	
	48870-48GR1		ARM	
	48870-48GR2		ARM	
	11560-125		POLE	
	43951-27GR1		BASE	
	43956-3GR2		CAP	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-4	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	0502-1	2	BOLT & NUT	
	626-215	2	WASHER	
A30-504			SIGNAL ASSEMBLY	13
	55050-12GR1	4	LEX-C UNIT	
	48870-48GR5		ARM COMPLETE	
	11560-122		POLE	
	43951-16GR6		BASE	
	59840-3GR6		D GATE MECHANISM	
	56894 GR8		PINNACLE	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-40	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	34331-15	2	BOLT & NUT	
	626-215	2	WASHER	
	32368-25	2	SPACER	
	317-46GR1		CLAMP	
A30-505			SIGNAL ASSEMBLY	13
	55050-12GR1	2	LEX-C UNIT	
	48870-48GR6		ARM COMPLETE	
	11560-122		POLE	
	43951-16GR6		BASE	
	59840-3GR6		D GATE MECHANISM	
	56894 GR8		PINNACLE	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-40	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	34331-15	2	BOLT & NUT	
	626-215	2	WASHER	
	32368-25	2	SPACER	
	317-46GR1		CLAMP	
A30-506			SIGNAL ASSEMBLY	13
	55050-12GR1	4	LEX-C UNIT	
	48870-48GR5		ARM COMPLETE	
	11560-122		POLE	
	43951-16GR6		BASE	
	56894 GR8		PINNACLE	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-40	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	34331-15	2	BOLT & NUT	
	626-215	2	WASHER	
	32368-25	2	SPACER	

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CROSS - INDEX

HIGHWAY CROSSING WARNING

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-507			SIGNAL ASSEMBLY	13
	55050-12GR1	2	LEX-C UNIT	
	48870-48GR6		ARM COMPLETE	
	11560-122		POLE	
	43951-16GR6		BASE	
	56894 GR8		PINNACLE	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-40	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	34331-15	2	BOLT & NUT	
	626-215	2	WASHER	
	32368-25	2	SPACER	
A30-508			SIGNAL ASSEMBLY	13
	55050-12GR1	8	LEX-C UNIT	
	48870-48GR5		ARM COMPLETE	
	48870-48GR3		ARM COMPLETE	
	11560-123		POLE	
	43951-16GR6		BASE	
	59840-3GR6		D GATE MECHANISM	
	56894 GR8		PINNACLE	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-40	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	34331-15	2	BOLT & NUT	
	626-215	2	WASHER	
	32368-25	2	SPACER	
	317-46GR1		CLAMP	
A30-509			SIGNAL ASSEMBLY	13
	55050-12GR1	6	LEX-C UNIT	
	48870-48GR5		ARM COMPLETE	
	48870-48GR4		ARM COMPLETE	
	11560-123		POLE	
	43951-16GR6		BASE	
	59840-3GR6		D GATE MECHANISM	
	56894 GR8		PINNACLE	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-40	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	34331-15	2	BOLT & NUT	
	626-215	2	WASHER	
	32368-25	2	SPACER	
	317-46GR1		CLAMP	
A30-510			SIGNAL ASSEMBLY	13
	55050-12GR1	8	LEX-C UNIT	
	48870-48GR5		ARM COMPLETE	
	48870-48GR3		ARM COMPLETE	
	11560-123		POLE	
	43951-16GR6		BASE	
	56894 GR8		PINNACLE	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-40	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	34331-15	2	BOLT & NUT	
	626-215	2	WASHER	
	32368-25	2	SPACER	

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HIGHWAY CROSSING WARNING

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-511			SIGNAL ASSEMBLY	13
	55050-12GR1	6	LEX-C UNIT	
	48870-48GR5		ARM COMPLETE	
	48870-48GR4		ARM COMPLETE	
	11560-123		POLE	
	43951-16GR6		BASE	
	56894 GR8		PINNACLE	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-40	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	34331-15	2	BOLT & NUT	
	626-215	2	WASHER	
	32368-25	2	SPACER	
A30-512			CROSSING GATE ASSEM	13
	59840-3GR6		D GATE MECHANISM	
	11560-124		POLE	
	43951-16GR6		BASE	
	56894 GR8		PINNACLE	
	317-46GR1		CLAMP	
A30-520	43956-3GR2		CAP W/BOLT & NUT	15
A30-521	56894 GR8		PINNACLE W/BOLT & NUT	15
A30-522	56779		BELL	15
A30-523	56779-5		BELL	15
A30-528	11560-121		POLE	
A30-529	11560-122		POLE	
A30-530	11560-125		POLE	
A30-531	11560-123		POLE	
A30-533	11560-124		POLE	
A30-534			SPLIT BASE	
	43953-12	2	BASE	
	0412-3	4	BOLT & NUT	
	626-216	8	WASHER	
A30-535			SPLIT BASE	
	43953-39	2	BASE	
	46460-12GR1	4	BOLT & NUT	
	626-218	8	WASHER	
A30-536	43950-1		BASE	
A30-537	43951-16GR6		BASE	
A30-552			RAILROAD XING SIGN W/MOUNTING HARDWARE	15
	20896-102		SIGN	
	35378-12	2	ADAPTER P30-201	
	20476-4	2	U BOLT	
	1048-5	4	NUT P85-204	
	01250-21	4	WASHER P76-201	
	0502-1	2	BOLT & NUT P30-107	
	626-215	2	WASHER	
A30-553			RAILROAD XING SIGN W/MOUNTING HARDWARE	15
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-40	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	34331-15	2	BOLT & NUT	
	626-215	2	WASHER	
	32368-25	2	SPACER	
A30-554			RAILWAY CROSSING SIGN W/MOUNTING HARDWARE	15
	20896-117		SIGN	
	35378-12	2	ADAPTER	
	20476-4	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	0502-1	2	BOLT & NUT	
	626-215	2	WASHER	

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HIGHWAY CROSSING WARNING

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-555			RAILWAY CROSSING SIGN W/MOUNTING HARDWARE	15
	20896-117		SIGN	
	35378-12	2	ADAPTER	
	20476-40	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	34331-15	2	BOLT	
	626-215	2	WASHER	
	32368-25	2	SPACER	
A30-558			TRACK SIGN 2 TRACKS 4 IN PIPE	15
	20896-105		SIGN	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	20476-4	2	U BOLT	
	31549		SUPPORT	
	0582-1	2	BOLT	
	626-215	2	WASHER	
	35378-12	2	ADAPTER	
A30-559			TRACK SIGN, 2 TRACKS, FOR 5 IN PIPE INCLUDES ALL MTG HARDWARE	15
	20896-105		SIGN	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	20476-40	2	U BOLT	
	31549		SUPPORT	
	34331-13	2	BOLT	
	626-215	2	WASHER	
	35378-12	2	ADAPTER	
	32368-25	2	SPACER	
A30-560			TRACK SIGN 3 TRACKS 4 IN PIPE	15
	20896-106		SIGN	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	20476-4	2	U BOLT	
	31549		SUPPORT	
	0582-1	2	BOLT	
	626-215	2	WASHER	
	35378-12	2	ADAPTER	
A30-561			TRACK SIGN	15
	20896-106		SIGN	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	20476-40	2	U BOLT	
	31549		SUPPORT	
	34331-13	2	BOLT	
	626-215	2	WASHER	
	35378-12	2	ADAPTER	
	32368-25	2	SPACER	
A30-562			TRACK SIGN 4 TRACKS 4 IN PIPE	15
	20896-107		SIGN	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	20476-4	2	U BOLT	
	31589		SUPPORT	
	0582-1	2	BOLT	
	626-215	2	WASHER	
	35378-12	2	ADAPTER	
A30-563			TRACK SIGN	15
	20896-107		SIGN	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	20476-40	2	U BOLT	
	31549		SUPPORT	
	34331-13	2	BOLT	
	626-215	2	WASHER	
	35378-12	2	ADAPTER	
	32368-25	2	SPACER	

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HIGHWAY CROSSING WARNING

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-564			TRACK SIGN	15
	20896-108		SIGN	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	20476-4	2	U BOLT	
	31549		SUPPORT	
	0582-1	2	BOLT	
	626-215	2	WASHER	
	35378-12	2	ADAPTER	
A30-565			TRACK SIGN	15
	20896-108		SIGN	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	20476-40	2	U BOLT	
	31549		SUPPORT	
	34331-13	2	BOLT	
	626-215	2	WASHER	
	35378-12	2	ADAPTER	
	32368-25	2	SPACER	
A30-566			TRACK SIGN	15
			6 TRACKS 4	
			IN PIPE	
	20896-109		SIGN	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	20476-4	2	U BOLT	
	31549		SUPPORT	
	0582-1	2	BOLT	
	626-215	2	WASHER	
	35378-12	2	ADAPTER	
A30-567			TRACK SIGN	15
	20896-109		SIGN	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	20476-40	2	U BOLT	
	31549		SUPPORT	
	34331-13	2	BOLT	
	626-215	2	WASHER	
	35378-12	2	ADAPTER	
	32368-20	2	SPACER	
A30-568			SIGN	
			HARDWARE	
	20476-4		U BOLT	
	1048-5	2	NUT	
	01250-21	2	WASHER	
	0582-1		BOLT & NUT	
	2400-1		WASHER	
	43209-5		WASHER	
	35378-12		ADAPTER	
A30-569			SIGN	
			HARDWARE	
	20476-40		U BOLT	
	1048-5	2	NUT	
	01250-21	2	WASHER	
	0582-1		BOLT & NUT	
	2400-1		WASHER	
	43209-5		WASHER	
	35378-12		ADAPTER	
A30-570			SIGN	
			HARDWARE	
	20476-40		U BOLT	
	1048-5	2	NUT	
	01250-21	2	WASHER	
	34331-15		BOLT & NUT	
	626-215		WASHER	
	32368-25		SPACER	
	35378-12		ADAPTER	
A30-571			SIGN	
			HARDWARE	
	20476-40		U BOLT	
	1048-5	2	NUT	
	01250-21	2	WASHER	
	34331-28		BOLT	
	645-6		NUT	
	626-215		WASHER	
	32368-26		SPACER	
	35378-12		ADAPTER	
A30-575	48870-48GR1		CROSSARM	
			ASSEMBLY	
A30-578	48870-48GR2		ARM	
			COMPLETE	
A30-581	48870-48GR5		CROSSARM	
A30-582	48870-48GR3		ARM COMP	
A30-584	48870-48GR6		CROSSARM	
A30-585	48870-48GR4		CROSSARM	
A30-587	36039-6		COVER	
A30-588	51131-4GR1		COVER	

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C R O S S - I N D E X

HIGHWAY CROSSING WARNING

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-589	55884-12		BRACKET	
A30-590	55884-13		BRACKET	
A30-591	55884-14		BRACKET	
A30-592	53135-9		ELBOW	
A30-593	53135-10		ELBOW	
A30-594	5971-19GR3		TERMINAL BLOCK	
A30-595	55215-20		CROSS ARM	
A30-597	48870-17GR2		ARM COMP.	
A30-598	48870-17GR1		ARM COMPLETE	
A30-605	55343-2GR1		REFLECTOR	
A30-615	59840-3GR6		D GATE MECHANISM	
A30-617	23410		GEAR & PINION	
A30-618	23410-6		GEAR & PINION	
A30-619	29830-10		SECTOR	
A30-620	43119-8GR1		CONTACT BLOCK	
A30-621	29890-12GR1		MOTOR	
A30-622				
A30-623	57523-3		COVER	
A30-624	56090-28GR1		HEATER	
A30-625				
A30-626	317-46GR1		CLAMP	
A30-630	48870-46		WOODEN GATE ARM	
A30-631	48870-45		WOODEN GATE ARM	
A30-632	48870-47		WOODEN GATE ARM 32-38	
A30-635	48870-26		GATE ARM	
A30-636	48870-28		GATE ARM	
A30-637	48870-30		GATE ARM	
A30-638	48870-32		GATE ARM	
A30-639	48870-34		GATE ARM	
A30-640	48870-36		GATE ARM	
A30-641	48870-38		GATE ARM	
A30-642	48870-40		GATE ARM	
A30-643	48870-42		GATE ARM	
A30-644	48870-44		GATE ARM	
A30-650			BRACKET COMPLETE A30-650	
	18919 GR1		SUPPORT	
	0390-1	16	BOLT & NUT	
	01250-21	8	WASHER	
A30-651			BRACKET W/NUT & BOLT	
	55478-82		BRACKET	
	0390-1	4	BOLT & NUT	
A30-654	44991-6		GRIP ARM	
A30-655	44991-7		GRIP ARM	
A30-656	44991-5		GRIP ARM	
A30-657	19085		ARM SUPPORT	
A30-660			MODIFICATION KIT FOR SIDEWALK SHAFT DWG 17550-6 GR1	
	041	3	COTTER PIN	
	046	2	COTTER PIN	
	092-3	2	BOLT	
	0387		KEY WOF	
	504-99		PIN	
	1048-5		NUT	
	01273-10	3	WASHER	
	3343-29		SCREW	
	7670-5	2	WASHER	
	9098-3GR1		LINK	
	14915-3GR1		CRANK	
	29417-3	2	SEAL	
	29839-8		SHAFT	
	49536-125	2	BRNG OP	
	57520-3		CRANK	
	19085		ARM SUPPORT	
A30-663	9685-11		COUNTERWEIGHT	
A30-664	9685-10		COUNTERWEIGHT	

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HIGHWAY CROSSING WARNING

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-665			COUNTERWEIGHT COMP.	
	9685-12		COUNTERWEIGHT	
	17708-41	2	SCREW	
	1048-5	2	NUT	
A30-666			COUNTERWEIGHT COMP.	
	9685-9		COUNTERWEIGHT	
	0215-3	3	SCREWS	
	645-10	3	NUTS	
	51432-142		STRAP	
	33645-20	2	SPACERS	
	6983-1	2	SCREWS	
A30-667			COUNTERWEIGHT COMP.	
	9685-13		COUNTERWEIGHT	
	17708-41	2	SCREW	
	1048-5	2	NUT	
A30-669	15578-10		EXTENSION ARM	
A30-670			MOUNTING KIT FOR 14 FT FIBERGLASS ARM	17
	44991-5		GRIP ARM	
	44991-7		GRIP ARM	
	9685-9		COUNTERWEIGHT	
	0215-3	3	BOLT	
	645-10	3	NUT	
	33645-20	2	SPACER	
	51432-142		STRAP	
	6983-1	2	SCREW	
	46461-147		BOLT	
	18793		CLAMP	
	1047-14		NUT	
	626-218		WASHER	
	55478-82		BRACKET	
	0390-1	4	BOLT & NUT	
A30-671			MOUNTING KIT FOR 16 FT FIBERGLASS ARM	17
	44991-5		GRIP ARM	
	44991-7		GRIP ARM	
	9685-9		COUNTERWEIGHT	
	9685-11		COUNTERWEIGHT	
	0215-3	3	BOLT	
	645-10	3	NUT	
	33645-20	2	SPACER	
	51432-142		STRAP	
	6983-1	2	SCRW	
	46461-147		BOLT	
	18793		CLAMP	
	1047-14		NUT	
	626-218		WASHER	
	55478-82		BRACKET	
	0390-1	4	BOLT & NUT	
A30-672			MOUNTING KIT FOR 18 FT FIBERGLASS ARM	17
	44991-5		GRIP ARM	
	44991-7		GRIP ARM	
	9685-9		COUNTERWEIGHT	
	9685-10		COUNTERWEIGHT	
	9685-11		COUNTERWEIGHT	
	0215-3	3	BOLT	
	645-10	3	NUT	
	33645-20	2	SPACER	
	51432-142		STRAP	
	6983-1		SCREW	
	46461-148		BOLT	
	18793		CLAMP	
	1047-14		NUT	
	626-218		WASHER	
	55478-82		BRACKET	
	0390-1	4	BOLT & NUT	

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HIGHWAY CROSSING WARNING

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-673			MOUNTING KIT FOR 20 FT FIBERGLASS ARM	17
	44991-5		GRIP ARM	
	44991-7		GRIP ARM	
	9685-9		COUNTERWEIGHT	
	9685-12		COUNTERWEIGHT	
	0215-3	3	BOLT	
	645-10	3	NUT	
	33645-20	2	SPACER	
	51432-142		STRAP	
	6983-1	2	SCREW	
	46461-148		BOLT	
	18793		CLAMP	
	1047-14		NUT	
	626-218		WASHER	
	17708-41	2	SCREW	
	1048-5	2	NUT	
	55478-82		BRACKET	
	0390-1	4	BOLT & NUT	

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-674			MOUNTING KIT FOR 22 FT FIBERGLASS ARM	17
	44991-5		GRIP ARM	
	44991-7		GRIP ARM	
	9685-9		COUNTERWEIGHT	
	9685-11		COUNTERWEIGHT	
	9685-12		COUNTERWEIGHT	
	0215-3	3	BOLT	
	645-10	3	NUT	
	33645-20	2	SPACER	
	51432-142		STRAP	
	6983-1	2	SCREW	
	46461-148		BOLT	
	18793		CLAMP	
	1047-14		NUT	
	626-218		WASHER	
	17708-41	2	SCREW	
	1048-5	2	NUT	
	55478-82		BRACKET	
	0390-1	4	BOLT & NUT	

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HIGHWAY CROSSING WARNING

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-675			MOUNTING KIT FOR 24 FT FIBERGLASS ARM	17
	44991-5		GRIP ARM	
	44991-7		GRIP ARM	
	9685-9		COUNTERWEIGHT	
	9685-13		COUNTERWEIGHT	
	0215-3	3	BOLT	
	645-10	3	NUT	
	33645-20	2	SPACER	
	51432-142		STRAP	
	6983-1	2	SCREW	
	46461-149		BOLT	
	18793		CLAMP	
	1047-14		NUT	
	626-218		WASHER	
	17708-41	2	SCREW	
	1048-5	2	NUT	
	55478-82		BRACKET	
	0390-1	4	BOLT & NUT	

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-676			MOUNTING KIT FOR 26 FT FIBERGLASS ARM	17
	44991-6		GRIP ARM	
	44991-7		GRIP ARM	
	9685-9	2	COUNTERWEIGHT	
	9685-10		COUNTERWEIGHT	
	9685-11		COUNTERWEIGHT	
	0215-3	3	BOLT	
	645-10	6	NUT	
	33645-20	4	SPACER	
	51432-142	2	STRAP	
	6983-1	4	SCREW	
	46461-147		BOLT	
	46461-148		BOLT	
	18793	2	CLAMP	
	1047-14	2	NUT	
	626-218	2	WASHER	
	55478-82		BRACKET	
	0390-1	4	BOLT & NUT	

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HIGHWAY CROSSING WARNING

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-677			MOUNTING KIT FOR 28 FT FIBERGLASS ARM	17
	44991-6		GRIP ARM	
	44991-7		GRIP ARM	
	9685-9	2	COUNTERWEIGHT	
	9685-10		COUNTERWEIGHT	
	9685-12		COUNTERWEIGHT	
	0215-3	3	BOLT	
	645-10	6	NUT	
	33645-20	4	SPACER	
	51432-142	2	STRAP	
	6983-1	4	SCREW	
	46461-148	2	BOLT	
	18793	2	CLAMP	
	1047-14	2	NUT	
	626-218	2	WASHER	
	17708-41	4	SCREW	
	1048-5	4	NUT	
	55478-82		BRACKET	
	0390-1	4	BOLT & NUT	

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-678			MOUNTING KIT FOR 30 FT FIBERGLASS ARM	17
	44991-6		GRIP ARM	
	44991-7		GRIP ARM	
	9685-9	2	COUTERWEIGHT	
	9685-10	2	COUNTERWEIGHT	
	9685-12	2	COUNTERWEIGHT	
	0215-3	3	BOLT	
	645-10	6	NUT	
	33645-20	4	SPACER	
	51432-142	2	STRAP	
	6983-1	4	SCREW	
	46461-148	2	BOLT	
	46461-179	2	BOLT	
	18793	2	CLAMP	
	1047-14	2	NUT	
	626-218	2	WASHER	
	55478-82		BRACKET	
	0390-1	4	BOLT & NUT	

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HIGHWAY CROSSING WARNING

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-679			MOUNTING KIT FOR 32 FT FIBERGLASS ARM	17
	15578-10	2	CHANNEL	
	46461-150	4	BOLT	
	44991-6		GRIP ARM	
	44991-7		GRIP ARM	
	9685-9	2	COUNTERWEIGHT	
	9685-10	2	COUNTERWEIGHT	
	0215-3	3	BOLT	
	645-10	6	NUT	
	33645-20	4	SPACER	
	51432-142	2	STRAP	
	6983-1	4	SCREW	
	46461-148	2	BOLT	
	18793	4	CLAMP	
	1047-14	6	NUT	
	626-218	8	WASHER	
	55478-82		BRACKET	
	0390-1	4	BOLT & NUT	
A30-683			MOUNTING KIT FOR 16FT TO 22 FT WOODEN GATE ARM	17
	44991-5		GRIP ARM	
	44991-7		GRIP ARM	
	9685-9		COUNTERWEIGHT	
	9685-11		COUNTERWEIGHT	
	9685-12		COUNTERWEIGHT	
	0215-3	3	BOLT	
	645-10	3	NUT	
	33645-20	2	SPACER	
	51432-142		STRAP	
	6983-1	2	SCREW	
	46461-148		BOLT	
	18793		CLAMP	
	1047-14		NUT	
	626-213		WASHER	
	17708-41		SCREW	
	1048-5	2	NUT	
	317-46GR1		POLE CLAMP	
	18919 GR1		BRACKET	
	0390-1	16	BOLT & NUT	
	01250-21	8	WASHER	

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HIGHWAY CROSSING WARNING

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-684			MOUNTING KIT FOR 24 FT TO 30 FT WOODEN GATE ARM	17
	44991-6		GRIP ARM	
	44991-7		GRIP ARM	
	9685-9	2	COUNTERWEIGHT	
	9685-10	2	COUNTERWEIGHT	
	9685-12	2	COUNTERWEIGHT	
	0215-3	3	BOLT	
	645-10	6	NUT	
	33645-20	4	SPACER	
	51432-142	2	STRAP	
	6983-1		SCREW	
	46461-179	2	BOLT	
	18793	2	CLAMP	
	1047-14	2	CLAMP	
	626-213	2	WASHER	
	17708-41	4	SCREW	
	1048-5	4	NUT	
	317-46GR1		POLE CLAMP	
	18919 GR1		BRACKET	
	0390-1	16	BOLT & NUT	
	01250-21	8	WASHER	
A30-685			MOUNTING KIT FOR 32 FT TO 38 FT WOODEN GATE ARM	17
	44991-6		GRIP ARM	
	44991-7		GRIP ARM	
	9685-9	2	COUNTERWEIGHT	
	9685-10	3	COUNTERWEIGHT	
	9685-11		COUNTERWEIGHT	
	0215-3	3	BOLT	
	645-10	6	NUT	
	33645-20	4	SPACERS	
	51432-142	2	STRAP	
	6983-1	4	SCREW	
	46461-148	2	BOLT	
	18793	4	CLAMP	
	1047-14	6	NUT	
	626-213	8	WASHER	
	317-46GR1		POLE CLAMP	
	18919 GR1		BRACKET	
	0390-1	16	BOLT & NUT	
	01250-21	8	WASHER	
A30-900	55050-12GR1		LEX-C UNIT	
A30-901	55050-11GR1		LEX-C UNIT	
A30-903	36762-51GR1		LENS UNIT 8"	
A30-904	55051-11		REFLECTOR	
A30-905	52709-1GR1		LAMP HOLDER COMPLETE	
A30-906			BACKGROUND W/HARDWARE	
	49162-114		BACKGROUND	
	01250-7	3	WASHERS	
	53029-68	3	WASHERS	
	07608-316	3	SCREW	
A30-907	53056-6GR1		CASE	
A30-909	53056-5GR1		CASE	
A30-913	36762-52GR1		LENS UNIT	
A30-914	55051-9		CASE (12")	
A30-915	52709-2GR1		LAMP HOLDER	

CATALOG SECTION A30

CROSS - INDEX

HIGHWAY CROSSING WARNING

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-916			BACKGROUND COMP W/HARDWARE FOR MOUNTING	
	49162-120		BACKGROUND COMP	
	01250-7	3	WASHER	
	53029-68	3	WASHER	
	07608-316	3	SCREW	
A30-920			SIGNAL ASSEMBLY	
	55050-11GR1	4	LEX-C UNIT	
	48870-48GR1		ARM COMPLETE	
	11560-121		POLE	
	43951-27GR1		BASE	
	43956-3GR2		CAP	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-4	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	0502-1	2	BOLT & NUT	
	626-215	2	WASHER	
A30-921			SIGNAL ASSEMBLY	
	55050-11GR1	2	LEX-C UNIT	
	48870-48GR2		ARM COMPLETE	
	11560-121		POLE	
	43951-27GR1		BASE	
	43956-3GR2		CAP	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-4	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	0502-1	2	BOLT & NUT	
	626-215	2	WASHER	
A30-922			SIGNAL ASSEMBLY	
	55050-11GR1	8	LEX-C UNIT	
	48870-48GR1	2	ARM COMPLETE	
	11560-125		POLE	
	43951-27GR1		BASE	
	43956-3GR2		CAP	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-4	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	0502-1	2	BOLT & NUT	
	626-215	2	WASHER	
A30-923			SIGNAL ASSEMBLY	
	55050-11GR1	6	LEX-C UNIT	
	48870-48GR1		ARM COMPLETE	
	48870-48GR2		ARM COMPLETE	
	11560-125		POLE	
	43951-27GR1		BASE	
	43956-3GR2		CAP	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-4	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	0502-1	2	BOLT & NUT	
	626-215	2	WASHER	

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CATALOG SECTION A30

CROSS - INDEX

HIGHWAY CROSSING WARNING

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-924			SIGNAL ASSEMBLY	
	55050-11GR1	4	LEX-C UNIT	
	48870-48GR5		ARM COMPLETE	
	11560-122		POLE	
	43951-16GR6		BASE	
	59840-3GR6		D GATE MECHANISM	
	56894 GR8		PINNACLE	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-40	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	34331-15	2	BOLT & NUT	
	626-215	2	WASHER	
	32368-25	2	SPACER	
	317-46GR1		CLAMP	
A30-925			SIGNAL ASSEMBLY	
	55050-11GR1	2	LEX-C UNIT	
	48870-48GR6		ARM COMPLETE	
	11560-122		POLE	
	43951-16GR6		BASE	
	59840-3GR6		D GATE MECHANISM	
	56894 GR8		PINNACLE	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-40	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	34331-15	2	BOLT & NUT	
	626-215	2	WASHER	
	32368-25	2	SPACER	
	317-46GR1		CLAMP	
A30-926			SIGNAL ASSEMBLY	
	55050-11GR1	4	LEX-C UNIT	
	48870-48GR5		ARM COMPLETE	
	11560-122		POLE	
	43951-16GR6		BASE	
	56894 GR8		PINNACLE	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-40	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	34331-15	2	BOLT & NUT	
	626-215	2	WASHER	
	32368-25	2	SPACER	
A30-927			SIGNAL ASSEMBLY	
	55050-11GR1	2	LEX-C UNIT	
	48870-48GR6		ARM COMPLETE	
	11560-122		POLE	
	43951-16GR6		BASE	
	56894 GR8		PINNCALE	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-40	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	34331-15	2	BOLT & NUT	
	626-215	2	WASHER	
	32368-25	2	SPACER	

CATALOG SECTION A30

CROSS - INDEX

HIGHWAY CROSSING WARNING

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A30-928			SIGNAL ASSEMBLY	
	55050-11GR1	8	LEX-C UNIT	
	48870-48GR5		ARM COMPLETE	
	48870-48GR3		ARM COMPLETE	
	11560-123		POLE	
	43951-16GR6		BASE	
	59840-3GR6		D GATE MECHANISM	
	56894 GR8		PINNACLE	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-40	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	34331-15	2	BOLT & NUT	
	626-215	2	WASHER	
	32368-25	2	SPACER	
	317-46GR1		CLAMP	
A30-929			SIGNAL ASSEMBLY	
	55050-11GR1	6	LEX-C UNIT	
	48870-48GR5		ARM COMPLETE	
	48870-48GR4		ARM COMPLETE	
	11560-123		POLE	
	43951-16GR6		BASE	
	59840-3GR6		D GATE MECHANISM	
	56894 GR8		PINNACLE	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-40	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	34331-15	2	BOLT & NUT	
	626-215	2	WASHER	
	32368-25	2	SPACER	
	317-46GR1		CLAMP	
A30-930			SIGNAL ASSEMBLY	
	55050-11GR1	8	LEX-C UNIT	
	48870-48GR5		ARM COMPLETE	
	48870-48GR3		ARM COMPLETE	
	1156-123		POLE	
	43951-16GR6		BASE	
	56894 GR8		PINNACLE	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-40	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	34331-15	2	BOLT & NUT	
	626-215	2	WASHER	
	32368-25	2	SPACER	
A30-931			SIGNAL ASSEMBLY	
	55050-11GR1	6	LEX-C UNIT	
	48870-48GR5		ARM COMPLETE	
	48870-48GR4		ARM COMPLETE	
	11560-123		POLE	
	43951-16GR6		BASE	
	56894 GR8		PINNACLE	
	20896-102		SIGN	
	35378-12	2	ADAPTER	
	20476-40	2	U BOLT	
	1048-5	4	NUT	
	01250-21	4	WASHER	
	34331-15	2	WASHER	
	626-215	2	WASHER	
	32368-25	2	SPACER	
A30-936	17550-82GR1		12" PHANKILL	
A30-937	17550-93GR1		PHANKILL 8 -IN	

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CATALOG SECTION 46

Lamps—Incandescent

CONTENTS

	Page
Single Contact, Bayonet Base	4
Rebased	6
Miscellaneous	8

GENERAL RAILWAY SIGNAL COMPANY

ROCHESTER, NEW YORK

Printed in U. S. A.

A-1676

June 1963

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GENERAL INFORMATION

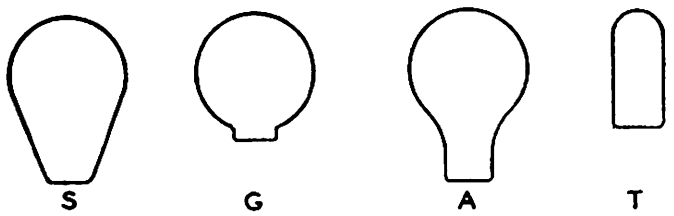
The incandescent lamps shown on the following pages have been arranged into three classifications, namely:

1. Page 4 shows lamps for light signals and electric semaphore lamps, using single contact candelabra bayonet bases.
2. Page 6 shows rebased lamps for light signals.
3. Page 8 shows lamps for indicating purposes and other miscellaneous applications, equipped with various types of bases.

Railway signal lamps are rated in volts and either watts or amperes. All performance data tabulated is based upon operation at rated volts.

A brief explanation of the terms used in connection with incandescent lamps is given below:

Bulb Shapes—The shapes of lamp bulbs are designated by letter as illustrated below, and the number following the letter indicates the maximum diameter in eighths of an inch.



Examples: S-11 $= \frac{11}{8} = 1\frac{3}{8}$" diameter

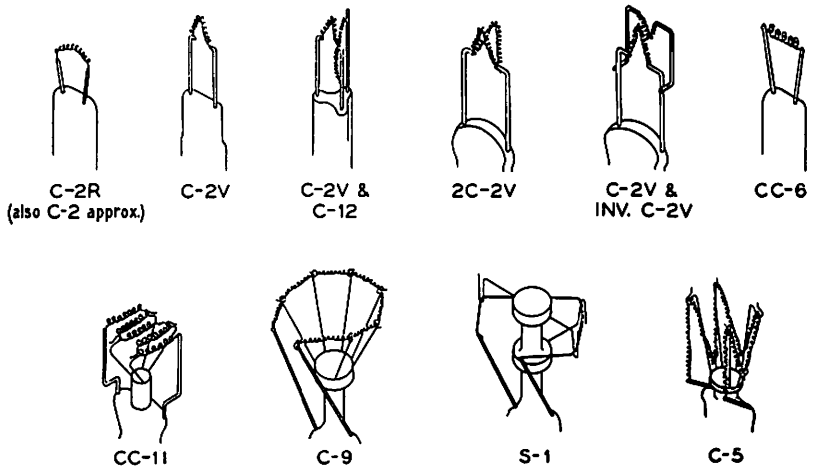
G-16½ $= \frac{16\frac{1}{2}}{8} = 2\frac{1}{16}$" diameter

All bulbs are clear glass unless otherwise stated

Filament Form—These are designated by a prefix letter, a number and sometimes a suffix letter, such as S-1 or C-2V. The prefix letter indicates whether the wire is (S) straight, (C) coiled, or (CC) coiled coil; the number indicates the arrangement of the filaments on the supports, and the suffix letter "R" or "V" indicates whether the filament is rounded or "V" shape. Two identical filaments in multiple have a prefix "2" such as 2C-2V. "Inv." means the filament is inverted from its usual position of mounting.

Lamps illustrated on the following pages show only typical filament forms for each figure. Consult tabulation for exact filament form supplied with rating selected.

The filament forms are shown below.



Filament Precision—This term represents the maximum variation in light center length and axial alignment in inches ±.

Light Center Length—This term represents the distance from the center of the light source to the point shown below for the base used:

(a) Screw Base—Bottom of base contact (not including solder)

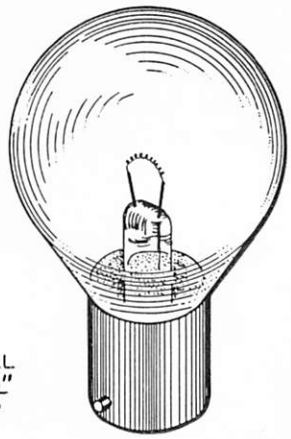
(b) Bayonet and Rebased Types—Top of base pins

Pretested Lamps—The General Railway Signal Company subjects each light signal lamp to an exacting testing procedure to ensure that the filament position of each lamp in relation to its base pins is in accordance with GRS precision lamp specifications. We stamp the base of each lamp meeting these specifications, "Tested by GRS". Ordinary run-of-production lamps are not satisfactory replacements in the precisely focused optical systems of GRS light signals. Only a pretested lamp can ensure proper intensity and focus of the signal beam.

This does not apply to lamps for control panels, lever lamps, illuminated diagrams, etc., as precise focus is not important in such applications.

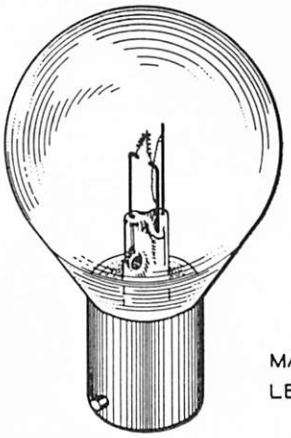
HOW TO ORDER

Order lamp and give catalog number and quantity.



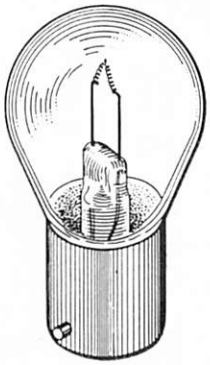
MAX. OVER-ALL LENGTH – $2\frac{3}{8}$"

A



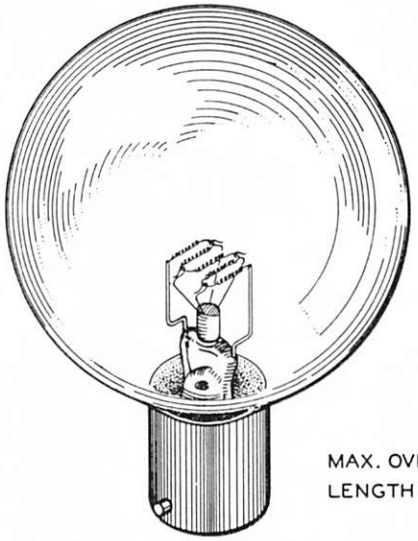
MAX. OVER-ALL LENGTH – $2\frac{3}{8}$"

B



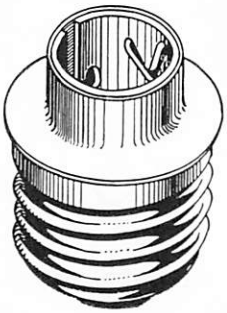
MAX. OVER-ALL LENGTH – 2"

C



MAX. OVER-ALL LENGTH – 3"

D



E

Incandescent Lamps—S.C. Bayonet Base

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INCANDESCENT LAMPS

With Single Contact Candelabra Bayonet Bases For Color-Light Signals and Semaphore Lamps

See general information on pages 2 and 3.

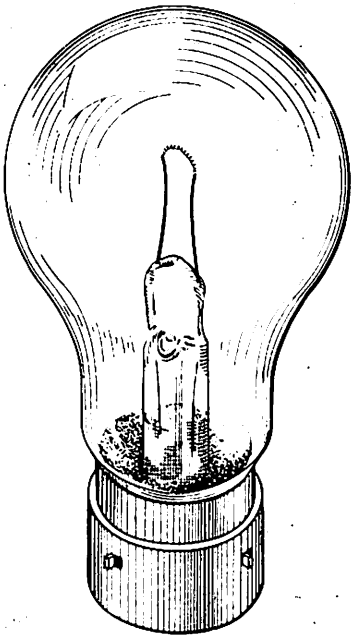
The list shown below includes lamps for use with the following types of signals:

Searchlight Type Signals and Marker Lights
Types D, FA, G, MD, ME, MF, and W Color-Light Signals
Types XC and XD Highway Crossing Signals
Types U, VA and VB Color-Position-Light Signals
Electric Semaphore Lamps
Electric Switch Lamps
Cab Signals
Electric Switch Locks

SINGLE CONTACT CANDELABRA BAYONET BASES (2 Pin)

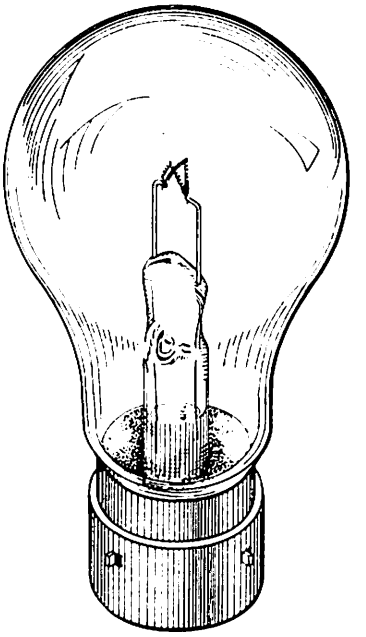
REF.	RATING			BULB SHAPE	FILAMENT			AVERAGE LIFE IN HOURS	CATALOG NUMBER
	VOLTS	AMPS.	WATTS		FORM	PRECISION	LIGHT CENTER LENGTH		
A	8	—	5	S-11	C-2V	1/64"	1¼"	1000	A46-100
A1	"	—	18	"	CC-6	"	"	"	A46-101
A3	10	—	5	"	C-2R	"	"	"	A46-103
A4	"	—	11	"	CC-6	"	"	"	A46-104
A5	"	—	18	"	CC-6	"	"	"	A46-105
A6	"	—	25	"	CC-6	"	"	"	A46-106
A7	11	—	11	"	C-2V	"	"	2500	A46-107
A8	13.5	—	17	"	"	"	"	2000	A46-108
B	10	—	5+3.5	"	C-2V & C-12	"	"	1000	A46-121
B1	"		13+3.5	"	"	"	"	"	A46-122
B2	"	—	18+3.5	"	CC-6 & C-12	"	"	"	A46-124
C	3.5	.12	—	S-8	C-2R	2/64"	1¼"	1000	A46-130
C1	"	.30	—	"	"	"	"	"	A46-131
C2	8	.25	—	"	"	"	"	"	A46-132
C4	12	"	—	"	"	"	"	"	A46-134
C5	13.5	"	—	"	"	"	"	"	A46-135
C6	11.3	—	13.3	"	CC-6	"	"	"	A46-136
D*	120	—	25	G-16½	CC-11	"	"	"	A46-145
D1†	"	—	"	"	C-5	4/64"	"	"	A46-146
E	Adapter, for mounting two-pin candelabra bayonet base lamp in medium screw base receptacle.								A46-160

*Horizontal burning †Vertical burning



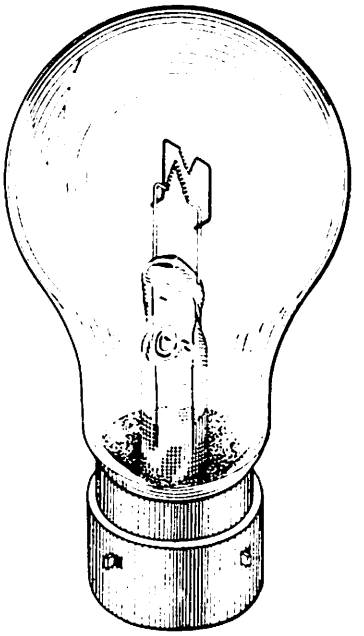
MAX. OVER-ALL LENGTH - $3\frac{3}{4}$"

A



MAX. OVER-ALL LENGTH - $3\frac{3}{4}$"

B



MAX. OVER-ALL LENGTH - $3\frac{3}{4}$"

C

Incandescent Lamps—Special Rebased Type

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INCANDESCENT LAMPS

For Color-Light Signals
Special Rebased Type

See general ordering information on pages 2 and 3.
These lamps are used with the following:

Types D, E, F, G, and Doublet Lens Color-Light Signals

REBASED SINGLE FILAMENT—3 PIN

REF.	RATING		BULB SHAPE	FILAMENT			AVERAGE LIFE IN HOURS	CATALOG NUMBER
	VOLTS	WATTS		FORM	PRECISION	LIGHT CENTER LENGTH		
A2	10	18	A-15	CC-6	1/64"	2 3/16"	1000	A46-172
A3	"	40	"	C-2V	"	"	1500	A46-173

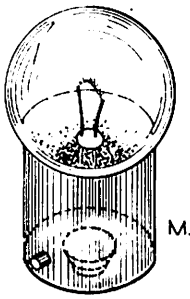
REBASED DOUBLE FILAMENT—3 PIN

B	10	18	A-15	2C-2V	1/64"	2 3/16"	1500	A46-181

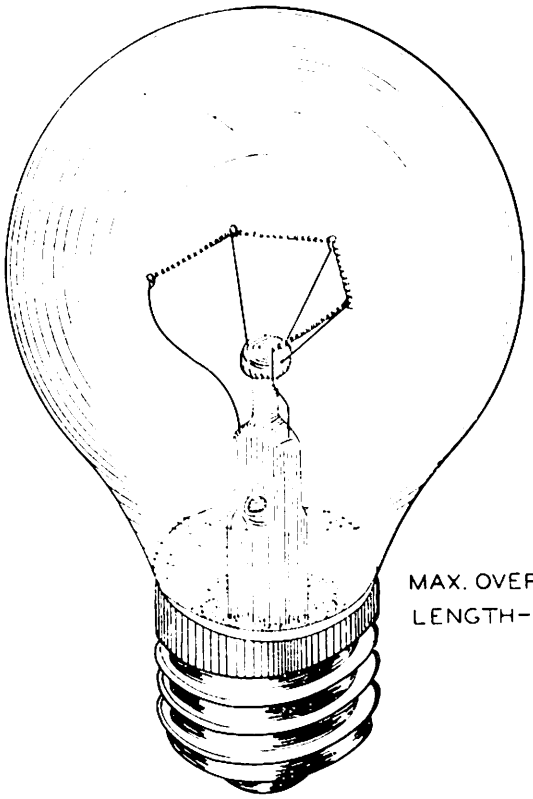
REBASED MAJOR AND MINOR FILAMENTS—3 PIN

C	8	18+3.5	A-15	C-2V & Inv. C-2V	1/64"	2 3/16"	1500*	A46-190
C1	10	"	"	CC-6 & CC-6	"	"	" *	A46-191

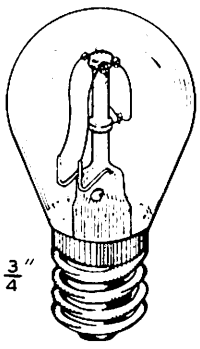
**Rating of major filament only.*



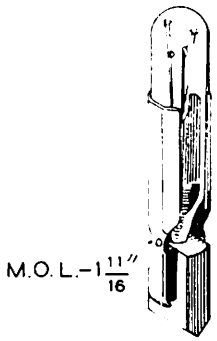
A



D



E



F

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INCANDESCENT LAMPS

For Indicating Purposes and For Electric Semaphore Lamps

See general information on pages 2 and 3.

The list shown below includes lamps for use with the following devices:

cTc Control Machines
NX Control Machines
Lever Lights in Interlocking Machines
Illuminated Track Indicators and Diagrams
Electric Semaphore Lamps, etc.

REF.	RATING			REMARKS	TYPE OF BASE	BULB SHAPE	FILAMENT		AVERAGE LIFE IN HOURS	CATALOG NUMBER
	VOLTS	AMPS. OR CANDLE-POWER	WATTS				FORM	LIGHT CENTER LENGTH		
A	6-8	3 C.P.	—	—	S.C. Bay. Cand.	G-6	C-2R	¾"	1000	A46-200
A1	12-16	4 C.P.	—	—	S.C. Bay. Cand.	"	"	13/16"	1000	A46-201
A2	"	6 C.P.	—	—	S.C. Bay. Cand.	"	"	¾"	750	A46-202
A3	18-24	3 C.P.	—	—	S.C. Bay. Cand.	"	C-2V	"	200	A46-203
D	120	—	25	Inside Frosted	Med. Screw	A-19	C-9	2½"	1000	A46-225
E	60	—	10	—	Min. Screw	S-8	C-17	—	—	A46-230
F	4	.17 to .21	—	Mfgr. 4A	Slide	T-2	C-6	—	1500	A46-235
F1	12	.09 to .11	—	" 12A	"	"	C-21	—	1000	A46-236
F2	"	.15 to .190	—	" 12C	"	"	"	—	"	A46-237
F3	16	.09 to .11	—	" 16A	"	"	"	—	"	A46-238
F4	24	.032 to .038	—	" 24E	"	"	C-2F	—	"	A46-239
F5	"	.09 to .11	—	" 24D	"	"	C-21	—	"	A46-240
F7	35	.060 to .085	—	" 35B	"	"	C-5	—	"	A46-242
F8	"	.035 to .045	—	" 35A	"	"	"	—	"	A46-243
F9	30	.065 to .085	—	" 30 A	"	"	C-21	—	"	A46-244

Memoranda

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CATALOG SECTION A46

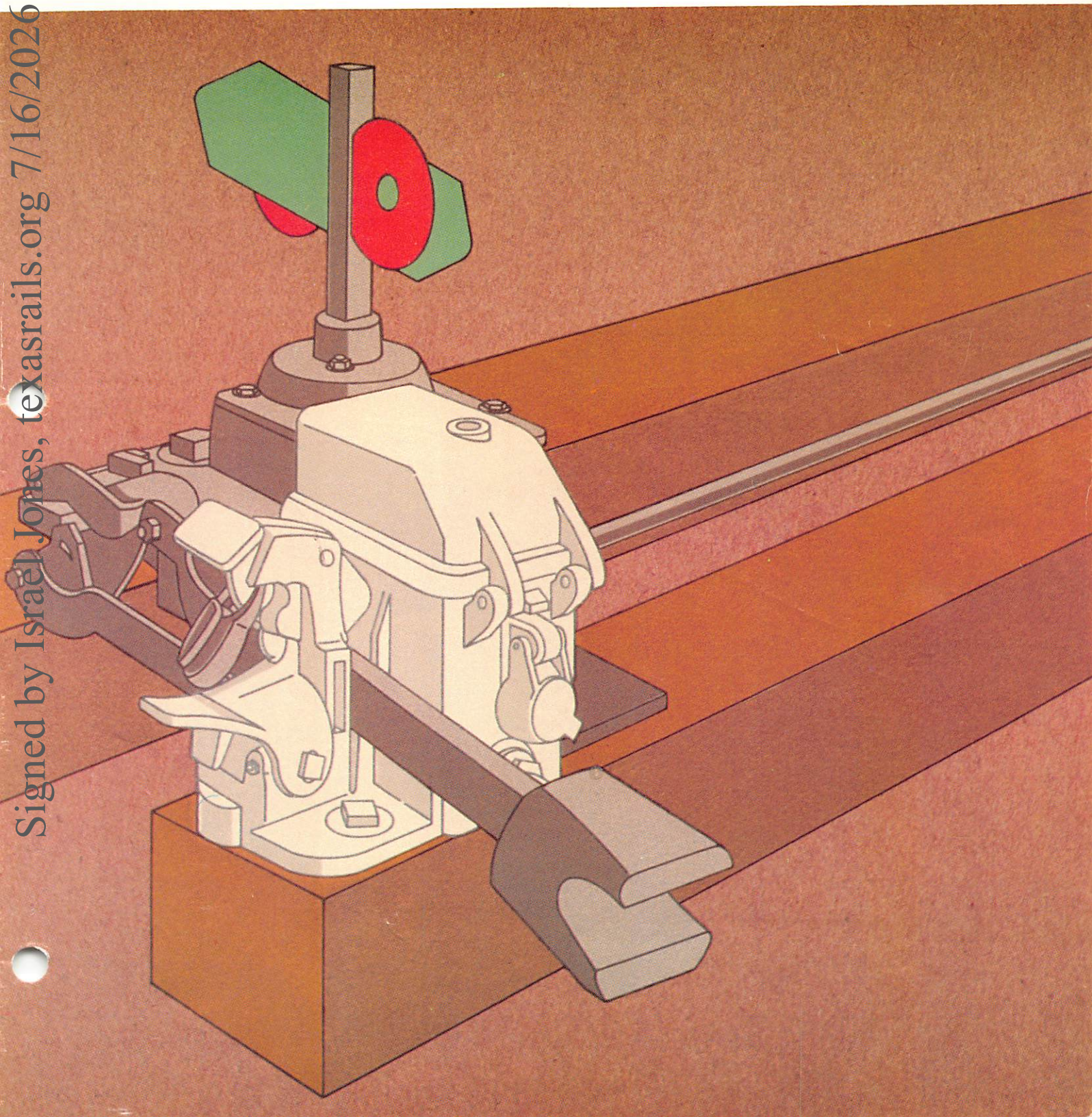
CROSS - INDEX

LAMPS - INCANDESCENT

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A46-103	34866-38		LAMP	5
A46-105	34866-81		LAMP	5
A46-106	34866-84		LAMP	5
A46-107	34866-59		LAMP	5
A46-108	34866-25		LAMP	5
A46-121	34866-70		LAMP	5
A46-122	34866-60		LAMP	5
A46-124	34866-86		LAMP	5
A46-130	34866-56		LAMP	
A46-135	34866-6		LAMP	5
A46-146	34866-46		LAMP	5
A46-160	55345		ADAPTER	5
A46-172	47438-9GR9		LAMP	7
A46-181	47438-6GR3		LAMP	7
A46-191	47438-20GR2		LAMP	7
A46-200	48088-4		LAMP	9
A46-201	48088-5		LAMP	9
A46-202	48088-8		LAMP	9
A46-203	48083-3		LAMP	9
A46-225	44775-10		LAMP	9
A46-235	52879		LAMP	9
A46-236	52879-1		LAMP	9
A46-237	52879-6		LAMP	9
A46-238	52879-3		LAMP	9
A46-239	52879-2		LAMP	9
A46-240	52879-5		LAMP	9
A46-242	52879-13		LAMP	9
A46-243	52879-16		LAMP	9
A46-244	52879-18		LAMP	9

MODEL 9B AND MODEL 10 ELECTRIC SWITCH LOCKS

GRS CATALOG **50-1**



Signed by Israel Jones, texasrails.org 7/16/2026

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- Operation 4
- Description 6
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- Description 12
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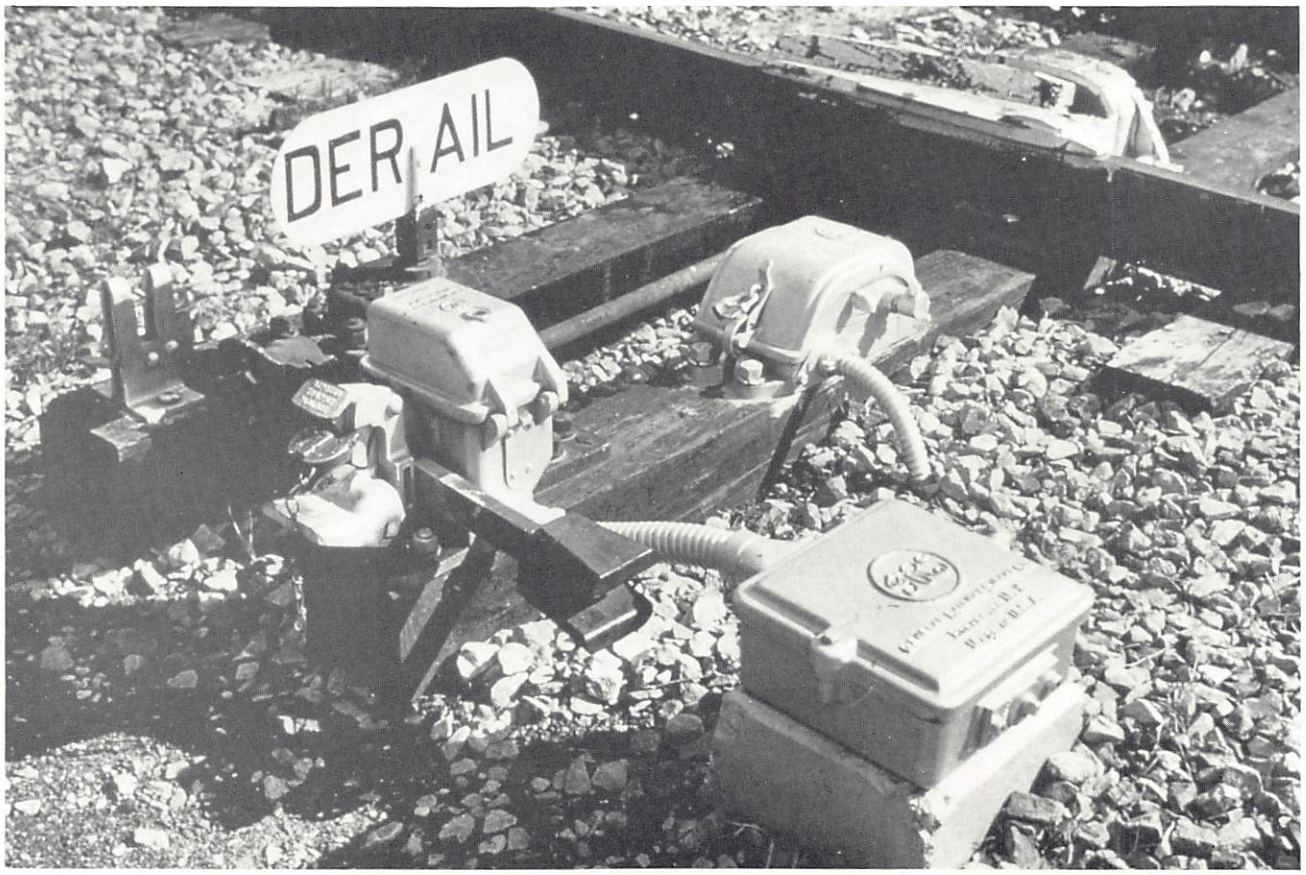
ORDERING INFORMATION
- Model 9B Switch Lock 16
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INTRODUCTION

GRS electric switch locks prevent unauthorized operation of switch stands, hand-throw switch machines, derails, and other devices. They can be electrically interlocked with the signaling system or remotely unlocked by the dispatcher, preventing switch operation unless traffic conditions permit.

The Model 9B lock operates by means of a plunger which is lowered into a hole in the lock rod connected to switch points, derail, or other devices. It may also be used to lock the locking plunger of a GRS Model 9 hand-operated switch machine. The Model 10 lock secures the hand-throw lever on a switch stand or Model 9 switch machine in the normal position. Both locks are furnished with a sealable emergency release mechanism with latchout. The latchout feature prevents resetting of the emergency release by anyone but an authorized person possessing a key to the case padlock.

The rugged, vandal-resistant, weatherproof construction of these locks ensures long, reliable service.



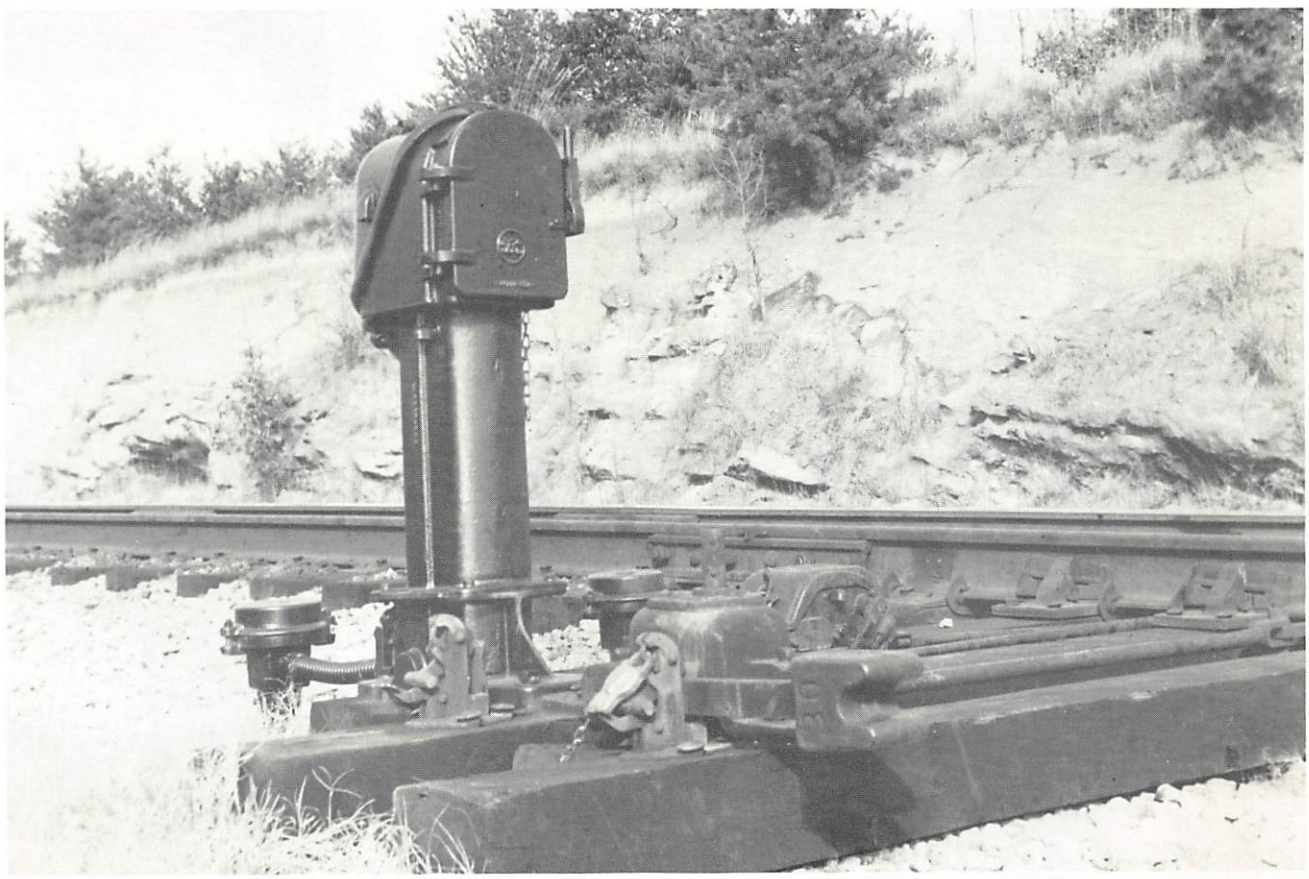
Copyright General Signal Corporation 1984 ©

MODEL 9B ELECTRIC SWITCH LOCK

The GRS Model 9B electric switch lock is used to lock devices which can be locked with a lock rod, such as switch points, derails, etc. The lock may be connected to the signal circuits to prevent operation of the protected device unless traffic conditions permit, or unless the normally sealed emergency release is operated.

FEATURES

- Available in two heights, high and dwarf.
- Door cannot be closed unless the switch is locked.
- Banner type indicator displays LOCKED or UNLOCKED condition.
- Four adjustable contacts, actuated by the operating handle, make or break as required (as furnished, two contacts are closed in the normal position and two are closed in the preliminary 42° position).
- Emergency release provided.
- Door-operated circuit controller optional.
- Sturdy, weatherproof construction.
- Easy maintenance.



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OPERATION

When a train is to leave a siding and enter the main line, the brakeman opens the door on the Model 9B lock by removing the padlock and pulling the door handle down, Figure 1. Raising the operating handle to the preliminary unlock position, Figure 2, moves the handle-operated shaft, Figure 6, to open the commutator contacts causing the wayside signal to display stop. Other contacts start a timer which prevents further unlock operations to ensure that a train (which may have passed the signal just before it went to stop) arrives at and passes the switch location. In some installations, unlock is controlled by a dispatcher at the request of the brakeman.

After the signal clears, or a train on the main line goes by, the lock coils, Figure 6, are energized which raises the locking lever and key to clear the notch in the locking dog. This raises a push rod which causes the banner indicator to display UNLOCKED. The brakeman moves the unlocked operating handle all the way over, Figure 3, which lifts the lock plunger out of the hole in the lock rod, Figure 6. The brakeman now operates the hand-throw switch reverse so the train can proceed onto the main line.

Before leaving the lock location, the brakeman returns the hand-throw switch to normal and moves the lock's operating handle to reinsert the locking plunger in the lock rod. This action forces the locking key down into its notch in the locking dog. The brakeman closes and padlocks the lock door, Figures 4 and 5. A lug on the inside of the door prevents closure until the operating handle is in the locked position.

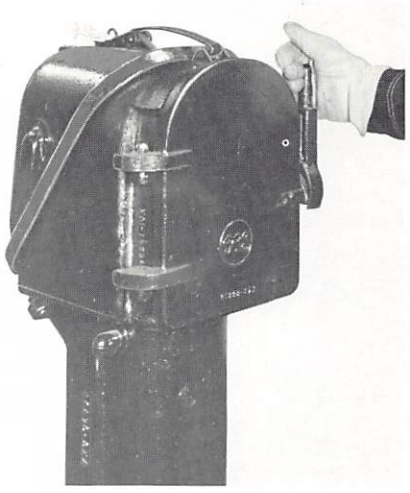


Figure 1. Pulling handle down to open door.

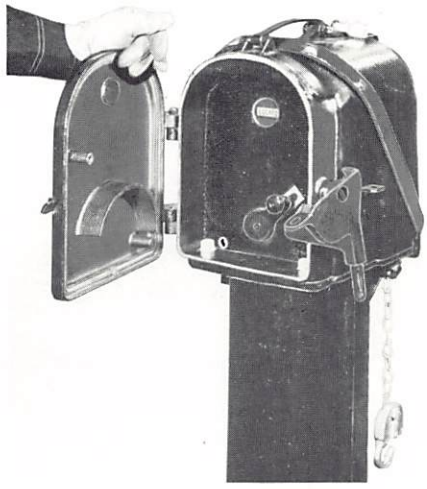


Figure 2. Waiting for unlock with operating handle raised to intermediate position.

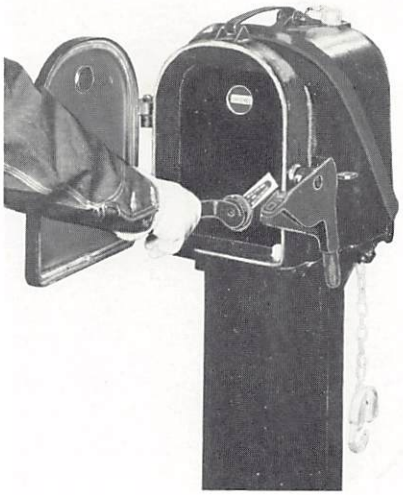


Figure 3. Operating handle rotated to the reverse position.



Figure 4. Closing brakeman's door.

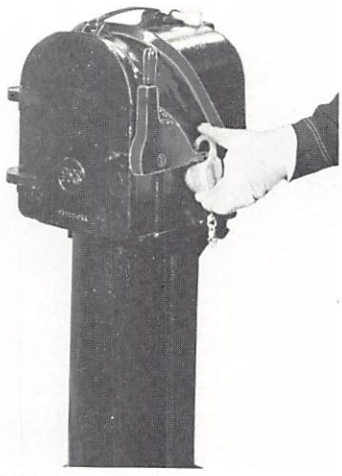


Figure 5. Closing padlock.

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Emergency Release

In the case of power or circuit failure, the Model 9B lock can be released by operation of the emergency release lever. The brakeman breaks the seal and pushes down the emergency release lever, Figure 7, to release the locking key via a cross connecting arm. He turns the operating handle, as previously described, while holding down the emergency release lever. The lever is normally provided with a latchout feature which prevents reset except by the maintainer who has access to the mechanism; see Figure 8.

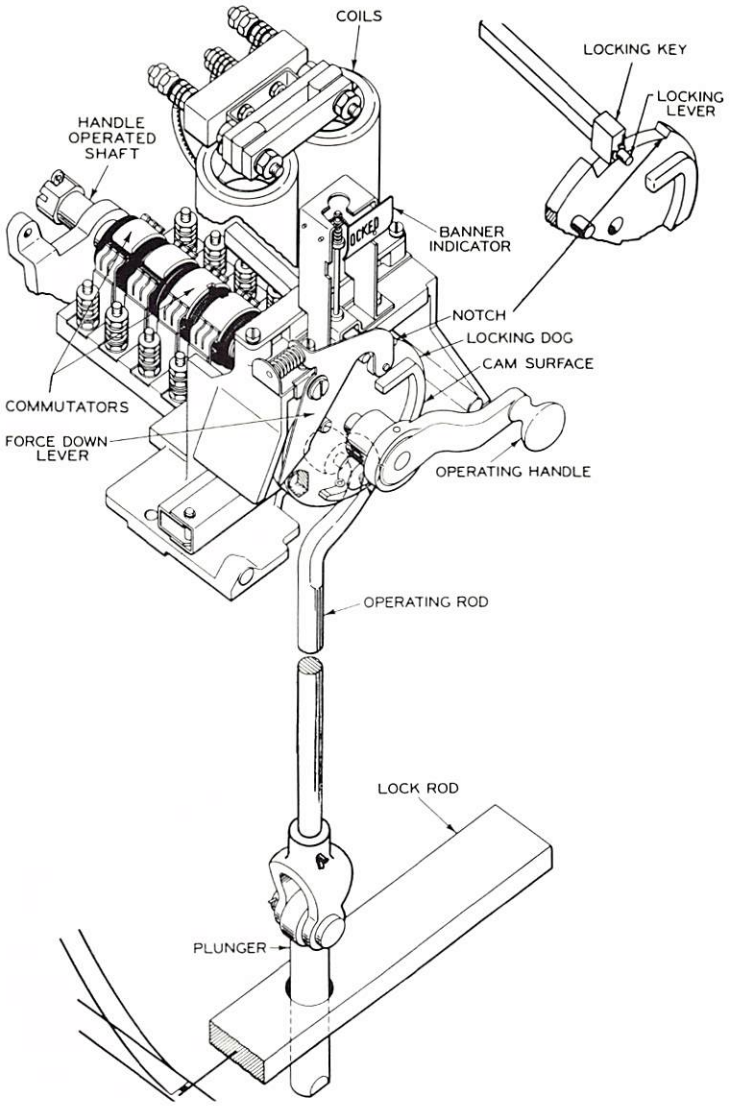


Figure 6. Internal mechanism.

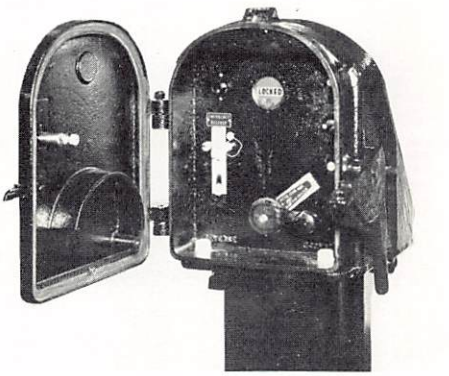


Figure 7. To use emergency release, operate handle to intermediate position, remove seal, hold down emergency release lever, and move operating handle to unlock position.

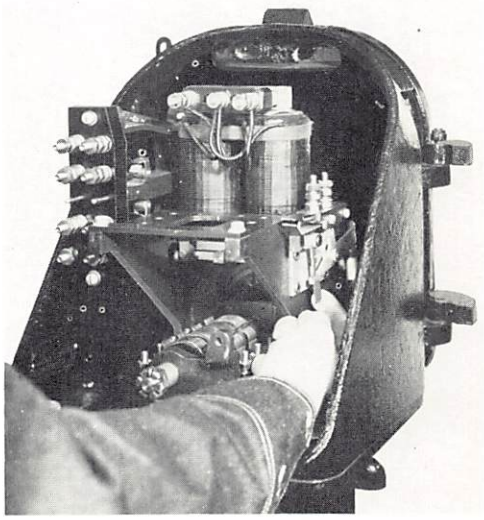


Figure 8. To reset emergency release, pull reset lever forward as shown.

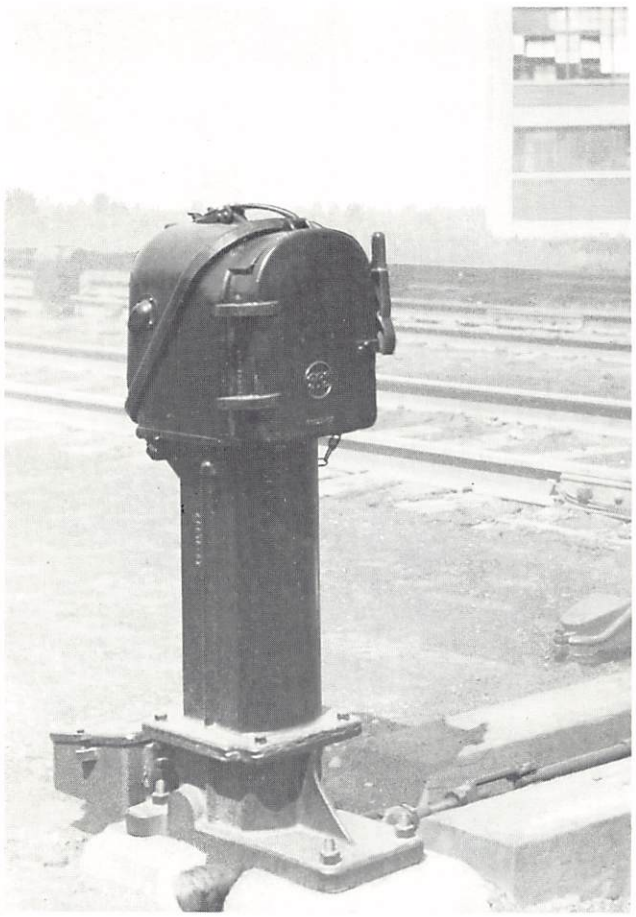
DESCRIPTION

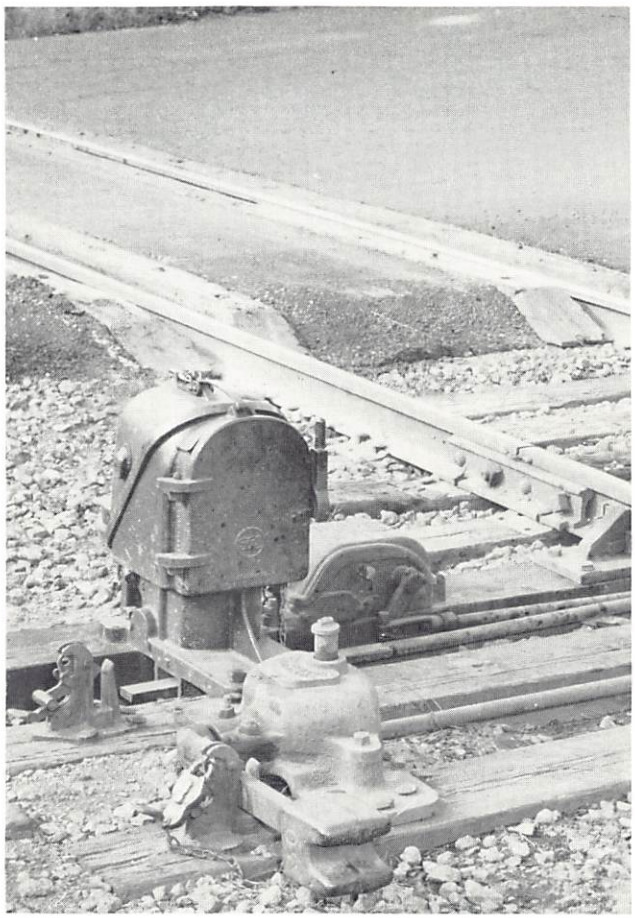
The Model 9B lock is available in two heights, high and dwarf. It is of durable cast construction well suited to withstand many years of weather and frequent usage under the most severe operating conditions.

The base has four 7/8-inch mounting holes for lags or bolts. It is bolted to the pedestal of a high lock or directly to the mechanism case of a dwarf lock.

The pedestal is divided into two compartments. The front compartment encloses the operating rod and locking plunger; the back compartment houses the wiring from the base to the mechanism. Either a wire entrance plate or a junction box can be bolted to the wire compartment.

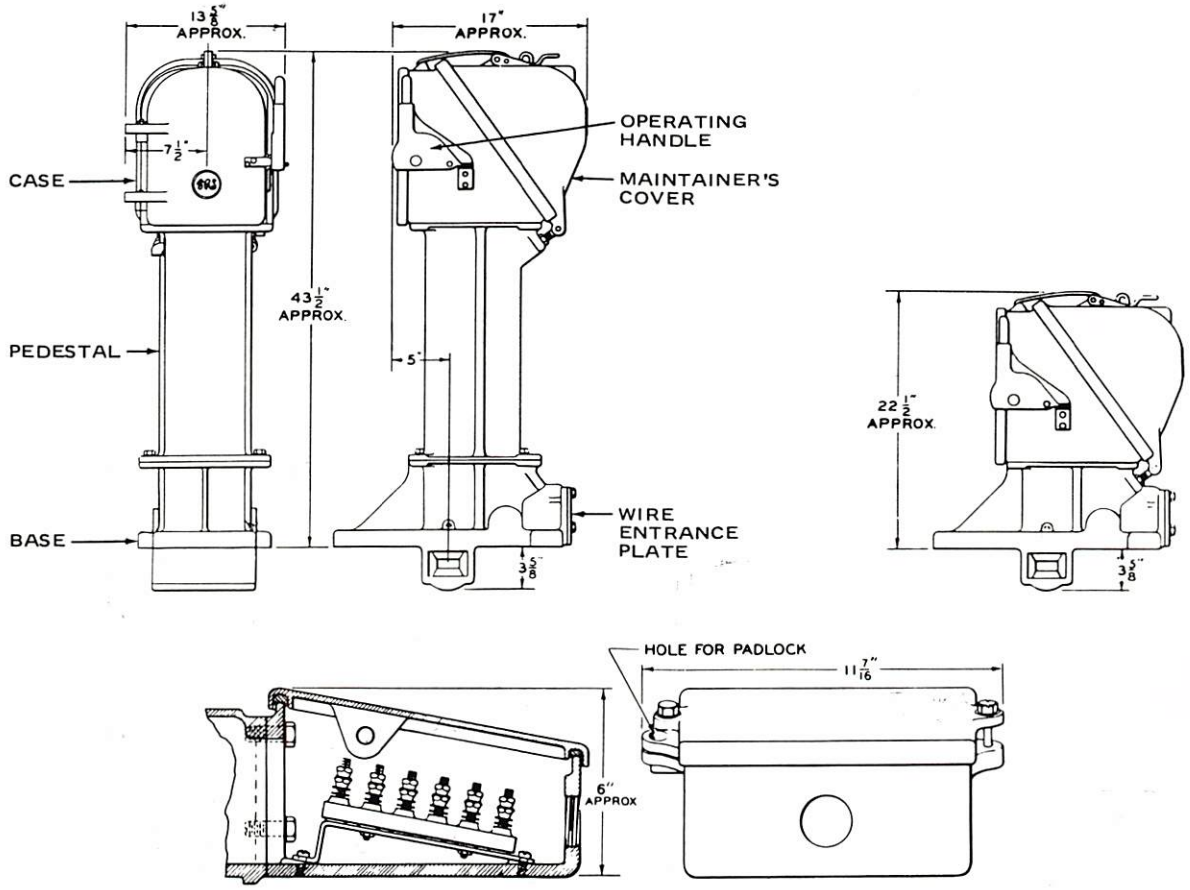
The mechanism case has an integral partition separating the mechanism from the operating handle compartment. An optional door-operated circuit controller is mounted on the case partition as shown at the bottom of the next page. The controller has two independent normally open and two independent normally closed relay-type contacts. The lever-operated emergency release of the latchout type fits on the left-hand side of the frame near the force-down lever. The release is equipped with one normally closed contact and is sealed with a wire seal.



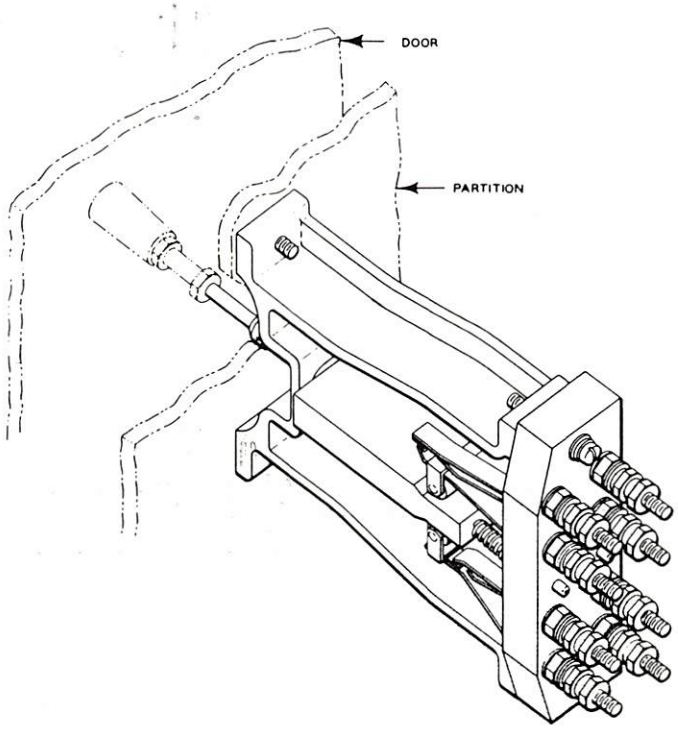


Two heights are available: high and dwarf.

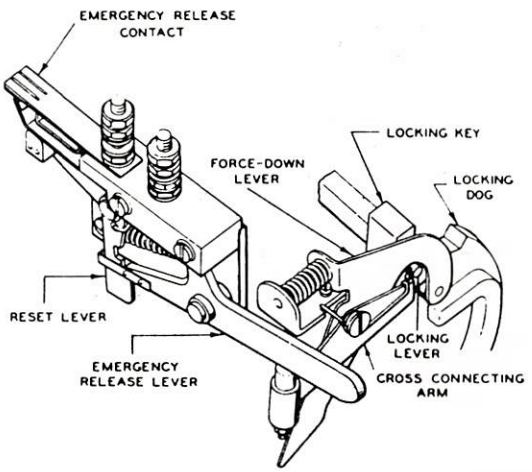
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The junction box, an optional feature, can be used when the lock is mounted on a concrete foundation.

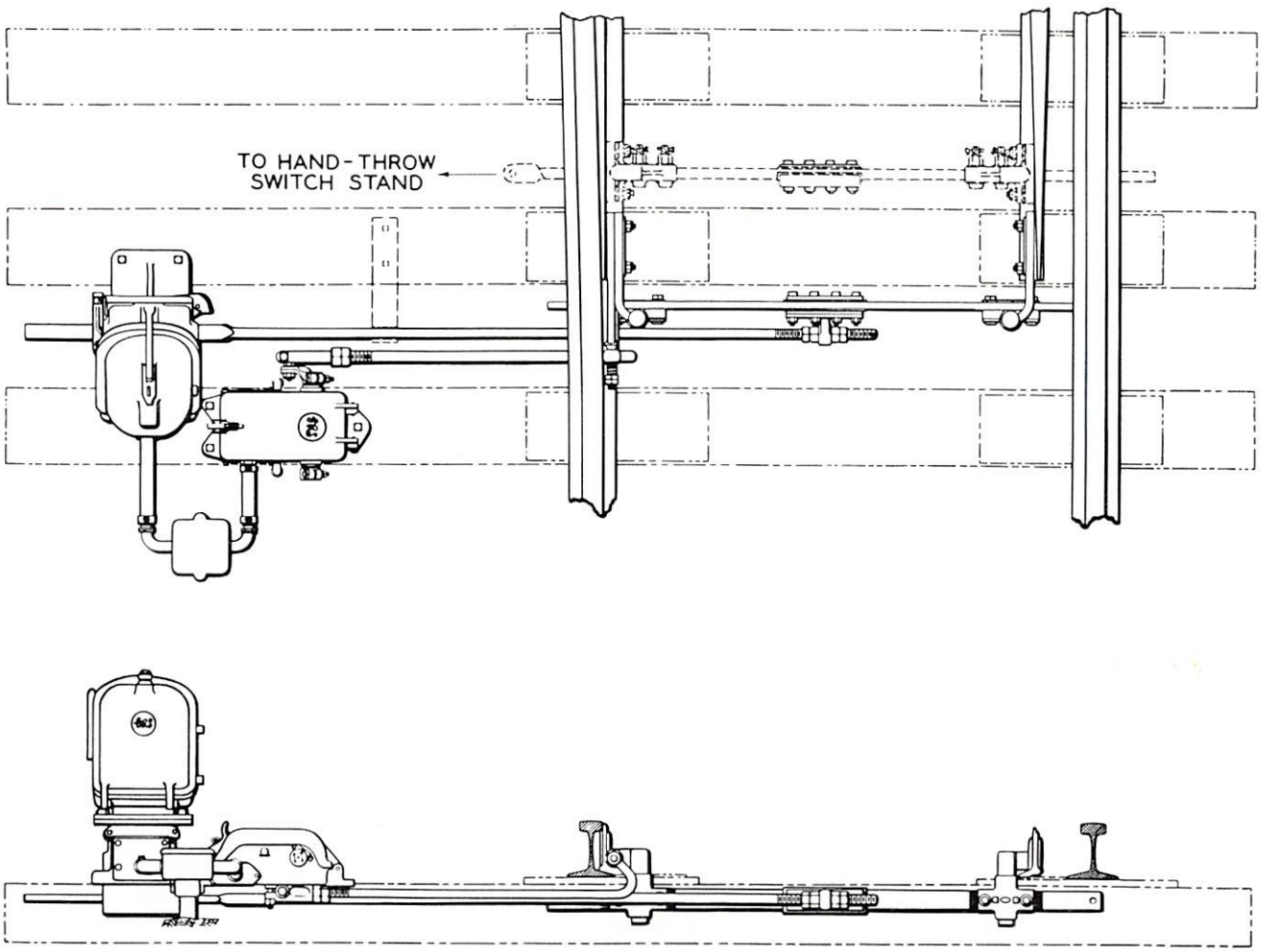


Door-operated circuit controller.



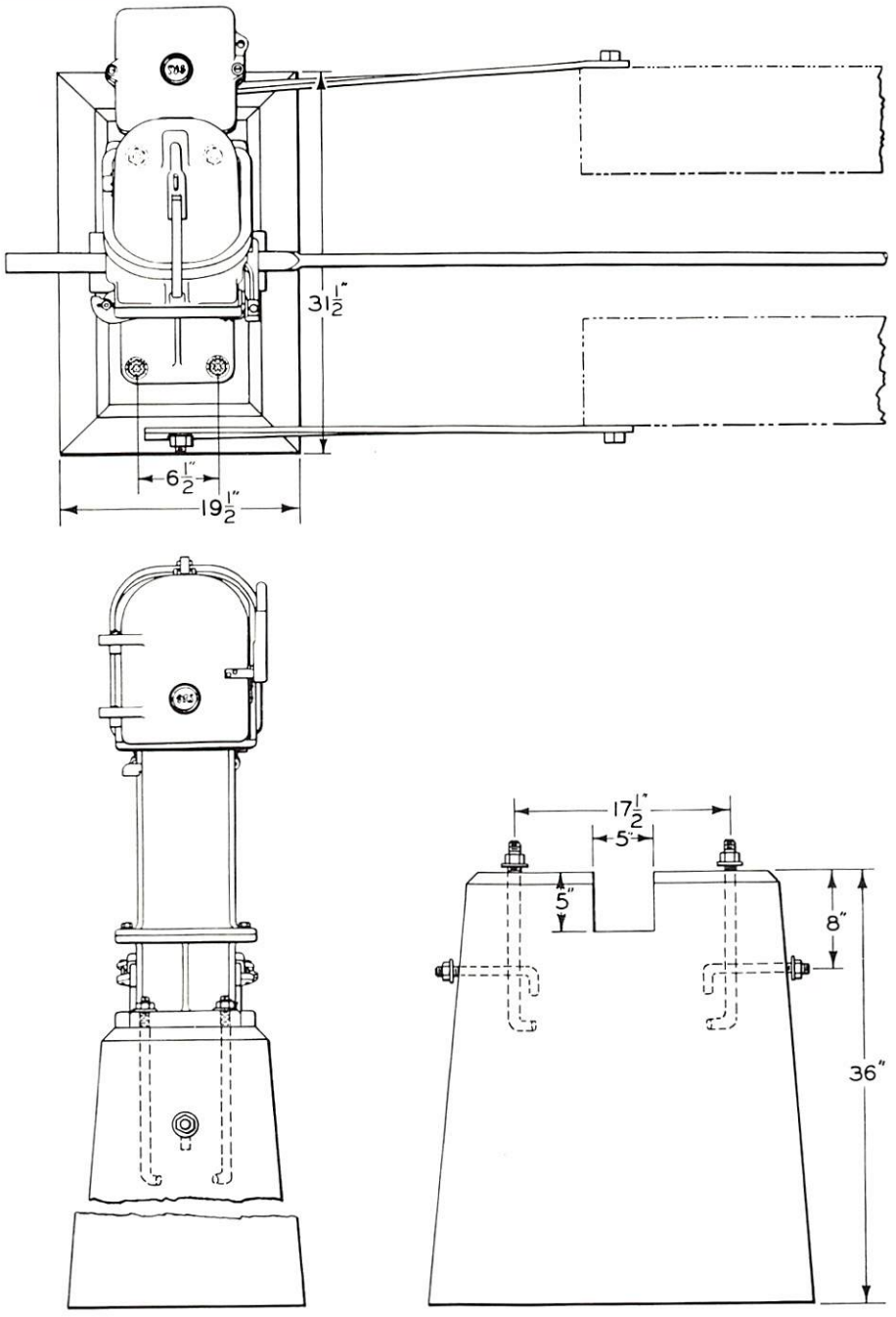
Emergency release.

TYPICAL LAYOUTS



Dwarf Model 9B lock installed on two ties.

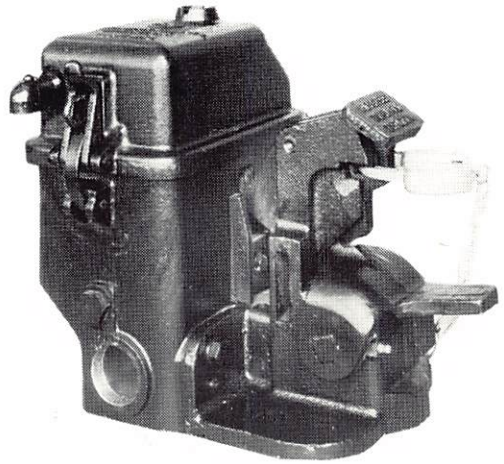
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High Model 9B lock installed on a concrete foundation.

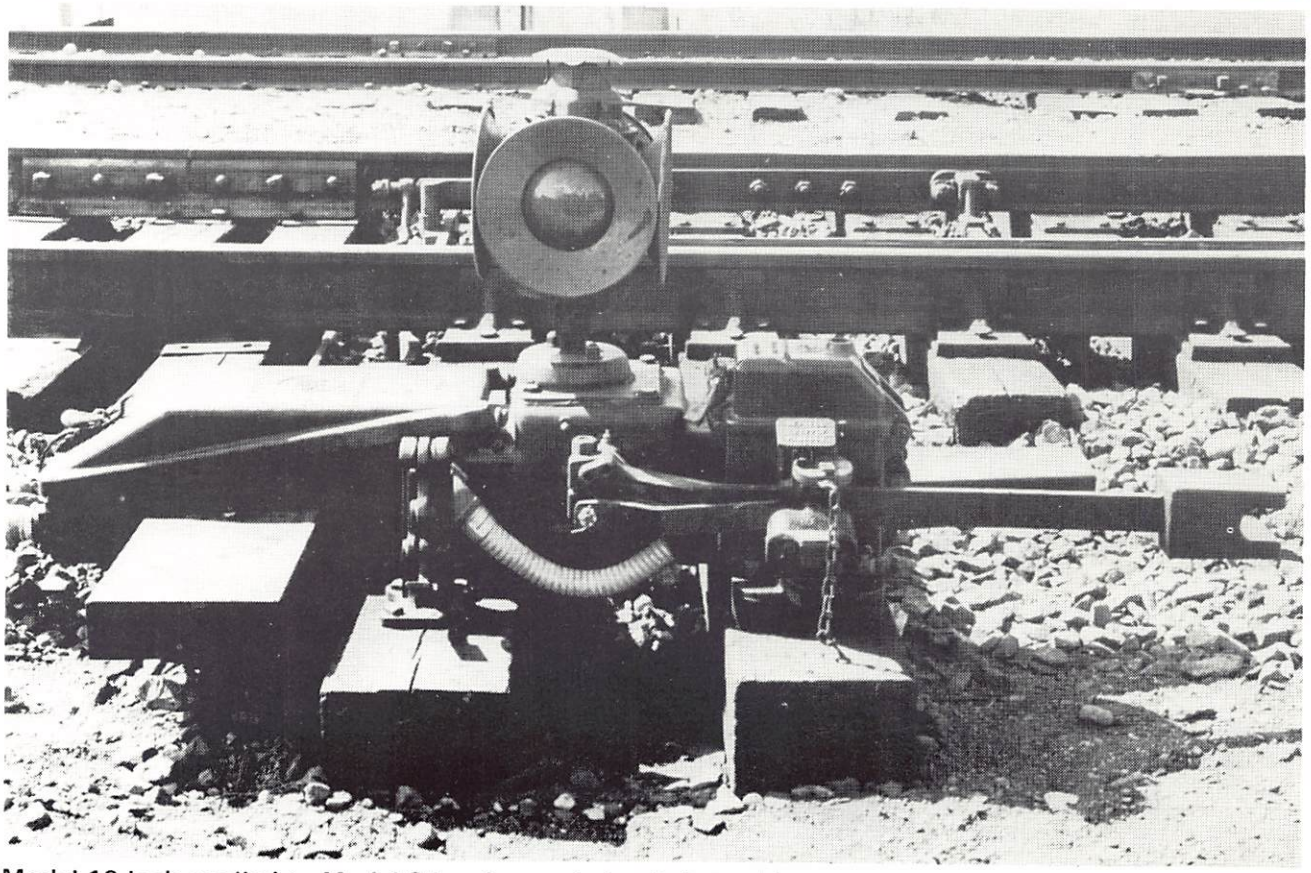
MODEL 10 ELECTRIC SWITCH LOCK

The GRS Model 10 electric switch lock is used to lock the hand-throw lever of a ground-throw switch stand or hand-operated switch machine in the normal position, and may be applied to either a right- or left-hand layout. It provides a means of interlocking a manually-operated switch with the signal circuits so that the switch cannot be operated unless traffic conditions permit, or unless the normally-sealed emergency release is operated.



FEATURES

- Easy operation leaves both hands free to operate the switch lever.
- Any of the five readily-accessible independent contacts may be normally open or normally closed, as desired.
- Emergency release available.
- Spring tension secures internal parts to minimize wear due to vibration.
- Sturdy, weatherproof construction.
- Easy maintenance.



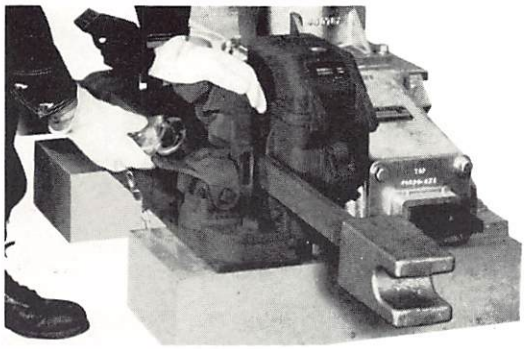
Model 10 lock applied to Model 9 hand-operated switch machine.

OPERATION

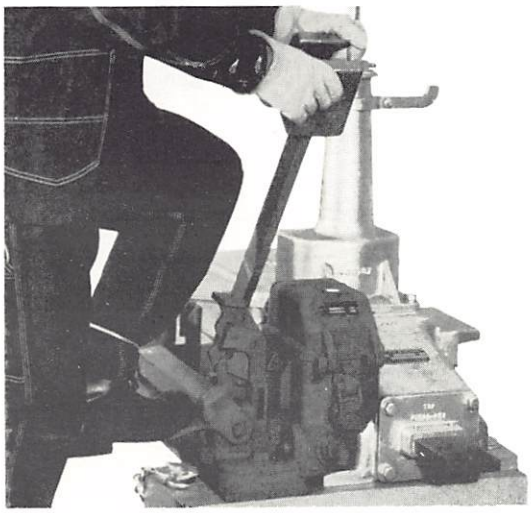
Normal operation of the Model 10 lock requires three steps as shown in the illustrations.

In the case of power or circuit failure, the lock can be released by operation of the emergency release lever. The brakeman lifts the emergency release cover, removes the seal, and turns the emergency release lever, as shown below, which unlocks the internal mechanism.

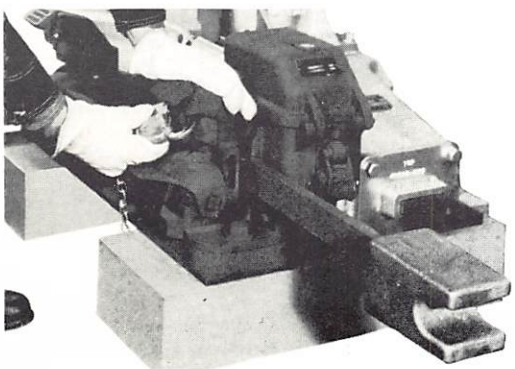
The emergency release lever is normally provided with a latchout feature which prevents reset except by the maintainer who has access to the mechanism compartment (see lower illustration).



Step 1. Depress the latch and remove the padlock.



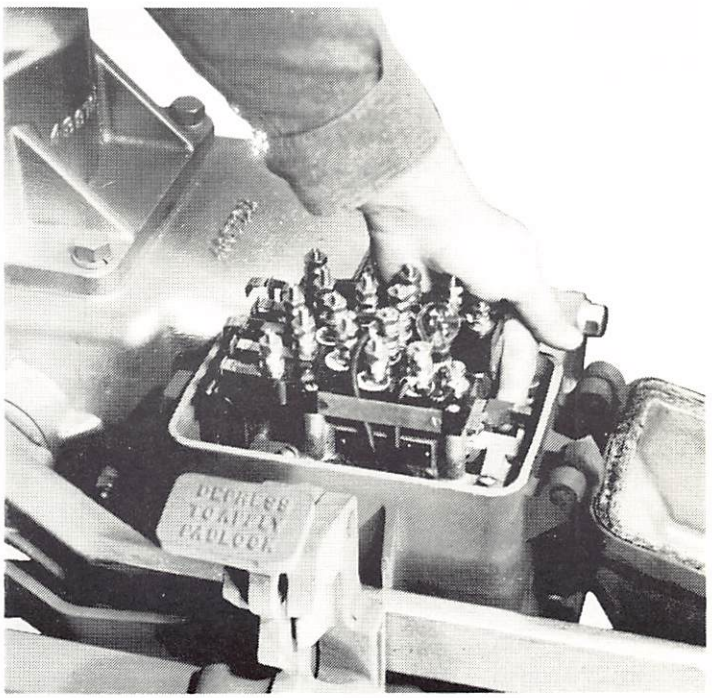
Step 2. When traffic conditions permit, the lamp will light, indicating that the mechanism is unlocked. The pedal may then be depressed and the hand-throw lever thrown to the reverse position.



Step 3. After the hand-throw lever has been returned to its normal position, depress the latch and insert the switch padlock.



Operating the emergency release lever.



Resetting the emergency release lever.

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DESCRIPTION

The Model 10 electric switch lock is of durable cast construction, well suited to withstand many years of weather and frequent usage under the most severe operating conditions.

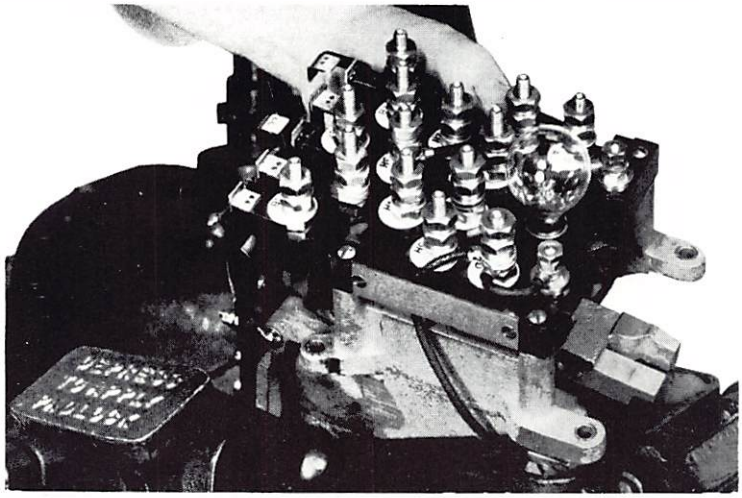
Two 13/16-inch holes for mounting bolts are provided in the base. The cover has a gasket to exclude dirt and moisture and is equipped with a spring-type padlock hasp to keep it securely closed under constant pressure. An observation window is cemented into a recess in the top of the cover so the unlock indication lamp can be seen.

There is a choice of two 1½-inch, pipe-threaded wiring inlets, one at either end of the case.

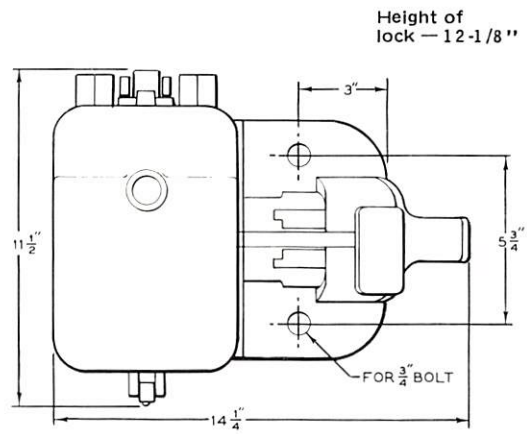
An emergency release lever, located on one end of the case, can be sealed in its locked position, and has a cover which cannot be opened until the switch padlock has been removed.

The Model 10 lock is designed for 8- to 12-volt d-c operation. If a-c operation is required, a transformer and rectifier are required in an adjacent relay housing.

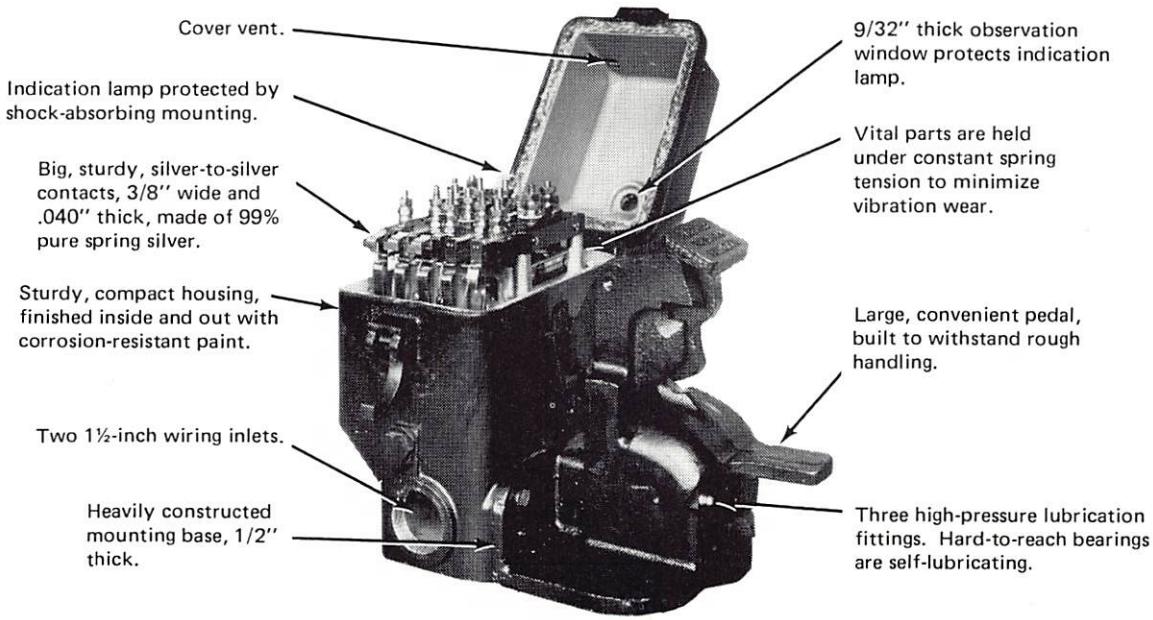
The entire mechanism can be taken out of the housing by removing four screws.



The entire mechanism can be removed from the housing.

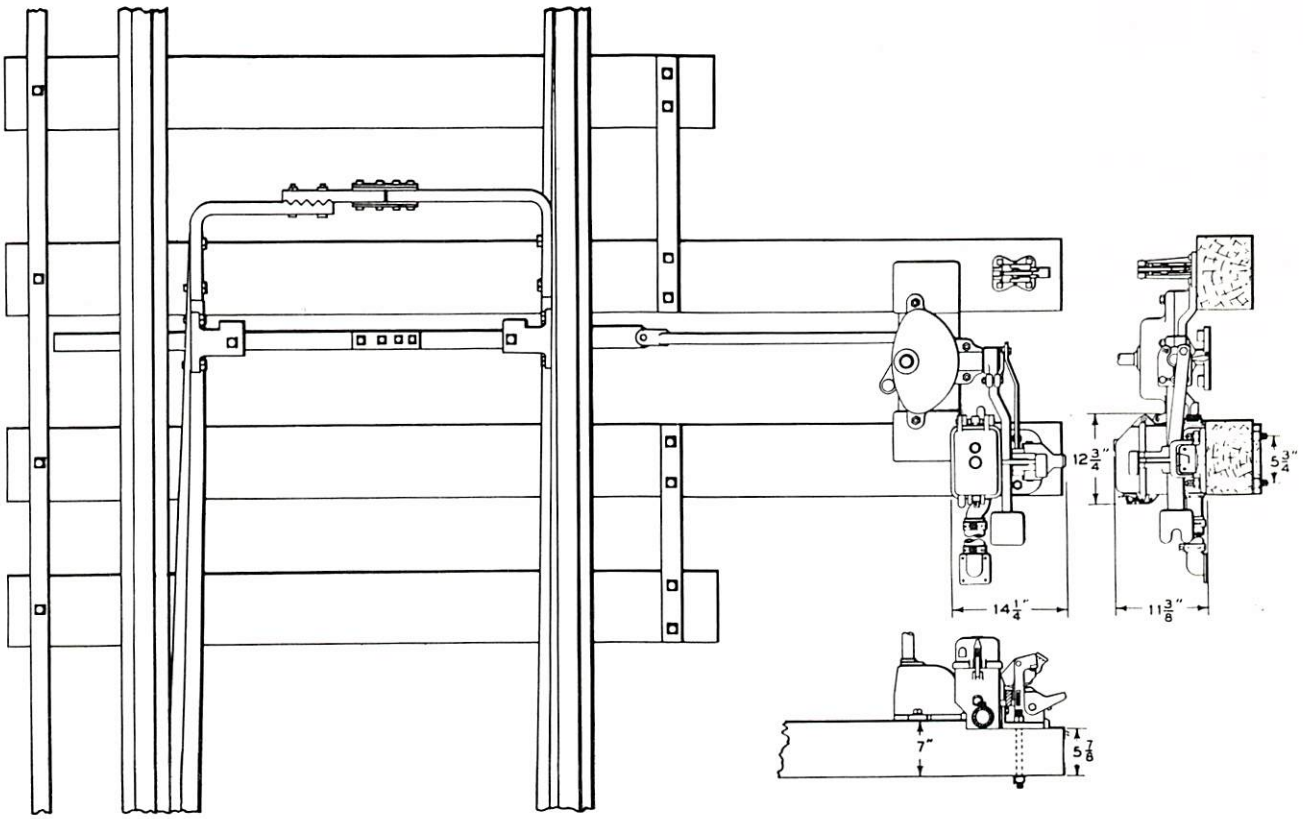


Dimension diagram.



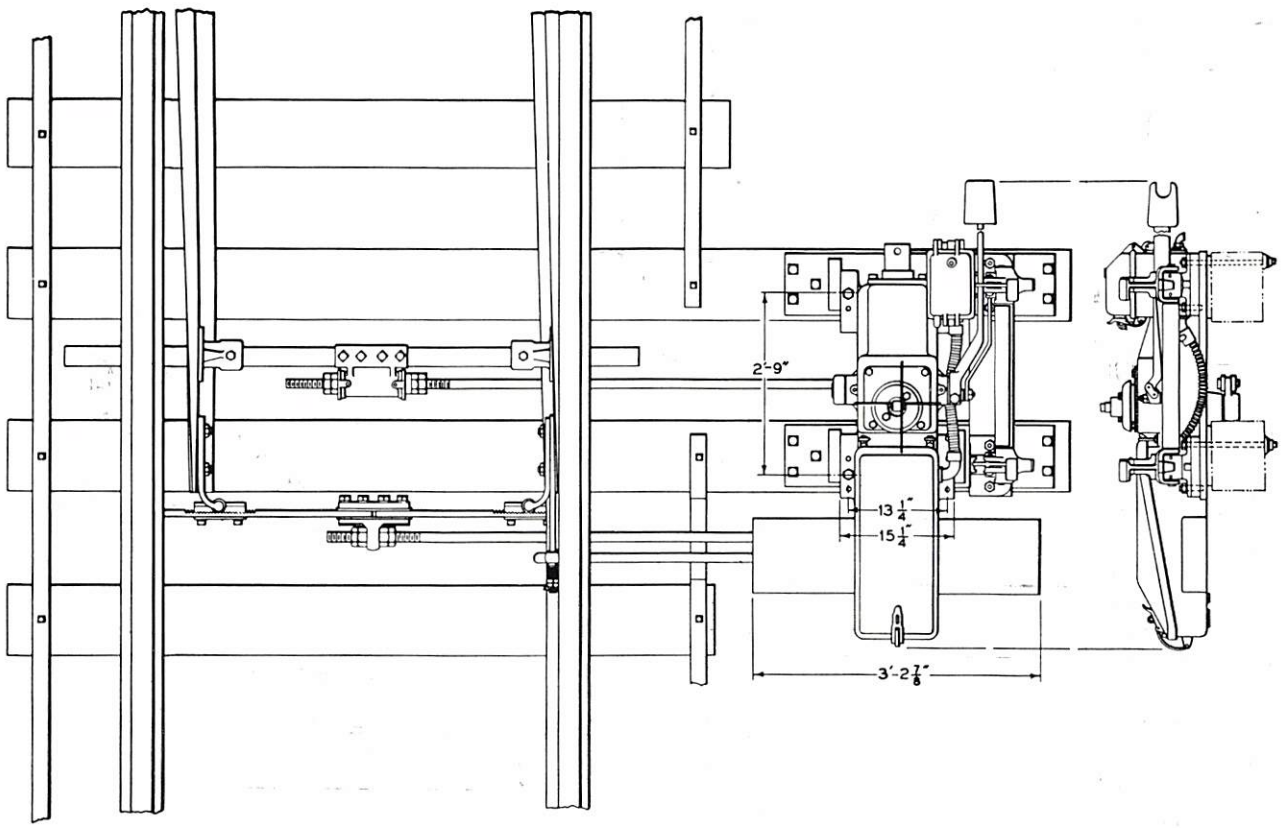
TYPICAL LAYOUTS

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Model 10 electric switch lock installed on low switch stand without lock rod.

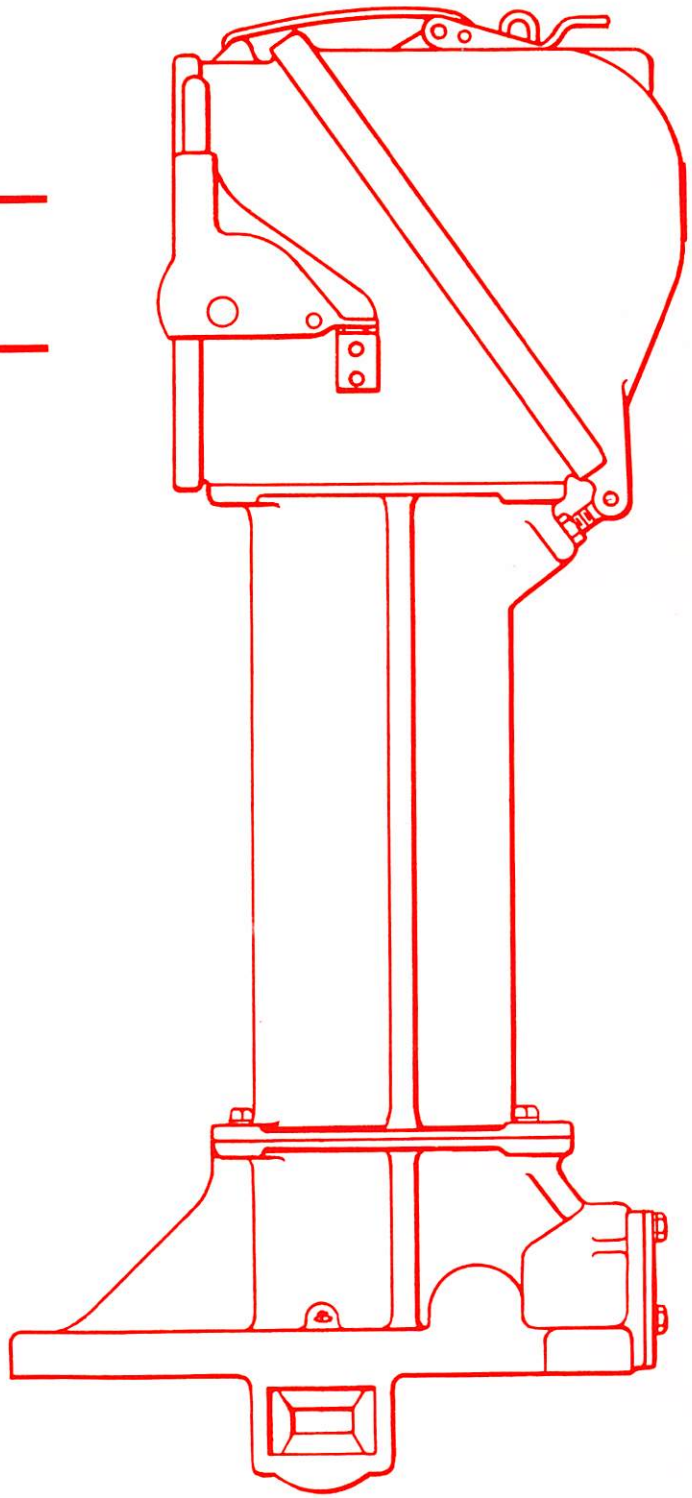
TYPICAL LAYOUTS (cont'd)



Model 10 electric switch lock installed on Model 9 hand-operated switch machine.

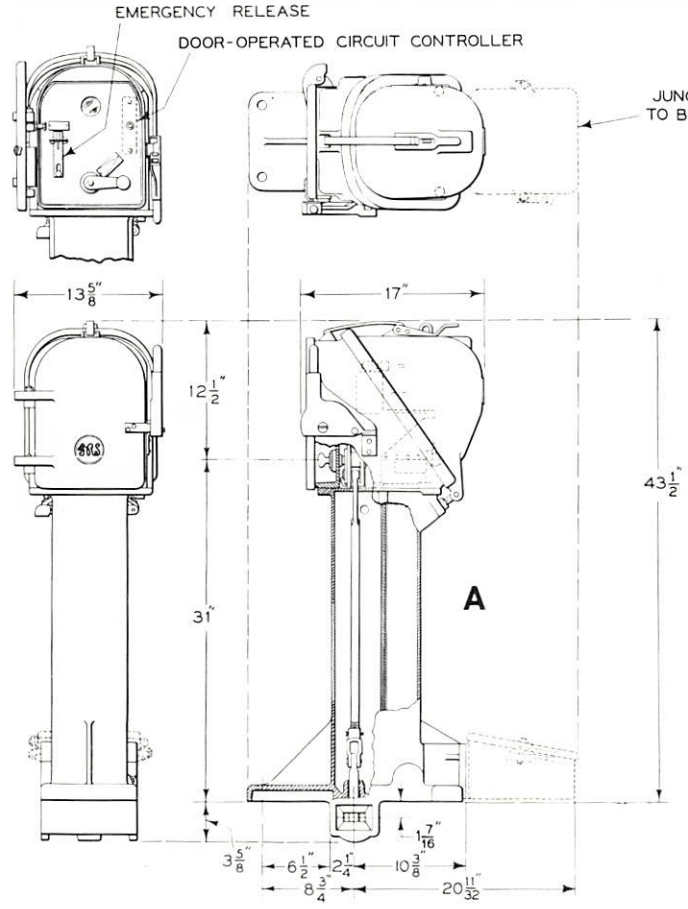
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ORDERING INFORMATION

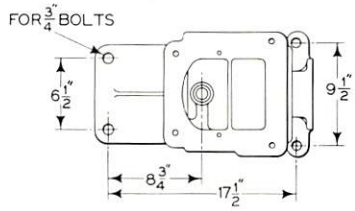


MODEL 9B SWITCH LOCK

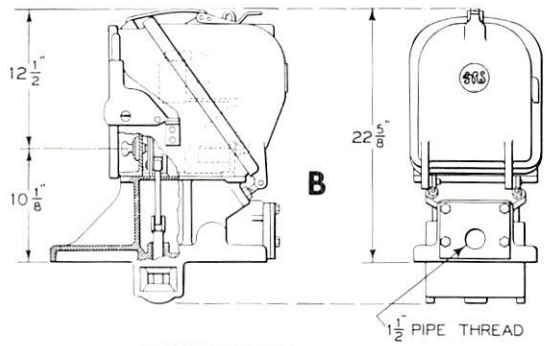
Each Model 9B switch lock listed on page 17 INCLUDES four handle-operated contacts (two closed in the normal position and two closed in the preliminary 42° position) and an emergency release mechanism. Model 9B locks DO NOT INCLUDE a lock rod or junction box; please order separately as listed on page 17.



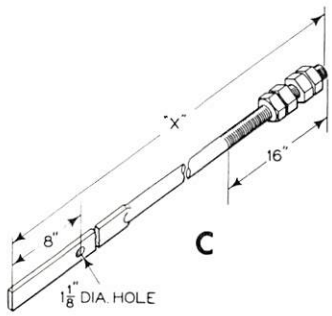
HIGH MODEL



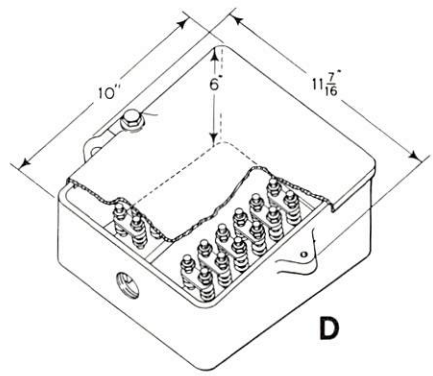
PLAN VIEW OF BASE



DWARF MODEL



LOCK ROD



JUNCTION BOX

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PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE.

REF.	NAME	CATALOG NUMBER
A	**MODEL 9B LOCK,** high	A50-105
A1	Same as above, with door-operated circuit controller	A50-100
B	**MODEL 9B LOCK,** dwarf	A50-115
B1	Same as above, with door-operated circuit controller	A50-110
C	**LOCK ROD***, single, used to lock normal only. Dim. "X" = 7' 10"	A50-205
C1	Same as above, except Dim. "X" = 12' 8"	A50-206
C2	Same as Ref. C, except undrilled. Dim. "X" = 7' 10"	A50-207
C3	Same as Ref. C2, except Dim. "X" = 12' 8"	A50-208
D	**JUNCTION BOX,** replaces wire entrance plate, which is furnished as standard equipment. Has two terminal blocks with twelve No. 14-24 posts each. Has 1-1/2" pipe threaded hole for wire entrance	A50-220
D1	Same as above, except arranged for Raco entrance seal	A50-221

* For other rods and lugs, see Catalog Section 91.

MODEL 10 SWITCH LOCK

The Model 10 switch lock layouts listed below INCLUDE your choice of contact arrangements listed on page 19. The locks DO NOT INCLUDE the following; please order separately: entrance coupling, pipe nipple, and conduits (see page 19), and lamp bulb (see Assemblies Catalog Section 46, bulb shape S-11 or S-8).

MODEL 10 LOCK, WITH ALL PARTS REQUIRED TO FIT THE FOLLOWING:	CONTACT ARRANGEMENT (See page 19)	CATALOG NUMBER
GRS Model 9 Switch Machine	Figure 1	A50-420
	Figure 2	A50-421
	Figure 3	A50-422
Bethlehem 51A ("New Century")	Figure 1	A50-495
	Figure 2	A50-496
	Figure 3	A50-497
Bethlehem 53A	Figure 1	A50-445
	Figure 2	A50-446
	Figure 3	A50-425
Cleveland Odenkirk	Figure 1	A50-450
	Figure 2	A50-451
	Figure 3	A50-427
Ramapo (Racor) 109 or 110	Figure 1	A50-455
	Figure 2	A50-456
	Figure 3	A50-429
Pettibone Mulliken 4	Figure 1	A50-460
	Figure 2	A50-461
	Figure 3	A50-431
Pettibone Mulliken 5	Figure 1	A50-465
	Figure 2	A50-466
	Figure 3	A50-433
Ramapo Ajax 26E	Figure 1	A50-470
	Figure 2	A50-471
	Figure 3	A50-435
Ramapo Ajax 36D	Figure 1	A50-476
	Figure 2	A50-477
	Figure 3	A50-437
Ramapo Ajax 36H	Figure 1	A50-480
	Figure 2	A50-481
	Figure 3	A50-439
Rapro	Figure 1	A50-490
	Figure 2	A50-491
	Figure 3	A50-459

CONTACT ARRANGEMENTS

The contact arrangements available with the Model 10 electric switch lock are shown below with the switch locked in the normal position. Contacts 1 and 5 are actuated by energization of the lock-magnet coils. Contacts 2, 3, and 4 are actuated whenever the padlock is removed.

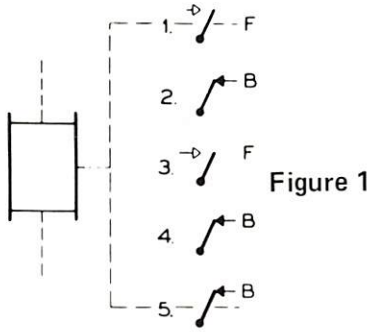


Figure 1

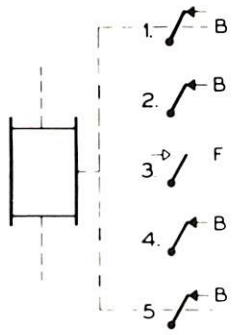


Figure 2

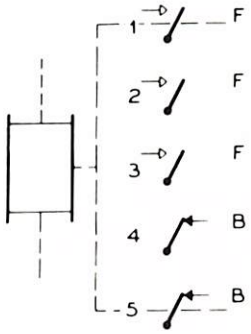
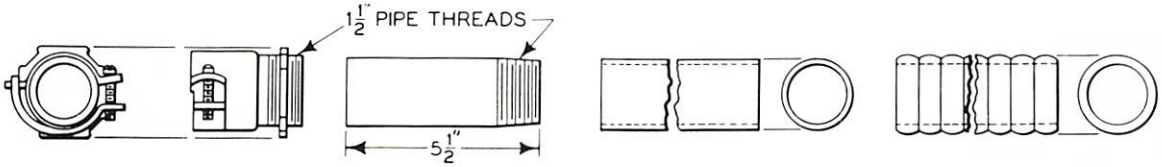


Figure 3

ENTRANCE COUPLING, PIPE NIPPLE, AND CONDUITS



A-COUPLING B-PIPE NIPPLE C-CONDUIT D-CONDUIT

PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE.

REF.	NAME	CATALOG NUMBER
A	**COUPLING,** 1-1/2" pipe thread for 1-1/2" flexible conduit	**A85-866**
B	**PIPE NIPPLE,** 1-1/2" pipe thread for 1-7/8" I.D. rubber conduit	**P85-1003**
C	**CONDUIT,** 1-7/8" I.D., solid rubber, length 3'	**A85-520**
D	**CONDUIT,** 1-1/2" flexible, length 3'	**A85-868**

MODEL 10 SWITCH LOCK ONLY

The Model 10 locks listed below INCLUDE your choice of contact arrangements as listed above. The locks DO NOT INCLUDE a lamp bulb; please order separately from Assemblies Catalog Section 46, bulb shape S-11 or S-8.

PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE.

NAME	CONTACT ARRANGEMENTS	CATALOG NUMBER
MODEL 10 LOCK, with emergency release	Figure 1	**A50-400**
MODEL 10 LOCK, with emergency release	Figure 2	**A50-401**
MODEL 10 LOCK, with emergency release	Figure 3	**A50-402**
MODEL 10 LOCK, emergency release without latchout	Figure 1	**A50-403**

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Telex: 978317

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3379 PEACHTREE ROAD NE ATLANTA GA 30326 Phone: 404 • 233-7373

CHICAGO OFFICE
PRUDENTIAL PLAZA SUITE 2120 CHICAGO IL 60601 Phone: 312 • 467-1221

MONTREAL OFFICE
POINTE-CLAIRE COMMERCE CENTER SUITE 320 6600 TRANSCANADA HIGHWAY POINTE-CLAIRE QUEBEC H9R 4S2
Phone: 514 • 694-7350

NEW YORK OFFICE
230 PARK AVENUE ROOM 928 NEW YORK NY 10169 Phone: 212 • 697-3681

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FIRST INTERSTATE BANK OF CALIFORNIA BUILDING SUITE 1440 1330 BROADWAY OAKLAND CA 94612
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LACLEDE GAS BUILDING 720 OLIVE STREET ST. LOUIS MO 63101
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GEC-GENERAL SIGNAL LIMITED
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Cable: RAILSIGKO BOREHAMWOOD (ENGLAND) Telex: 851-22777 GECBWD G BOREHAMWOOD (ENGLAND)

ALGEMENE SEIN INDUSTRIE B.V.
CROESELAAN 28 3521 CB UTRECHT NETHERLANDS Phone: 31-30-94-26-46
Cable: GENRASIG UTRECHT (NETHERLANDS) Telex: 844-47455 GRASI NL UTRECHT (NETHERLANDS)

REPRESENTATIVES AND LICENSEES THROUGHOUT THE WORLD

CATALOG SECTION 50

Model 9B Direct-Current Electric Switch Lock

Forced Drop

GENERAL DESCRIPTION

The Model 9B Electric Switch Lock is especially designed to provide protection of hand-throw switches or other devices which can be locked with a lock rod. Once the electric lock has been released and the switch has been moved from its normal position, the electric lock cannot be locked again until the switch has been fully returned to its normal position.

The Model 9B switch lock is designed for d-c operation. If a-c operation is required, it can be operated from a rectifier.

For more detailed description, including circuit application and operating values, see Handbook 52 — or write your GRS sales office.

LOCKS ARE FURNISHED AS FOLLOWS:

(a) Door cannot be closed unless switch is locked.
(b) Banner type indicator showing LOCKED and UNLOCKED.
(c) Four adjustable contacts, actuated by the operating handle (as shipped, two contacts are closed in the normal position and two closed in the preliminary 42° position).
(d) Base wire-entrance plate is drilled and tapped for 1-1/2" pipe thread.
(e) With or without door-operated circuit controller having two normally open and two normally closed metal-to-metal contacts.
(f) With emergency release.

THE FOLLOWING ITEMS ARE NOT FURNISHED ASSEMBLED ON LOCKS. THEY MUST BE ORDERED SEPARATELY IF REQUIRED, SEE PAGE 4.

(a) Lock rod
(b) Junction box

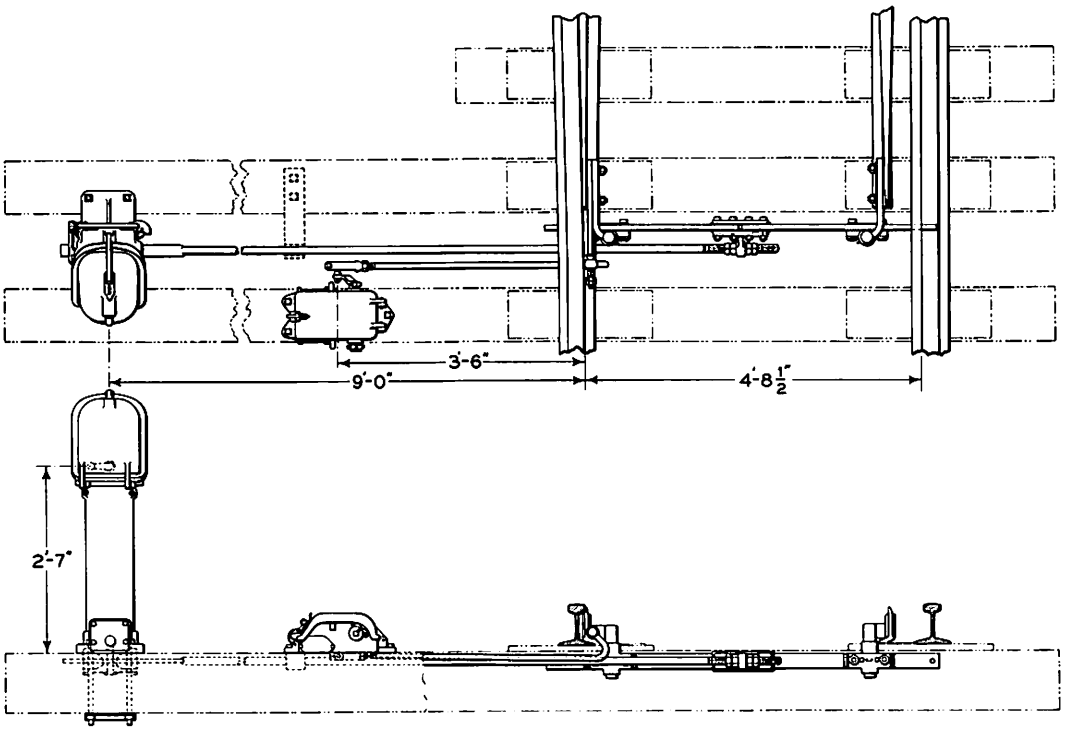
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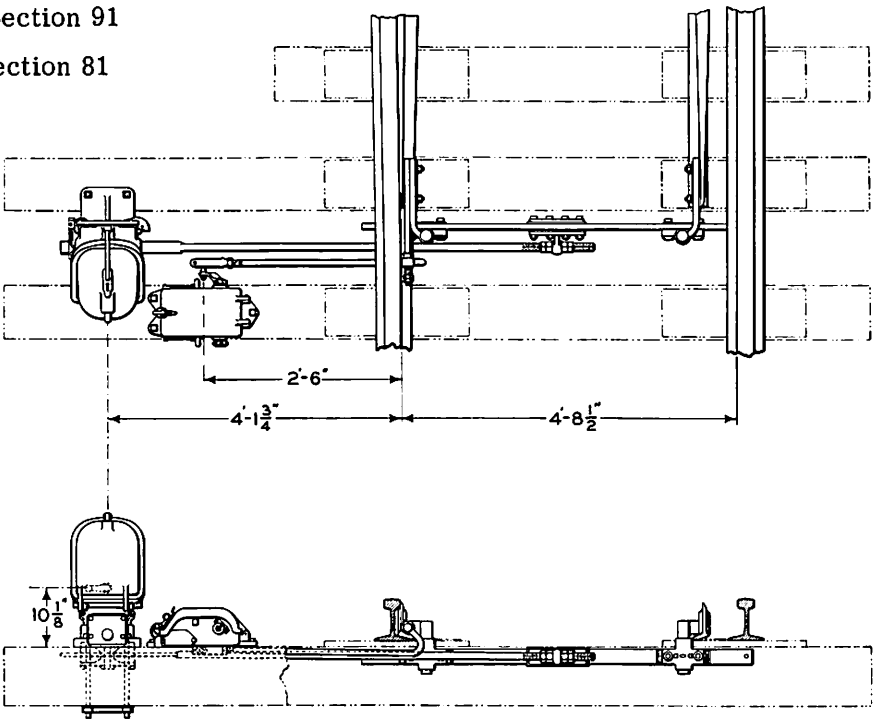


Typical Layout, High Model 9B Lock

For lock rod, see page 4

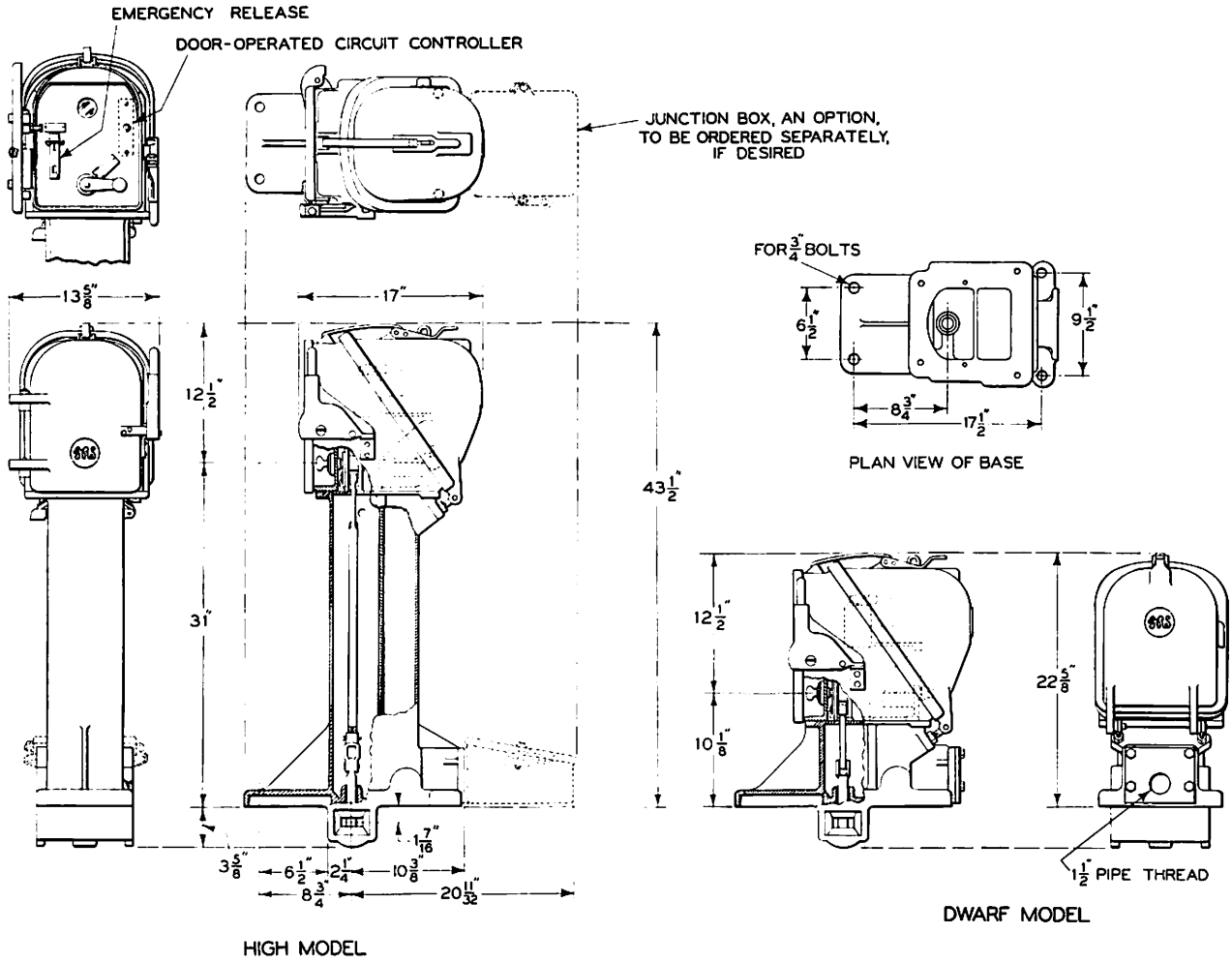
For other rods and lugs, see Section 91

For circuit controllers, see Section 81



Typical Layout, Dwarf Model 9B Lock

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MODEL 9B ELECTRIC SWITCH LOCK

When ordering, specify "Model 9B Lock" and give catalog number

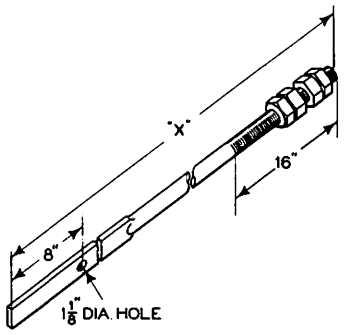
HIGH MODEL WITH BASE FOR SINGLE LOCK ROD

EQUIPPED WITH DOOR-OPERATED CIRCUIT CONTROLLER	EQUIPPED WITH EMERGENCY RELEASE	CATALOG NUMBER
Yes	Yes	A50-100
No	Yes	A50-105

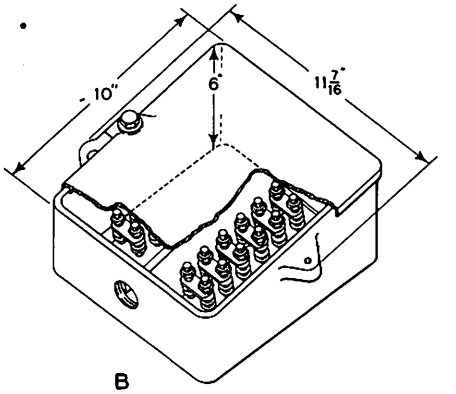
DWARF MODEL WITH BASE FOR SINGLE LOCK ROD

Yes	Yes	A50-110
No	Yes	A50-115

OPTIONAL PARTS FOR MODEL 9B ELECTRIC SWITCH LOCK



A



B

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
A	LOCK ROD, single, used to lock normal only. Dim. "X" =7' -10" . . .	A50-205
A1	as above, except Dim. "X" = 12' -8"	A50-206
A2	Same as Ref. A, except undrilled. Dim. "X" = 7' -10"	A50-207
A3	Same as Ref. A2, except Dim. "X" = 12' -8".	A50-208
B	JUNCTION BOX, replaces wire entrance plate, which is furnished as standard equipment. Has two terminal blocks with twelve No. 14-24 posts on each. Has 1-1/2" pipe threaded hole for wire entrance . . .	A50-220
B1	as above, except arranged for Raco entrance seal	A50-221

CATALOG SECTION 50

Model 10 Direct-Current

Electric Switch Lock

Forced Drop

CONTENTS

	Page
General Description	23
Ordering Information	23
Lock only	28
Locks with fittings to adapt to specific switch stands, to lock normal only	25
Conduit and fittings	26

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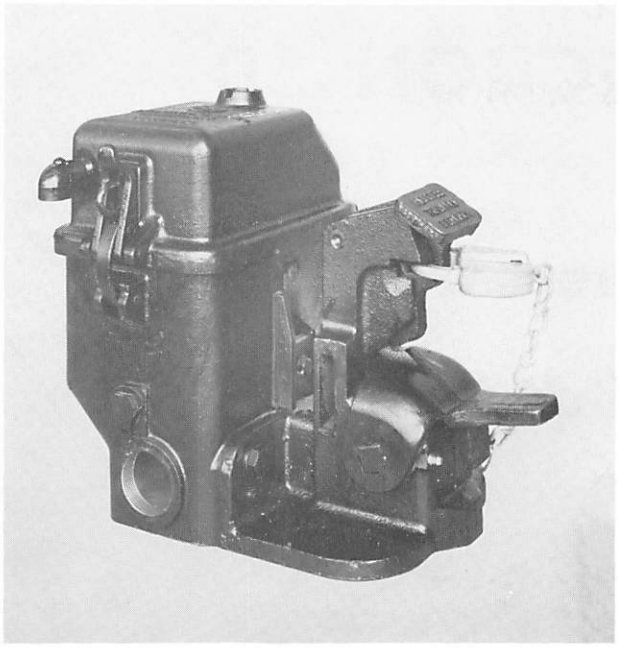
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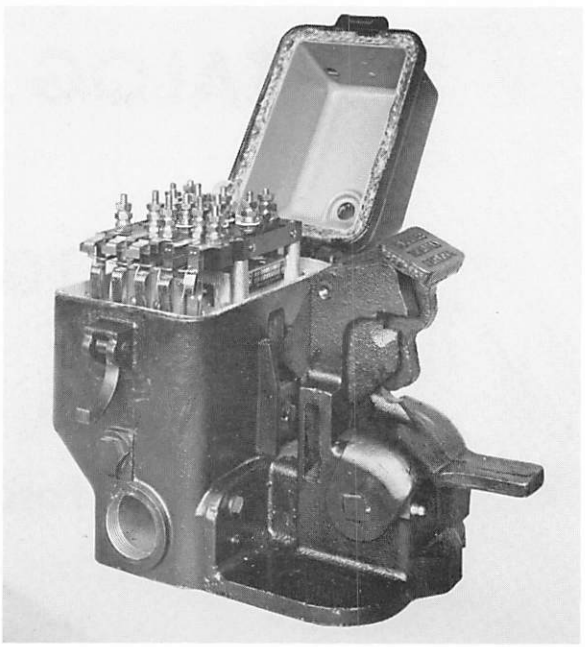
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December 1965

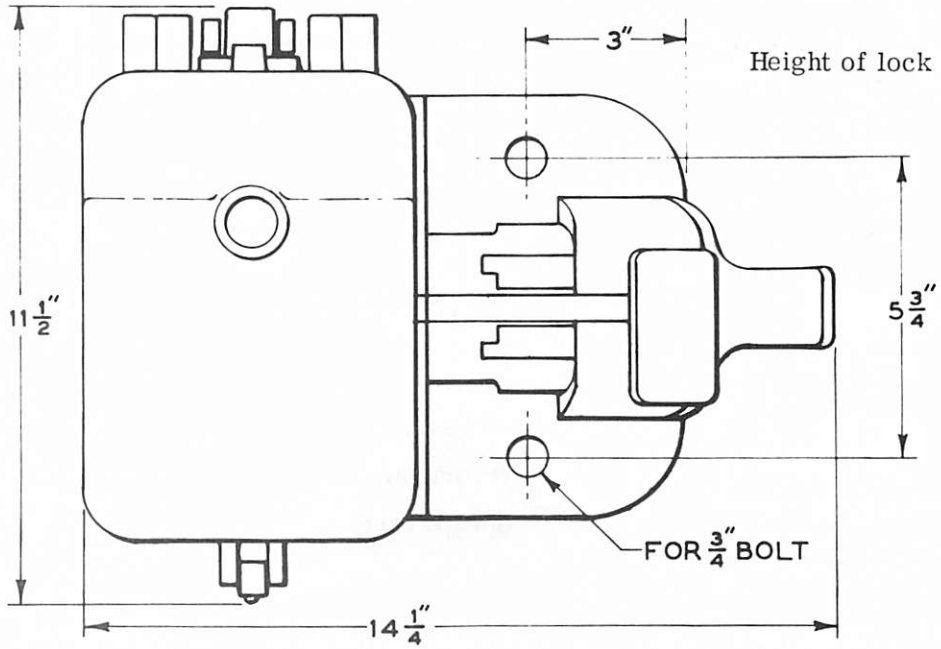
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Model 10 electric switch lock in normally locked position.



Model 10 electric switch lock with maintainer's cover opened showing contacts and easily accessible wiring terminals.



Dimension diagram.

MODEL 10 DIRECT-CURRENT ELECTRIC SWITCH LOCK
Forced Drop

GENERAL DESCRIPTION

The Model 10 lock is used to lock the hand-throw lever of a ground-throw switch stand or a GRS Model 9 hand-operated switch machine.

As listed on page 24, the Model 10 lock is furnished arranged to lock the hand-throw lever in its normal position only.

The Model 10 lock operates on 8-12 volts d.c, (100 ohms). If ac operation is required, it can be operated from a rectifier. There are five independent contacts, three actuated mechanically by removal of the switchman's padlock and two operated electrically. The three choices of contact arrangements are shown in Figures 1, 2, and 3 page 24. The lock has an emergency release with latch-out feature, which cannot be operated until the switchman's padlock is removed. Provision is made for sealing the emergency release.

Locks are offered complete with all parts to fit switch stands as listed. The lever guide is fitted with two 1/8" thick shims for 3/4" thick hand-throw lever. One of these shims should be removed when 7/8" thick hand-throw lever is used and both shims should be removed when 1" thick hand-throw lever is used.

For more detailed description, see Bulletin 187. Installation details are given in Handbook 31.

ORDERING INFORMATION

Locks with fittings to adapt to specific latch stands are listed on pages 24 and 25 according to the switch stands they are designed to fit. These locks include your choice of wire entrance coupling (for either flexible or solid rubber conduit) and a single contact, candelabra bayonet base lamp, bulb shape S-11 or S-8, as you may specify from Catalog Section 46.

NOTE: If you do not find your switch stand listed on pages 24 and 25, please let us know manufacturer's name and model number, and we shall be glad to advise whether Model 10 lock can be applied.

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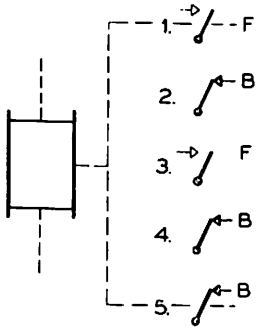


Figure 1

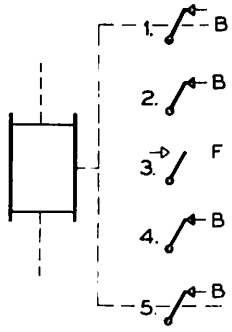


Figure 2

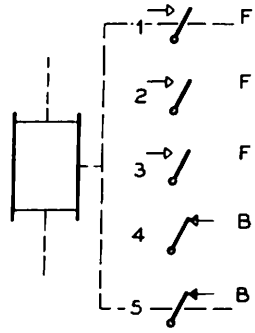


Figure 3

Contact arrangements available with Model 10 electric switch lock. Contacts are shown with switch locked in normal position. Contacts 1 and 5 are actuated by energization of the lock-magnet coils. Contacts 2, 3, and 4 are actuated whenever the padlock is removed.

MODEL 10 ELECTRIC SWITCH LOCKS WITH FITTINGS TO ADAPT TO SPECIFIC SWITCH STANDS

TO LOCK SWITCH STAND IN ONE POSITION ONLY - R-H or L-H.

NOTE: See ordering information on page 23.

To order, specify "Model 10 Lock" and give catalog number. Lock includes your choice of lamp bulb. Specify catalog number of lamp you wish (S8 or S11 bulb shape) from Catalog Section 46.

MODEL 10 LOCK, WITH ALL PARTS REQUIRED TO FIT THE FOLLOWING:	CONTACT ARRANGEMENT (See illustrations above)	CATALOG NUMBER WITH FITTING FOR 1-1/2" FLEX. CONDUIT*	CATALOG NUMBER WITH FITTING FOR 1-7/8" I. D. RUBBER CONDUIT*
GRS Model 9 Switch Machine	Figure 1	A50-420	*NOTE: A50-420 THRU A50-422 INCLUDE CONDUIT AS WELL AS CONDUIT FITTINGS.*
	Figure 2	A50-421	
	Figure 3	A50-422	
Bethlehem 51A ("New Century")	Figure 1	A50-495	A50-442
	Figure 2	A50-496	A50-443
	Figure 3	A50-497	A50-424
Bethlehem 53A	Figure 1	A50-445	A50-447
	Figure 2	A50-446	A50-448
	Figure 3	A50-425	A50-426
Cleveland Odenkirk	Figure 1	A50-450	A50-452
	Figure 2	A50-451	A50-453
	Figure 3	A50-427	A50-428
Ramapo (Racor) 109 or 110	Figure 1	A50-455	A50-457
	Figure 2	A50-456	A50-458
	Figure 3	A50-429	A50-430

* Conduit fittings and fastenings are furnished as required to fit each specific switch stand. To order conduit, see page 26.

MODEL 10 ELECTRIC SWITCH LOCKS WITH FITTINGS TO ADAPT TO SPECIFIC SWITCH STANDS

TO LOCK SWITCH STAND IN ONE POSITION ONLY. - R-H or L-H.

NOTE: See ordering information on page 23.

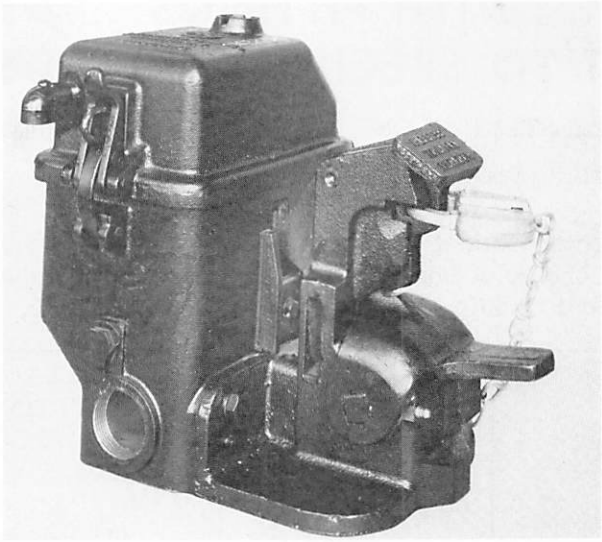
To order, specify "Model 10 Lock" and give catalog number. Lock includes your choice of lamp bulb. Specify catalog number of lamp you wish (S8 or S11 bulb shape) from Catalog Section 46.

MODEL 10 LOCK, WITH ALL PARTS REQUIRED TO FIT THE FOLLOWING:	CONTACT ARRANGEMENT (See illustrations on page 24)	CATALOG NUMBER	
		WITH FITTING FOR 1-1/2" FLEX. CONDUIT*	WITH FITTING FOR 1-7/8" I. D. RUBBER CONDUIT*
Pettibone Mulliken 4	Figure 1	A50-460	A50-462
	Figure 2	A50-461	A50-463
	Figure 3	A50-431	A50-432
Pettibone Mulliken 5	Figure 1	A50-465	A50-467
	Figure 2	A50-466	A50-468
	Figure 3	A50-433	A50-434
Ramapo Ajax 26E	Figure 1	A50-470	A50-472
	Figure 2	A50-471	A50-473
	Figure 3	A50-435	A50-436
Ramapo Ajax 36D	Figure 1	A50-476	A50-478
	Figure 2	A50-477	A50-479
	Figure 3	A50-437	A50-438
Ramapo Ajax 36H	Figure 1	A50-480	A50-482
	Figure 2	A50-481	A50-483
	Figure 3	A50-439	A50-444
Ramapo (Racor) E1419	Figure 1	A50-485	A50-487
	Figure 2	A50-486	A50-488
	Figure 3	A50-449	A50-454
Rapro	Figure 1	A50-490	A50-492
	Figure 2	A50-491	A50-493
	Figure 3	A50-459	A50-464

* Conduit fittings and fastenings are furnished as required to fit each specific switch stand. To order conduit, see page 26.

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MODEL 10 ELECTRIC SWITCH LOCK ONLY

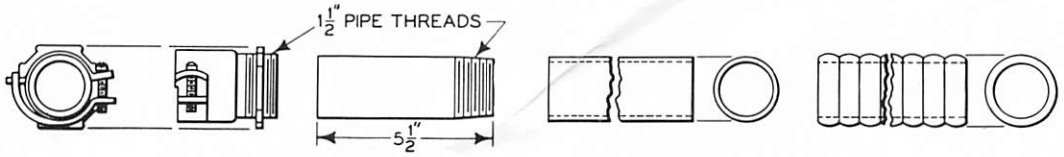


NOTE: See ordering information on page 23.

To order, specify "Model 10 Lock", and give catalog number. Lock includes your choice of lamp bulb. Specify catalog number of lamp you wish (S8 or S11 bulb shape) from Catalog Section 46.

CONTACT ARRANGEMENT (See illustrations on page 24)	CATALOG NUMBER For Single Lock
Figure 1	A50-400
Figure 2	A50-401
Figure 3	A50-402

CONDUIT AND FITTINGS



Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
A	COUPLING, 1-1/2" pipe thread for 1-1/2" flexible conduit	A85-866
B	PIPE NIPPLE, 1-1/2" pipe thread for 1-7/8" I. D. rubber conduit .	A85-867
C	CONDUIT, 1-7/8" I. D., solid rubber, length 3'	A85-520
D	CONDUIT, 1-1/2" flexible, length 3'	A85-868

CATALOG SECTION 50

Spring Switch Lock

CONTENTS

	Page
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Spring Switch Lock Layout	46
Spring Switch Lock	48
Marker	52
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Wire Entrance Coupling and Conduit	50
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A UNIT OF GENERAL SIGNAL CORPORATION
ROCHESTER NEW YORK 14602

PRINTED IN U.S.A.

A1780

February 1969

Spring Switch Lock

GENERAL DESCRIPTION

The GRS spring switch lock gives you all the facilities of a spring switch and also provides: (1) full facing point protection with complete circuit-controller check of both locking and point position; (2) automatic unlocking for trailing moves; and (3) a built-in hand-throw mechanism with high mechanical advantage for easy operation. Operation, installation, and maintenance are covered in Handbook 66.

Many parts of the GRS spring switch lock are interchangeable with those of the GRS Model 9 hand-operated switch machine. This feature helps reduce spare parts inventory.

The built-in circuit controllers are "dual-normal and reverse". The dual-normal controller checks that the switch points are in proper position and also provides for individual detection of overlocked and underlocked conditions. This permits individual control of signals governing facing and trailing moves, so that mainline moves in either direction - but not trailing moves from the siding - may be made with the switch overlocked; and trailing moves - but not facing moves - may be made with the switch underlocked. The reverse controller provides for detection of switch point position when the switch is hand-thrown to the reverse position.

Circuit controllers are designed to respond to the standard 1/4-inch obstruction requirement. In addition, the circuit controller mechanism has a latchout feature. If the point-detector rod is moved 3/8 inch or more from its normal position when the locking plunger is not withdrawn from the lock rod, the normal contacts will go to their unlocked position and will remain there until they are manually reset.

As shipped, dual-normal circuit controllers have one normally open and one normally closed independent contact on the "overlocked" section and same on the "underlocked" section. The reverse controller has two open and two closed. All contacts are designed so they can be rearranged in the field, if desired.

The spring switch lock is listed without target staff. A domed cap covers the upper end of the throw crank shaft. A collar is attached to this shaft by a pin. Either low or high target staff may be added to the spring switch lock. Remove the cap, pin, and collar and replace them with a complete target staff assembly, which includes drive coupling and driven coupling, adjustable for proper alignment.

The latch rod, which is installed in the field, is furnished with the spring switch lock. If the hand-throw lever is operated toward the normal position and is not fully seated in the latch stand, the latch rod will hold up the latch in the latch stand. This prevents the insertion of a padlock. Full throw of the hand-throw lever to the normal position before padlocking is thus ensured.

Wire entrance is through a 1-1/2 inch pipe-tapped hole on the circuit-controller end of the machine.

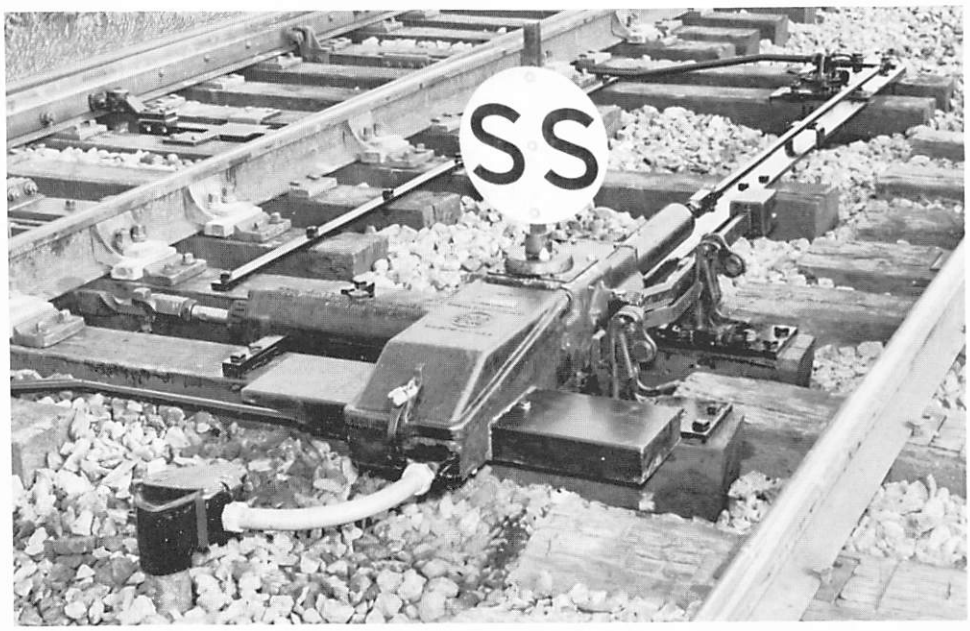
RIGHT-HAND OR LEFT-HAND LAYOUTS

Spring switch locks may be ordered for either right- or left-hand installation, both for the closed-point side. A right-hand layout is one located on the right-hand side of the track when facing the switch points.

The same switch lock serves for all layouts with a rearrangement of the hand-throw mechanism and release linkage. Changeover from a closed-point to an open-point application requires a different detector rod and release crank. See page 52.

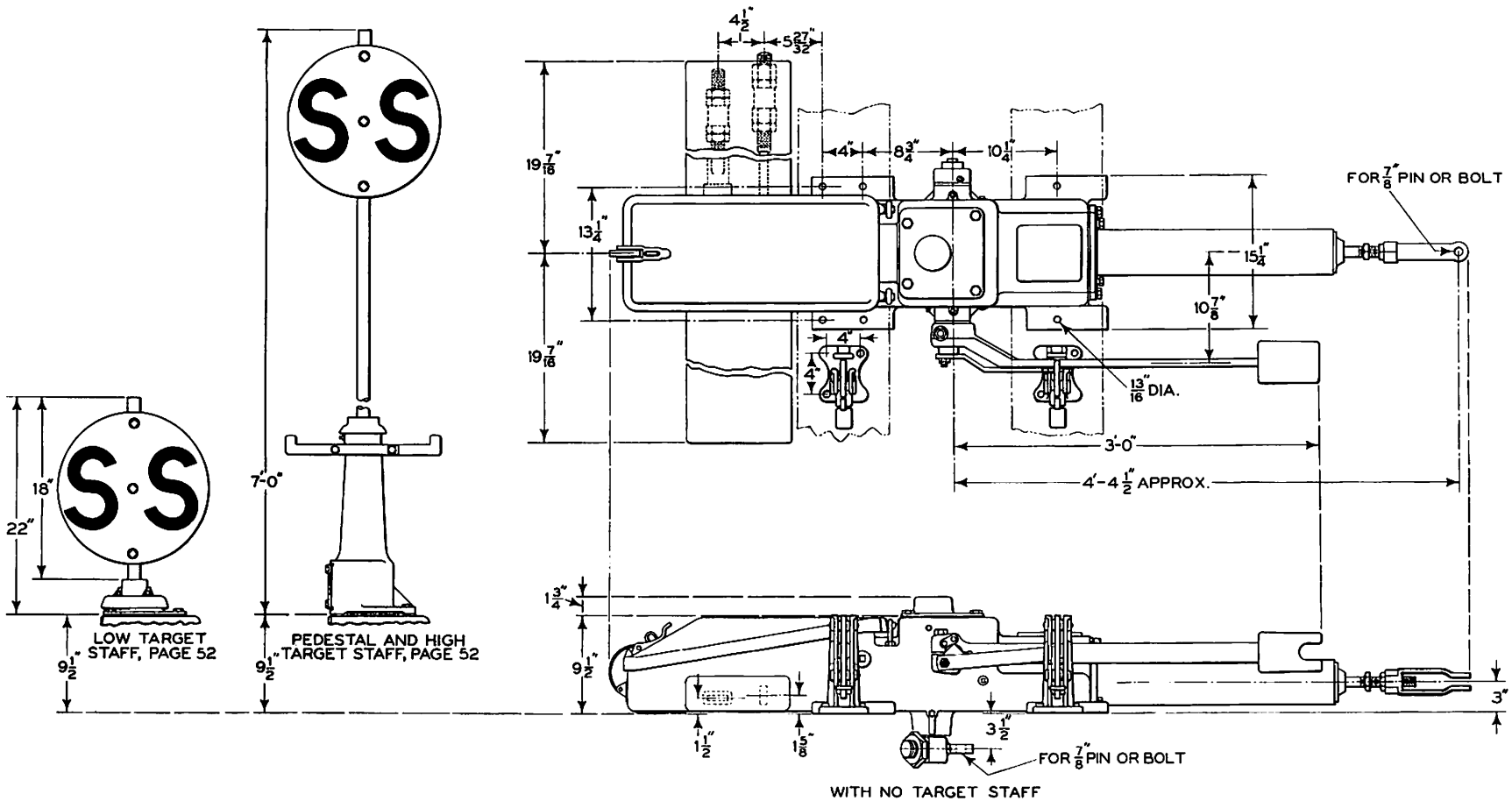
ROLLER BEARING

At least one roller bearing should be installed in the layout if the switch points are 20 feet or more in length. The roller bearing is described in detail in GRS Publication D53. 1001. To order, see Catalog Section 91.



Typical spring switch installation.
Low target staff with "SS" marker is optional equipment.

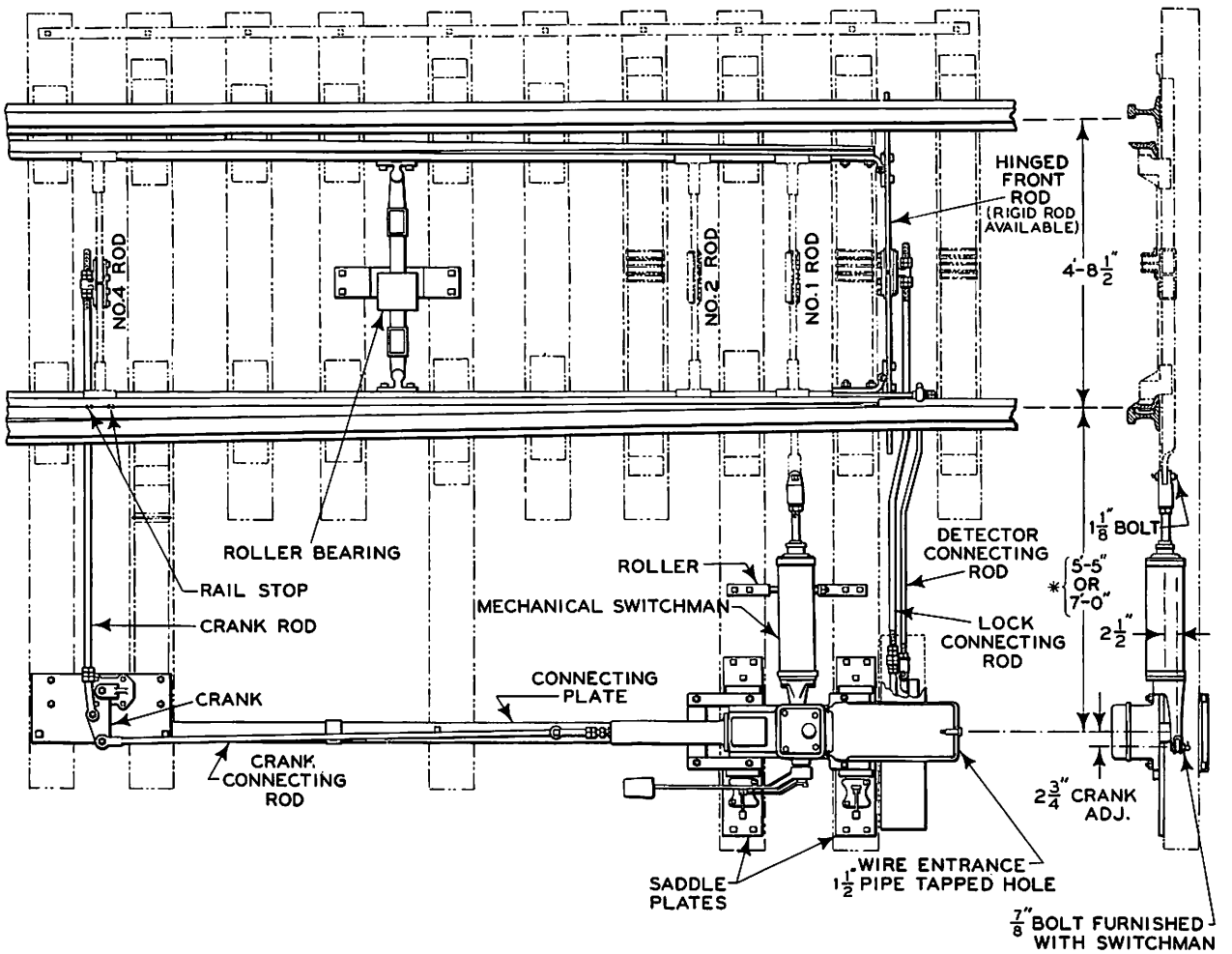
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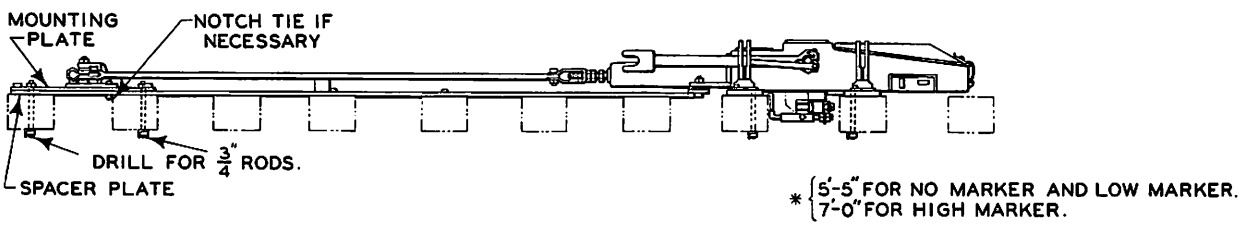


General dimensions.

Memoranda

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Spring switch lock layout.

SPRING SWITCH LOCK LAYOUT

To order, specify "Spring Switch Lock Layout", giving catalog number. Your choices of lugs A through F, page 50, are included with each lock. Please specify lug choices by catalog numbers.

IMPORTANT: Please send a drawing of the switch layout so we can supply you a lock exactly fitted to your switch. This drawing should include switch point drilling.

The Spring Switch Lock Layout comprises:

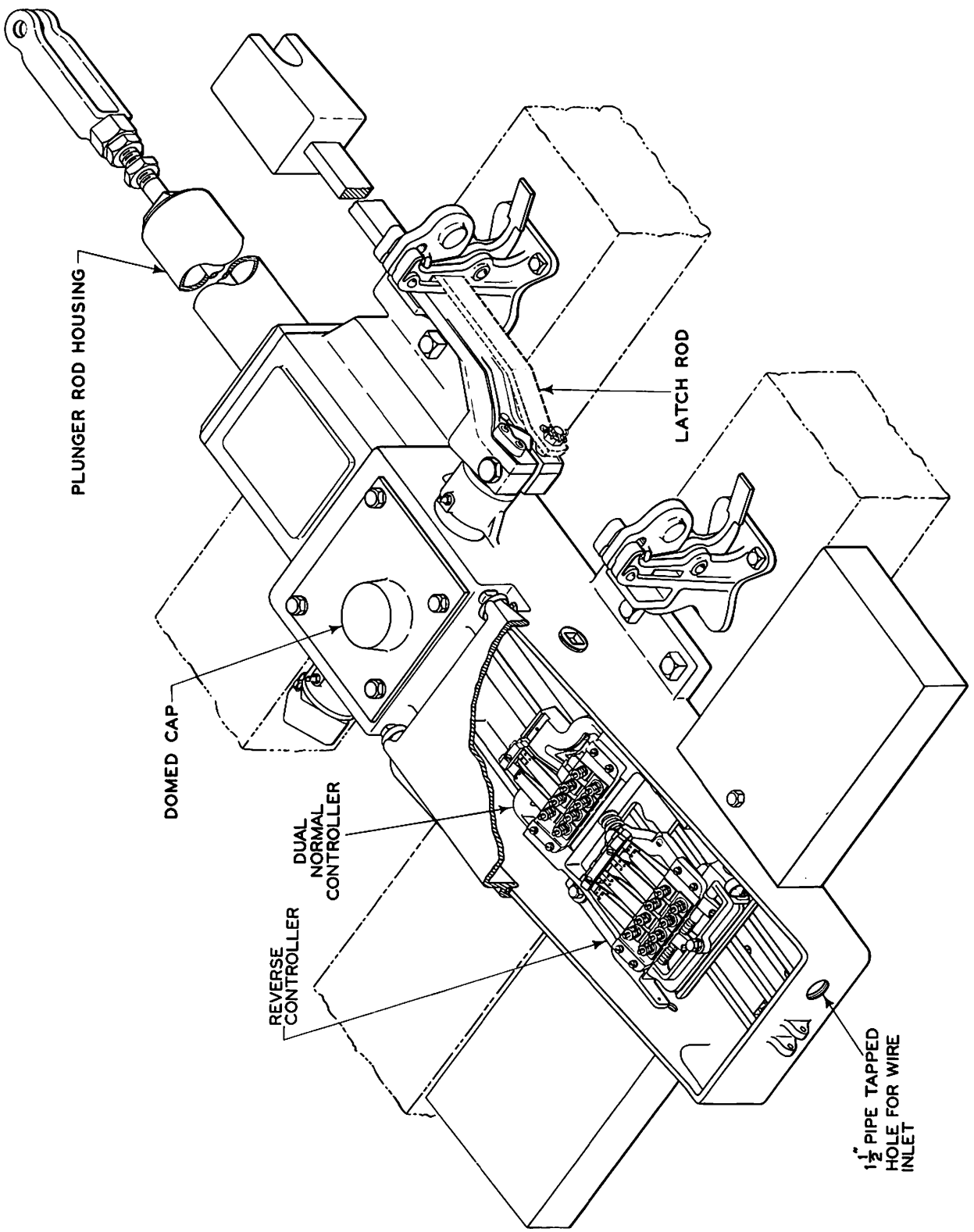
1. Spring switch lock with your choice of lock and detector rod lugs.
2. Latch stands.
3. Lock connecting rod complete.
4. Detector connecting rod complete.
5. Mechanical Switchman with roller.
6. Connecting plate, and crank with mounting plate and spacer plate.
7. Crank connecting rod and crank rod complete.
8. Rail stop.
9. Latch rod.

LOCK LAYOUT	POINT POSITION	CONTROLLER	CATALOG NUMBER
Right Hand	Closed	Dual-normal & Reverse	A50-720
Left Hand	Closed	Dual-normal & Reverse	A50-727

ORDER THE FOLLOWING ITEMS SEPARATELY, AS NEEDED.

1 - Wire entrance couplings and conduit, page 50.
2 - Target staffs, marker and lamp tip, page 52.
3 - Saddle plates, page 52.
4 - Roller bearing, front rods, point lugs and junction boxes, Catalog Section 91.
5 - Mounting bolts, Catalog Section 3.

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Spring switch lock only.

SPRING SWITCH LOCK

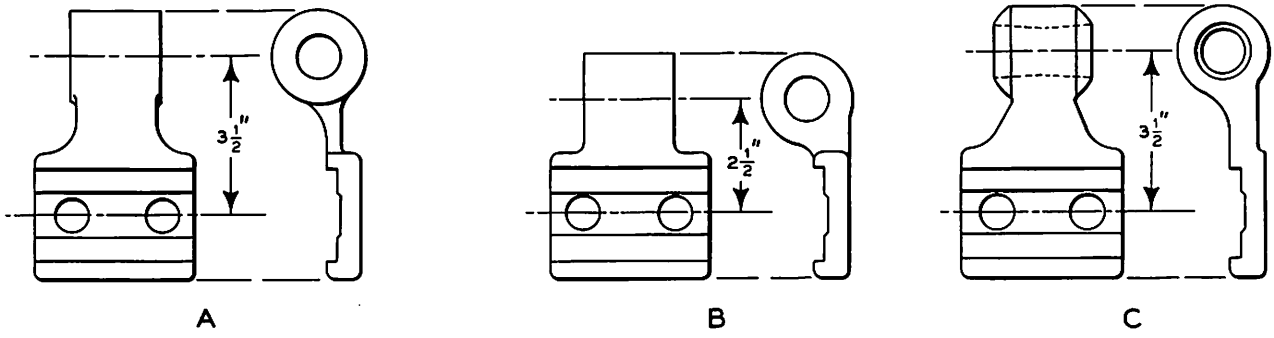
To order, specify "Spring Switch Lock", giving catalog number. Your choices of lugs A through F, page 50, are included with each lock. Please specify lug choices by catalog numbers.

LOCK LAYOUT	POINT POSITION	CONTROLLER	CATALOG NUMBER
Right Hand	Closed	Dual-normal & Reverse	A50-770
Left Hand	Closed	Dual-normal & Reverse	A50-777

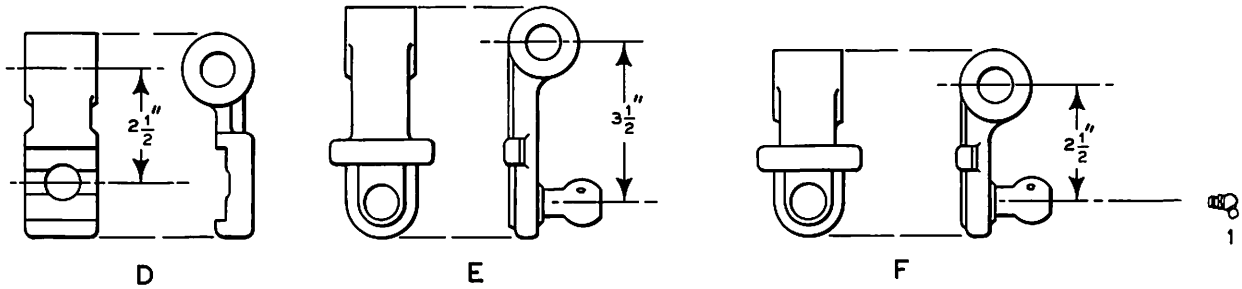
ORDER THE FOLLOWING ITEMS SEPARATELY, AS NEEDED:

1 - Wire entrance couplings and conduit, page 50.
2 - Target staffs, marker and lamp tip, page 52.
3 - Mounting bolts, Catalog Section 3.

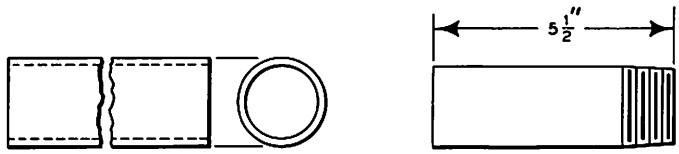
Signed by Israel Jones, texasrails.org 7/16/2026

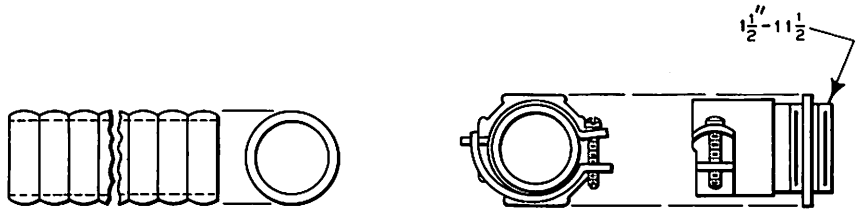


LOCK ROD LUGS



DETECTOR ROD LUGS





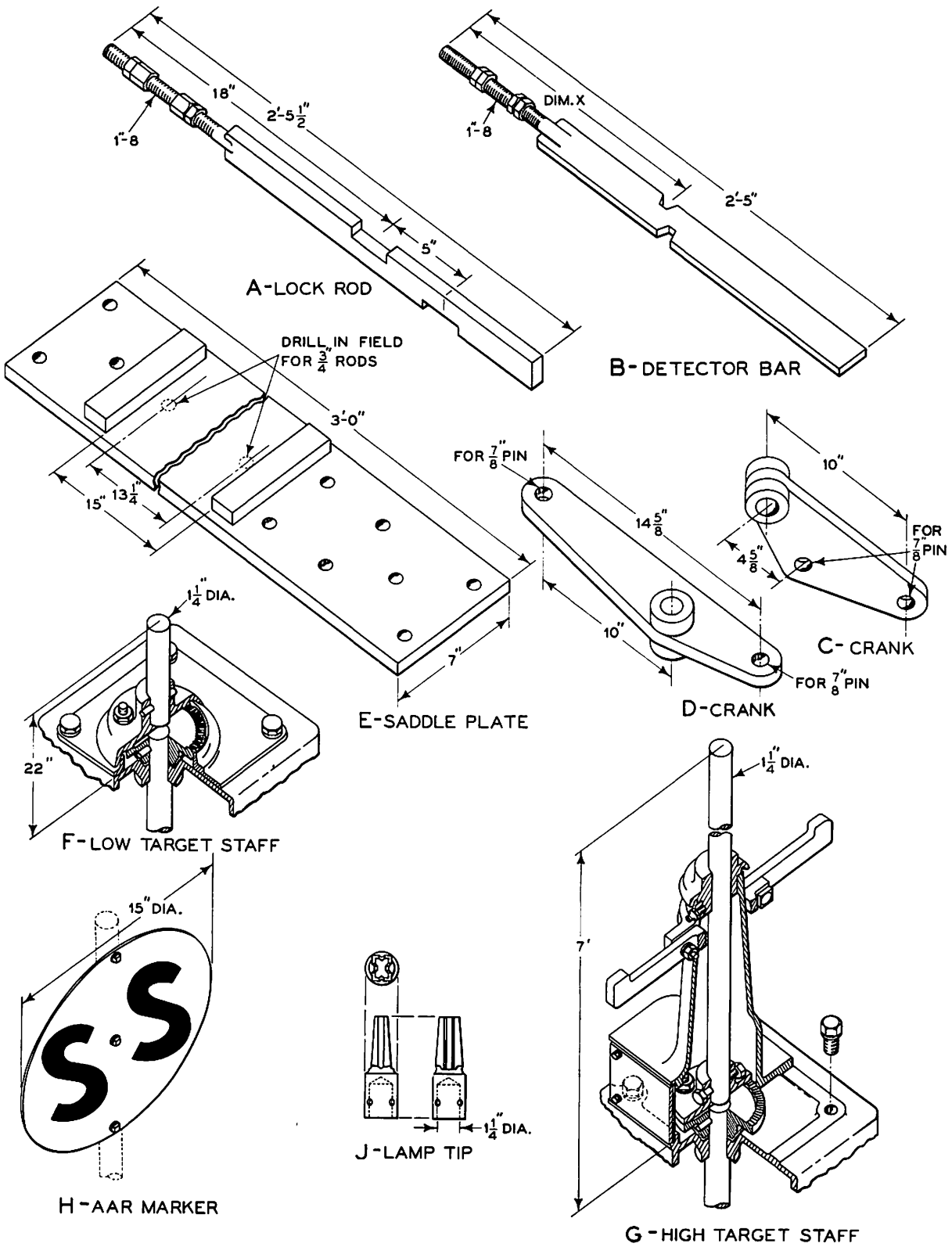
Accessories for spring switch lock.

ACCESSORIES FOR SPRING SWITCH LOCK

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
	THE FOLLOWING ITEMS ARE FURNISHED WITH LOCK LAYOUTS LISTED ON PAGE 47, AND LOCKS ONLY, PAGE 49, BUT ARE SHOWN HERE FOR YOUR SELECTION OF ONE LOCK ROD LUG AND ONE DETECTOR ROD LUG.	
A	LUG, 3-1/2" spacing, for lock rod	A85-560
B	LUG, 2-1/2" spacing, for lock rod	A85-561
C	LUG, 3-1/2" spacing, swivel type, for lock rod, includes cup nuts.	A85-562
D	LUG, 2-1/2" spacing, for 1" dia. detector rod	A87-179
E	LUG, 3-1/2" spacing, for 1" dia. detector rod	A87-181
F	LUG, 2-1/2" spacing, for 1" dia. detector rod	A87-185
	THE FOLLOWING ITEMS ARE NOT FURNISHED WITH LOCK LAYOUTS LISTED ON PAGE 47 AND LOCKS ONLY, PAGE 49, AND SHOULD BE ORDERED SEPARATELY AS NEEDED.	
G	CONDUIT, 1-7/8" I. D., solid rubber, length 3'	A85-520
H	PIPE NIPPLE, 1-1/2" pipe thread for 1-7/8" I. D. rubber conduit . .	A85-867
J	CONDUIT, 1-1/2" flexible, length 3'.	A85-868
K	COUPLING, 1-1/2" pipe thread for 1-1/2" flexible conduit	A85-866
1	GREASE FITTING, for detector lugs.	P87-101

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Target staffs, lock rod, detector rods, saddle plates and cranks.

TARGET STAFFS, LOCK ROD, DETECTOR RODS, SADDLE PLATES AND CRANKS

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
	NOTE: LOCK RODS AND DETECTOR RODS ARE FURNISHED WITH LOCK LAYOUTS LISTED ON PAGE 47, AND LOCKS ONLY, PAGE 49; CRANKS ARE FURNISHED WITH LOCK LAYOUTS ONLY, LISTED ON PAGE 49. THESE ARE SHOWN HERE FOR THE PURPOSE OF CONVERTING A LOCK FROM RIGHT-HAND TO LEFT-HAND.	
A	LOCK ROD, reversible, for either open or closed point side. Order lug from page 50	A87-230
B	DETECTOR BAR, for closed point side; for right- or left-hand layout. Dimension "X"= 17". Order lug from page 50	A87-239
B1	DETECTOR BAR, for open point side; for right- or left-hand layout. Dimension "X" = 22". Order lug from page 50	A87-241
C	CRANK, for closed-point layout	A50-790
D	CRANK, for open-point layout	A50-792
	NOTE: THE FOLLOWING ITEMS ARE NOT FURNISHED WITH LOCK LAYOUTS LISTED ON PAGE 47 AND LOCKS ONLY, PAGE 49, AND SHOULD BE ORDERED SEPARATELY AS NEEDED.	
E	SADDLE PLATE, for No. 1 or 2 tie, drilled for latch stand	A50-795
F	LOW TARGET STAFF complete, 1-1/4" dia., not drilled for marker or lamp tip. Includes drive and driven couplings and all necessary hardware	A87-250
G	HIGH TARGET STAFF complete, 1-1/4" dia., not drilled for marker or lamp tip. Includes drive and driven couplings, pedestal, and all necessary hardware. May be shortened in the field as desired	A87-253
H	MARKER, A. A. R. for low or high round target staffs, complete with bolts, nuts and washers	A50-799
J	LAMP TIP, for low or high target staffs, complete with bolt, nut and washer	A87-259

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Memoranda

CATALOG SECTION A50

CROSS - INDEX

SWITCHLOCKS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A50-100	21150-201 GR20		9B LOCK	3
A50-105	21150-201 GR18		9B LOCK	3
A50-110	21150-201 GR43		9B LOCK	3
A50-115	21150-201 GR10		9B LOCK	3
A50-205			LOCK ROD SINGLE DWG 14095-9 GR 2	4
	14094-44		ROD	
	545-11	2	NUT	
	2813	2	NUT	
A50-206			LOCK ROD SINGLE DWG 14095-9 GR 1	4
	14094-43		ROD	
	545-11	2	NUT	
	2813	2	NUT	
A50-207			LOCK ROD SINGLE DWG 14095-9 GR 3	4
	14094-56		ROD	
	545-11	2	NUT	
	2813	2	NUT	
A50-208			LOCK ROD SINGLE DWG 14095-9 GR 4	4
	14094-57		ROD	
	545-11	2	NUT	
	2813	2	NUT	
A50-220	6226-34GR2		JUNCTION BOX	4
A50-221	6226-34GR1		JUNCTION BOX	4
A50-225	21150-201 GR45		MODEL 9B DWARF LOCK	
A50-400			MODEL 10 LOCK W/LAMP	26
	58800-4GR1		10 LOCK	
	34866-6		LAMP	
A50-401			MODEL 10 LOCK W/LAMP	26
	58800-4GR3		10 LOCK	
	34866-6		LAMP	
A50-402			MODEL 10 LOCK W/LAMP	26
	58800-4GR38		10 LOCK	
	34866-6		LAMP	
A50-420			MODEL 10 LOCK W/LAMP	24
	58800-4GR1		10 LOCK	
	59559		BASE	
	46987-64		ROD	
	47509-2		STUD	
	38931-2		NUT	
	0169		COTTER	
	17188-10		PIN	
	0617-2	2	BOLT / NUT	
	01273-13	2	WASHER	
	46499	2	WASHER	
	45688-91GR2		COUPLING	
	0825		BUSHING	
	35132-11		ELBOW	
	56353-33		COUPLING	
	81086-20GR1	2	CONDUIT	
	34866-6		LAMP 12K-19 INST. SPEC. BLUE PRINT 51139-470	

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CATALOG SECTION A50

CROSS - INDEX

SWITCHLOCKS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A50-421			MODEL 10 LOCK W/LAMP	24
	58800-4GR3		10 LOCK	
	59559		BASE	
	46987-64		ROD	
	47509-2		STUD	
	38931-2		NUT	
	0169		COTTER	
	17188-10		PIN	
	0617-2	2	BOLT / NUT	
	01273-13	2	WASHER	
	46499	2	WASHER	
	45688-91GR2		COUPLING	
	0825		BUSHING	
	35132-11		ELBOW	
	56353-33		COUPLING	
	81086-20GR1	2	CONDUIT	
	34866-6		LAMP 12K-19 INST. SPEC. BLUE PRINT 51139-470	
A50-422			MODEL 10 LOCK W/LAMP	24
	58800-4GR38		10 LOCK	
	59559		BASE	
	46987-64		ROD	
	47509-2		STUD	
	38931-2		NUT	
	0169		COTTER	
	17188-10		PIN	
	0617-2	2	BOLT / NUT	
	01273-13	2	WASHER	
	46499	2	WASHER	
	45688-91GR2		COUPLING	
	0825		BUSHING	
	35132-11		ELBOW	
	56353-33		COUPLING	
	81086-20GR1	2	CONDUIT	
	34866-6		LAMP 12K-19 INST. SPEC. BLUE PRINT 51139-470	
A50-424			MODEL 10 LOCK W/LAMP	24
	58800-4GR38		10 LOCK	
	58667 GR2		SUPPORT	
	46987-66		ROD	
	50694		RIVET	
	6890		PIN	
	38922-16	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	45689-112		COUPLING	
	0827		NUT	
	34866-6		LAMP 12K-16 INST. SPEC. BLUE PRINT 51139-272	

CATALOG SECTION A50

CROSS - INDEX

SWITCHLOCKS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A50-425			MODEL 10 LOCK W/LAMP	24
	58800-4GR38		10 LOCK	
	58667-1GR1		SUPPORT	
	46987-27		ROD	
	50694		RIVET	
	46976-160		PLATE	
	38922-15	4	ROD	
	0229	4	NUT	
	0272-9	4	NUT	
	01273-13	4	WASHER	
	5656-67	2	WASHER	
	0617	2	BOLT / NUT	
	529		PIN	
	56353-33		COUPLING	
	34866-6		LAMP 12K-15 INST. SPEC. BLUE PRINT 51139-292	
A50-426			MODEL 10 LOCK W/LAMP	24
	58800-4GR38		10 LOCK	
	58667-1GR1		SUPPORT	
	46987-27		ROD	
	50694		RIVET	
	46976-160		PLATE	
	38922-15	4	ROD	
	0229	4	NUT	
	0272-9	4	NUT	
	01273-13	4	WASHER	
	5656-67	2	WASHER	
	0617	2	BOLT&NUT	
	529		PIN	
	49034-3		NIPPLE	
	0827		NUT	
	34866-6		LAMP 12K-15 INST. SPEC. BLUE PRINT 51139-292	
A50-427			MODEL 10 LOCK W/LAMP	24
	58800-4GR38		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-70		ROD	
	50694		RIVET	
	38922-16	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	56353-33		COUPLING	
	34866-6		LAMP 12K-20 INST. SPEC. BLUE PRINT 51139-324	
A50-428			MODEL 10 LOCK W/LAMP	24
	58800-4GR38		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-70		ROD	
	50694		RIVET	
	38922-16	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	49034-3		NIPPLE	
	0827		NUT	
	34866-6		LAMP 12K-20 INST. SPEC. BLUE PRINT 51139-324	

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CATALOG SECTION A50

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SWITCHLOCKS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A50-429			MODEL 10 LOCK W/LAMP	24
	58800-4GR38		10 LOCK	
	58667 GR1		SUPPORT	
	46987-68		ROD	
	50694		RIVET	
	6890		PIN	
	38922-25	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	56353-33		COUPLING	
	34866-6		LAMP 12K-17	
			INST.	
			SPEC.	
			BLUE PRINT 51139-290	
A50-430			MODEL 10 LOCK W/LAMP	24
	58800-4GR38		10 LOCK	
	58667 GR1		SUPPORT	
	46987-68		ROD	
	50694		RIVET	
	6890		PIN	
	38922-25	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	49034-3		NIPPLE	
	0827		NUT	
	34866-6		LAMP 12K-17	
			INST.	
			SPEC.	
			BLUE PRINT 51139-290	
A50-431			MODEL 10 LOCK W/LAMP	25
	58800-4GR38		10LOCK	
	58667-1GR2		SUPPORT	
	46987-54		ROD	
	50694		RIVET	
	21506-92		PLATE	
	068	2	SCREW	
	32446-3	2	BOLT&NUT	
	01273-13	2	WASHER	
	56353-33		COUPLING	
	34866-6		LAMP 12K-29	
			INST.	
			SPEC.	
			BLUE PRINT 51139-419	
A50-432			MODEL 10 LOCK W/LAMP	25
	58800-4GR38		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-54		ROD	
	50694		RIVET	
	21506-92		PLATE	
	068	2	SCREW	
	32446-3	2	BOLT&NUT	
	01273-13	2	WASHER	
	49034-5		NIPPLE	
	0827		NUT	
	34866-6		LAMP 12K-29	
			INST.	
			SPEC.	
			BLUE PRINT 51139-419	

CATALOG SECTION A50

CROSS - INDEX

SWITCHLOCKS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A50-433			MODEL 10 LOCK W/LAMP	25
	58800-4GR38		MODEL 10 LOCK	
	58667-1GR2		SUPPORT	
	46987-69		ROD	
	50694		RIVET	
	38922-22	2	ROD	
	0229	2	NUT	
	0272-9	2	WASHER	
	01273-13	2	WASHER	
	5656-67		WASHER	
	56353-33		COUPLING	
	34866-6		LAMP 12K-21	
			INST.	
			SPEC.	
			BLUE PRINT 51139-339	
A50-434			MODEL 10 LOCK W/LAMP	25
	58800-4GR38		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-69		ROD	
	50694		RIVET	
	38922-22	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	49034-5		NIPPLE	
	0827		NUT	
	34866-6		LAMP 12K-21	
			INST.	
			SPEC.	
			BLUE PRINT 51139-339	
A50-435			MODEL 10 LOCK W/LAMP	25
	58800-4GR38		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-76		ROD	
	50694		RIVET	
	542-109		BOLT	
	01273-13	2	WASHER	
	0272-9	2	NUT	
	38922-16		ROD	
	46499		WASHER	
	0229		NUT	
	21506-116		PLATE	
	068	2	SCREW	
	56353-33		COUPLING	
	34866-6		LAMP 12K-36	
			INST.	
			SPEC.	
			BLUE PRINT 51139-541	
A50-436			MODEL 10 LOCK W/LAMP	25
	58800-4GR38		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-76		ROD	
	50694		RIVET	
	542-109		BOLT	
	01273-13	2	WASHER	
	0272-9	2	NUT	
	38922-16		ROD	
	0229		NUT	
	46499		WASHER	
	21506-116		PLATE	
	068	2	SCREW	
	49034-5		NIPPLE	
	0827		NUT	
	34866-6		LAMP 12K-36	
			INST.	
			SPEC.	
			BLUE PRINT 51139-541	

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CATALOG SECTION A50

CROSS - INDEX

SWITCHLOCKS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A50-437			MODEL 10 LOCK W/LAMP	25
	58800-4GR38		10 LOCK	
	58667-2GR1		SUPPORT	
	46987-32		ROD	
	50694		RIVET	
	38922-13		ROD	
	0229		NUT	
	0272-9		NUT	
	46499		WASHER	
	01273-13	2	WASHER	
	0432		BOLT&NUT	
	21506-61		PLATE	
	0231	2	SCREW	
	56353-33		COUPLING	
	34866-6		LAMP 12K-18	
			INST.	
			SPEC.	
			BLUE PRINT 51139-301	
A50-438			MODEL 10 LOCK W/LAMP	25
	58800-4GR38		10 LOCK	
	58667-2GR1		SUPPORT	
	46987-32		ROD	
	50694		RIVET	
	38922-13		ROD	
	0229		NUT	
	0272-9		NUT	
	46499		WASHER	
	01273-13	2	WASHER	
	0432		BOLT / NUT	
	21506-61		PLATE	
	0231	2	SCREW	
	49034-5		NIPPLE	
	0827		NUT	
	34866-6		LAMP 12K-18	
			INST.	
			SPEC.	
			BLUE PRINT 51139-301	
A50-439			MODEL 10 LOCK W/LAMP	25
	58800-4GR38		10 LOCK	
	58667-2GR1		SUPPORT	
	46987-32		ROD	
	50694		RIVET	
	38922-13		ROD	
	0229		NUT	
	0272-9		NUT	
	46499		WASHER	
	01273-13	2	WASHER	
	0432		BOLT&NUT	
	21506-61		PLATE	
	0231	2	SCREW	
	56353-33		COUPLING	
	34866-6		LAMP 12K-18	
			INST.	
			SPEC.	
			BLUE PRINT 51139-301	
A50-442			MODEL 10 LOCK W/LAMP	24
	58800-4GR1		10 LOCK	
	58667 GR2		SUPPORT	
	46987-66		ROD	
	50694		RIVET	
	6890		PIN	
	38922-16	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	45689-112		COUPLING	
	0827		NUT	
	34866-6		LAMP 12K-16	
			INST.	
			SPEC.	
			BLUE PRINT 51139-272	

CATALOG SECTION A50

CROSS - INDEX

SWITCHLOCKS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A50-443			MODEL 10 LOCK W/LAMP	24
	58800-4GR3		10 LOCK	
	58667 GR2		SUPPORT	
	46987-66		ROD	
	50694		RIVET	
	6890		PIN	
	38922-16	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	45689-112		COUPLING	
	0827		NUT	
	34866-6		LAMP 12K-16 INST. SPEC. BLUE PRINT 51139-272	
A50-444			MODEL 10 LOCK W/LAMP	25
	58800-4GR38		10 LOCK	
	58667-2GR1		SUPPORT	
	46987-32		ROD	
	50694		RIVET	
	38922-13		ROD	
	0229		NUT	
	0272-9		NUT	
	46499		WASHER	
	01273-13	2	WASHER	
	0432		BOLT&NUT	
	21506-61		PLATE	
	0231	2	SCREW	
	49034-5		NIPPLE	
	0827		NUT	
	34866-6		LAMP 12K-18 INST. SPEC. BLUE PRINT 51139-301	
A50-445			MODEL 10 LOCK W/LAMP	24
	58800-4GR1		10 LOCK	
	58667-1GR1		SUPPORT	
	46987-27		ROD	
	50694		RIVET	
	46976-160		PLATE	
	38922-15	4	ROD	
	0229	4	NUT	
	0272-9	4	NUT	
	01273-13	4	WASHER	
	5656-67	2	WASHER	
	0617	2	BOLT / NUT	
	529		PIN	
	56353-33		COUPLING	
	34866-6		LAMP 12K-15 INST. SPEC. BLUE PRINT 51139-292	
A50-446			MODEL 10 LOCK / LAMP	24
	58800-4GR3		10 LOCK	
	58667-1GR1		SUPPORT	
	46987-27		ROD	
	50694		RIVET	
	46976-160		PLATE	
	38922-15	4	ROD	
	0229	4	NUT	
	0272-9	4	NUT	
	01273-13	4	WASHER	
	5656-67	2	WASHER	
	0617	2	BOLT / NUT	
	529		PIN	
	56353-33		COUPLING	
	34866-6		LAMP 12K-15 INST. SPEC. BLUE PRINT 51139-292	

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CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A50-447			MODEL 10 LOCK W/LAMP	24
	58800-4GR1		10 LOCK	
	58667-1GR1		SUPPORT	
	46987-27		ROD	
	50694		RIVET	
	46976-160		PLATE	
	38922-15	4	ROD	
	0229	4	NUT	
	0272-9	4	NUT	
	01273-13	4	WASHER	
	5656-67	2	WASHER	
	0617	2	BOLT / NUT	
	529		PIN	
	49034-3		NIPPLE	
	34866-6		LAMP 12K-15 INST. SPEC. BLUE PRINT 51139-292	
	0827		NUT	
A50-448			MODEL 10 LOCK W/LAMP	24
	58800-4GR3		10 LOCK	
	58667-1GR1		SUPPORT	
	46987-27		ROD	
	50694		RIVET	
	46976-160		PLATE	
	38922-15	4	ROD	
	0229	4	NUT	
	0272-9	4	NUT	
	01273-13	4	WASHER	
	5656-67	2	WASHER	
	0617	2	BOLT&NUT	
	529		PIN	
	49034-3		NIPPLE	
	0827		NUT	
	34866-6		LAMP 12K-15 INST. SPEC. BLUE PRINT 51139-292	
A50-450			MODEL 10 LOCK W/LAMP	24
	58800-4GR1		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-70		ROD	
	50694		RIVET	
	38922-16	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	56353-33		COUPLING	
	34866-6		LAMP 12K-20 INST. SPEC. BLUE PRINT 51139-324	
A50-451			MODEL 10 LOCK W/LAMP	24
	58800-4GR3		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-70		ROD	
	50694		RIVET	
	38922-16	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	56353-33		COUPLING	
	34866-6		LAMP 12K-20 INST. SPEC. BLUE PRINT 51139-324	

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CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A50-452			MODEL 10 LOCK W/LAMP	24
	58800-4GR1		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-70		ROD	
	50694		RIVET	
	38922-16	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	49034-3		NIPPLE	
	0827		NUT	
	34866-6		LAMP 12K-20	
			INST.	
			SPEC.	
			BLUE PRINT 51139-324	
A50-453			MODEL 10 LOCK W/LAMP	24
	58800-4GR3		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-70		ROD	
	50694		RIVET	
	38922-16	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	49034-3		NIPPLE	
	0827		NUT	
	34866-6		LAMP 12K-20	
			INST.	
			SPEC.	
			BLUE PRINT 51139-324	
A50-455			MODEL 10 LOCK W/LAMP	24
	58800-4GR1		10 LOCK	
	58667 GR1		SUPPORT	
	46987-68		ROD	
	50694		RIVET	
	6890		PIN	
	38922-25	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	56353-33		COUPLING	
	34866-6		LAMP 12K-17	
			INST.	
			SPEC.	
			BLUE PRINT 51139-290	
A50-456			MODEL 10 LOCK W/LAMP	24
	58800-4GR3		10 LOCK	
	58667 GR1		SUPPORT	
	46987-68		ROD	
	50694		RIVET	
	6890		PIN	
	38922-25	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	56353-33		COUPLING	
	34866-6		LAMP 12K-17	
			INST.	
			SPEC.	
			BLUE PRINT 51139-290	

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CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A50-457			MODEL 10 LOCK W/LAMP	24
	58800-4GR1		10 LOCK	
	58667 GR1		SUPPORT	
	46987-68		ROD	
	50694		RIVET	
	6890		PIN	
	38922-25	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	49034-3		NIPPLE	
	0827		NUT	
	34866-6		LAMP 12K-17 INST. SPEC. BLUE PRINT 51139-290	
A50-458			MODEL 10 LOCK W/LAMP	24
	58800-4GR3		10 LOCK	
	58667 GR1		SUPPORT	
	46987-68		ROD	
	50694		RIVET	
	6890		PIN	
	38922-25	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	49034-3		NIPPLE	
	0827		NUT	
	34866-6		LAMP 12K-17 INST. SPEC. BLUE PRINT 51139-290	
A50-459			MODEL 10 LOCK W/LAMP	25
	58800-4GR38		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-68		ROD	
	50694		RIVET	
	38922-20	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	56353-33		COUPLING	
	34866-6		LAMP 12K-26 INST. SPEC. BLUE PRINT 51139-358	
A50-460			MODEL 10 LOCK W/LAMP	25
	58800-4GR1		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-54		ROD	
	50694		RIVET	
	21506-92		PLATE	
	068	2	SCREW	
	32446-3	2	BOLT&NUT	
	01273-13	2	WASHER	
	56353-33		COUPLING	
	34866-6		LAMP 12K-29 INST. SPEC. BLUE PRINT 51139-419	

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CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A50-461			MODEL 10 LOCK W/LAMP	25
	58800-4GR3		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-54		ROD	
	50694		RIVET	
	21506-92		PLATE	
	068	2	SCREW	
	32446-3	2	BOLT&NUT	
	01273-13	2	WASHER	
	56353-33		COUPLING	
	34866-6		LAMP	
			12K-29	
			INST.	
			SPEC.	
			BLUE PRINT	
			51139-419	
A50-462			MODEL 10 LOCK W/LAMP	25
	58800-4GR1		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-54		ROD	
	50694		RIVET	
	21506-92		PLATE	
	068	2	SCREW	
	32446-3	2	BOLT&NUT	
	01273-13	2	WASHER	
	49034-5		NIPPLE	
	0827		NUT	
	34866-6		LAMP	
			12K-29	
			INST.	
			SPEC.	
			BLUE PRINT	
			51139-419	
A50-463			MODEL 10 LOCK W/LAMP	25
	58800-4GR3		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-54		ROD	
	50694		RIVET	
	21506-92		PLATE	
	068	2	SCREW	
	32446-3	2	BOLT&NUT	
	01273-13	2	WASHER	
	49034-5		NIPPLE	
	0827		NUT	
	34866-6		LAMP	
			12K-29	
			INST.	
			SPEC.	
			BLUE PRINT	
			51139-419	
A50-464			MODEL 10 LOCK W/LAMP	
	58800-4GR38		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-68		ROD	
	50694		RIVET	
	38922-20	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	49034-5		NIPPLE	
	0827		NUT	
	34866-6		LAMP	
			12K-26	
			INST.	
			SPEC.	
			BLUE PRINT	
			51139-358	

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SWITCHLOCKS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A50-465			MODEL 10 LOCK W/LAMP	25
	58800-4GR1		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-69		ROD	
	50694		RIVET	
	38922-22	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	56353-33		COUPLING	
	34866-6		LAMP	
			12K-21 INST. SPEC. BLUE PRINT 51139-339	
A50-466			MODEL 10 LOCK W/LAMP	25
	58800-4GR3		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-69		ROD	
	50694		RIVET	
	38922-22	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	56353-33		COUPLING	
			12K-21 INST.SPEC. BLUE PRINT 51139-339	
	34866-6		LAMP	
A50-467			SWITCH LOCK COMPLETE	25
	58800-4GR1		LOCK	
	58667-1GR2		SUPPORT	
	46987-69		ROD	
	50694		RIVET	
	38922-22	2	RODS	
	0229	2	NUTS	
	0272-9	2	NUTS	
	01273-13	2	WASHERS	
	5656-67		WASHER	
	49034-5		NIPPLE	
	0827		NUT	
	34866-6		LAMP	
			12K-21 INST.SPEC. BLUE PRINT 51139-339	
A50-468			MODEL 10 LOCK W/LAMP	25
	58800-4GR3		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-69		ROD	
	50694		RIVET	
	38922-22	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	49034-5		NIPPLE	
	0827		NUT	
	34866-6		LAMP	
			INST SPEC 12K-26 BLUE PRINT 51139-339	

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SWITCHLOCKS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A50-470			MODEL 10 LOCK W/LAMP	25
	58800-4GR1		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-76		ROD	
	50694		RIVET	
	542-109		BOLT	
	01273-13	2	WASHER	
	0272-9	2	NUT	
	38922-16		ROD	
	46499		WASHER	
	0229		NUT	
	21506-116		PLATE	
	068	2	SCREW	
	56353-33		COUPLING	
	34866-6		LAMP	
			12K-36	
			INST.	
			SPEC.	
			BLUE PRINT	
			51139-541	
A50-471			MODEL 10 LOCK W/LAMP	25
	58800-4GR3		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-76		ROD	
	50694		RIVET	
	542-109		BOLT	
	01273-13	2	WASHER	
	0272-9	2	NUT	
	38922-16		ROD	
	46499		WASHER	
	0229		NUT	
	21506-116		PLATE	
	068	2	SCREW	
	56353-33		COUPLING	
	34866-6		LAMP	
			12K-36	
			INST.	
			SPEC.	
			BLUE PRINT	
			51139-541	
A50-472			MODEL 10 LOCK W/LAMP	25
	58800-4GR1		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-76		ROD	
	50694		RIVET	
	542-109		BOLT	
	01273-13	2	WASHER	
	0272-9	2	NUT	
	38922-16		ROD	
	0229		NUT	
	46499		WASHER	
	21506-116		PLATE	
	068	2	SCREW	
	49034-5		NIPPLE	
	0827		NUT	
	34866-6		LAMP	
			12K-36	
			INST.	
			SPEC.	
			BLUE PRINT	
			51139-541	
A50-473			MODEL 10 LOCK W/LAMP	25
	58800-4GR3		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-76		ROD	
	50694		RIVET	
	542-109		BOLT	
	01273-13	2	WASHER	
	0272-9	2	NUT	
	38922-16		ROD	
	0229		NUT	
	46499		WASHER	
	21506-116		PLATE	
	068	2	SCREW	
	49034-5		NIPPLE	
	0827		NUT	
	34866-6		LAMP	
			12K-36	
			INST.	
			SPEC.	
			BLUE PRINT	
			51139-541	

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CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A50-476			MODEL 10 LOCK W/LAMP	25
	58800-4GR1		10 LOCK	
	58667-2GR1		SUPPORT	
	46987-32		ROD	
	50694		RIVET	
	38922-13		ROD	
	0229		NUT	
	0272-9		NUT	
	46499		WASHER	
	01273-13	2	WASHER	
	0432		BOLT&NUT	
	21506-61		PLATE	
	0231	2	SCREW	
	56353-33		COUPLING	
	34866-6		LAMP 12K-18	
			INST.	
			SPEC.	
			BLUE PRINT 51139-301	
A50-477			MODEL 10 LOCK W/LAMP	25
	58800-4GR3		10 LOCK	
	58667-2GR1		SUPPORT	
	46987-32		ROD	
	50694		RIVET	
	38922-13		ROD	
	0229		NUT	
	0272-9		NUT	
	46499		WASHER	
	01273-13	2	WASHER	
	0432		BOLT&NUT	
	21506-61		PLATE	
	0231	2	SCREW	
	56353-33		COUPLING	
	34866-6		LAMP 12K-18	
			INST.	
			SPEC.	
			BLUE PRINT 51139-301	
A50-478			MODEL 10 LOCK W/LAMP	25
	58800-4GR1		10 LOCK	
	58667-2GR1		SUPPORT	
	46987-32		ROD	
	50694		RIVET	
	38922-13		ROD	
	0229		NUT	
	0272-9		NUT	
	46499		WASHER	
	01273-13	2	WASHER	
	0432		BOLT / NUT	
	21506-61		PLATE	
	0231	2	SCREW	
	49034-5		NIPPLE	
	0827		NUT	
	34866-6		LAMP 12K-18	
			INST.	
			SPEC.	
			BLUE PRINT 51139-301	
A50-479			MODEL 10 LOCK W/LAMP	25
	58800-4GR3		10 LOCK	
	58667-2GR1		SUPPORT	
	46987-32		ROD	
	50694		RIVET	
	38922-13		ROD	
	0229		NUT	
	0272-9		NUT	
	46499		WASHER	
	01273-13	2	WASHER	
	0432		BOLT / NUT	
	21506-61		PLATE	
	0231	2	SCREW	
	49034-5		NIPPLE	
	0827		NUT	
	34866-6		LAMP 12K-18	
			INST.	
			SPEC.	
			BLUE PRINT 51139-301	

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SWITCHLOCKS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A50-480			MODEL 10 LOCK W/LAMP	25
	58800-4GR1		10 LOCK	
	58667-2GR1		SUPPORT	
	46987-32		ROD	
	50694		RIVET	
	38922-13		ROD	
	0229		NUT	
	0272-9		NUT	
	46499		WASHER	
	01273-13	2	WASHER	
	0432		BOLT&NUT	
	21506-61		PLATE	
	0231	2	SCREW	
	56353-33		COUPLING	
	34866-6		LAMP 12K-18 INST. SPEC. BLUE PRINT 51139-301	
A50-481			MODEL 10 LOCK W/LAMP	25
	58800-4GR3		10 LOCK	
	58667-2GR1		SUPPORT	
	46987-32		ROD	
	50694		RIVET	
	38922-13		ROD	
	0229		NUT	
	0272-9		NUT	
	46499		WASHER	
	01273-13	2	WASHER	
	0432		BOLT&NUT	
	21506-61		PLATE	
	0231	2	SCREW	
	56353-33		COUPLING	
	34866-6		LAMP BLUE PRINT 51139-301 12K-18 INST.SPEC.	
A50-482			MODEL 10 LOCK W/LAMP	25
	58800-4GR1		10 LOCK	
	58667-2GR1		SUPPORT	
	46987-32		ROD	
	50694		RIVET	
	38922-13		ROD	
	0229		NUT	
	0272-9		NUT	
	46499		WASHER	
	01273-13	2	WASHER	
	0432		BOLT&NUT	
	21506-61		PLATE	
	0231	2	SCREW	
	49034-5		NIPPLE	
	0827		NUT	
	34866-6		LAMP 12K-18 INST. SPEC. BLUE PRINT 51139-301	
A50-483			MODEL 10 LOCK W/LAMP	25
	58800-4GR3		10 LOCK	
	58667-2GR1		SUPPORT	
	46987-32		ROD	
	50694		RIVET	
	38922-13		ROD	
	0229		NUT	
	0272-9		NUT	
	46499		WASHER	
	01273-13	2	WASHER	
	0432		BOLT&NUT	
	21506-61		PLATE	
	0231	2	SCREW	
	49034-5		NIPPLE	
	0827		NUT	
	34866-6		LAMP 12K-18 INST. SPEC. BLUE PRINT 51139-301	

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CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A50-490			MODEL 10 LOCK W/LAMP	25
	58800-4GR1		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-68		ROD	
	50694		RIVET	
	38922-20	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	56353-33		COUPLING	
	34866-6		LAMP	
			INST SPEC 12K-26	
			BLUE PRINT 51139-358	
A50-491			MODEL 10 LOCK W/LAMP	25
	58800-4GR3		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-68		ROD	
	50694		RIVET	
	38922-20	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	56353-33		COUPLING	
	34866-6		LAMP	
			INST SPEC 12K-26	
			BLUE PRINT 51139-358	
A50-492			MODEL 10 LOCK W/LAMP	25
	58800-4GR1		10LOCK	
	58667-1GR2		SUPPORT	
	46987-68		ROD	
	50694		RIVET	
	38922-20	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	49034-5		NIPPLE	
	0827		NUT	
	34866-6		LAMP	
			12K-26	
			INST.	
			SPEC.	
			BLUE PRINT 51139-358	
A50-493			MODEL 10 LOCK W/LAMP	25
	58800-4GR3		10 LOCK	
	58667-1GR2		SUPPORT	
	46987-68		ROD	
	50694		RIVET	
	38922-20	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	49034-5		NIPPLE	
	0827		NUT	
	34866-6		LAMP	
			12K-26	
			INST.	
			SPEC.	
			BLUE PRINT 51139-358	

CATALOG SECTION A50

CROSS - INDEX

SWITCHLOCKS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A50-495			MODEL 10 LOCK W/LAMP	24
	58800-4GR1		10 LOCK	
	58667 GR2		SUPPORT	
	46987-66		ROD	
	50694		RIVET	
	6890		PIN	
	38922-16	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	56353-33		COUPLING	
	35132-32		ELBOW	
	34866-6		LAMP	
	0827		NUT .	
			BLUE PRINT 51139-272 INST.SPEC. 12K-16	
A50-496			MODEL 10 LOCK W/LAMP	24
	58800-4GR3		10 LOCK	
	58667 GR2		SUPPORT	
	46987-66		ROD	
	50694		RIVET	
	6890		PIN	
	38922-16	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	56353-33		COUPLING	
	35132-32		ELBOW	
	34866-6		LAMP	
	0827		NUT	
			BLUE PRINT 51139-272 INST.SPEC. 12K-16	
A50-497			MODEL 10 LOCK W/LAMP	24
	58800-4GR38		10 LOCK	
	58667 GR2		SUPPORT	
	46987-66		ROD	
	50694		RIVET	
	6890		PIN	
	38922-16	2	ROD	
	0229	2	NUT	
	0272-9	2	NUT	
	01273-13	2	WASHER	
	5656-67		WASHER	
	56353-33		COUPLING	
	35132-32		ELBOW	
	34866-6		LAMP	
	0827		NUT	
			BLUE PRINT 51139-272 INST.SPEC. 12K-16	
A50-777			LOCK W/ CHOICE OF LUGS (SPEC)	49
	59400-103GR7		LOCK	
	30908		LUG (LR)	
	30908		LUG (DR) OR	
	59534		LUG (DR)	
A50-790	58538-2GR1		CRANK	53
A50-792	58538-3GR1		CRANK	53
A50-799			MARKER	53
	39754-121		PLATE	
	45634-9	3	B&N	
	01273-7	3	WASHER	
	19867-2	3	WASHER	

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CATALOG SECTION 53

Power Supplies for cTc Type Code Lines for Code-Repeater Locations

CONTENTS

	Page
cTc Line Energy Power Supply	3
cTc Line and Relay Energy Power Supply	4
Motor Alternators	6
Replacement Parts	5

TOOLS FOR TRANSPORTATION

GENERAL RAILWAY SIGNAL COMPANY

ROCHESTER, NEW YORK

Printed in U. S. A.

A-1808

May 1961

Power Supplies for cTc Type Code lines for Code Repeater Locations

These power supplies are for use in place of a battery in cTc type installations. They are available in two arrangements, (1) a cTc Line Energy Power Supply; and (2) a cTc Line and Relay Energy Power Supply, which has provision for also supplying energy to code-repeater relays. This second arrangement is for use at Syncroscan® and at Quiktrol® code-repeater locations.

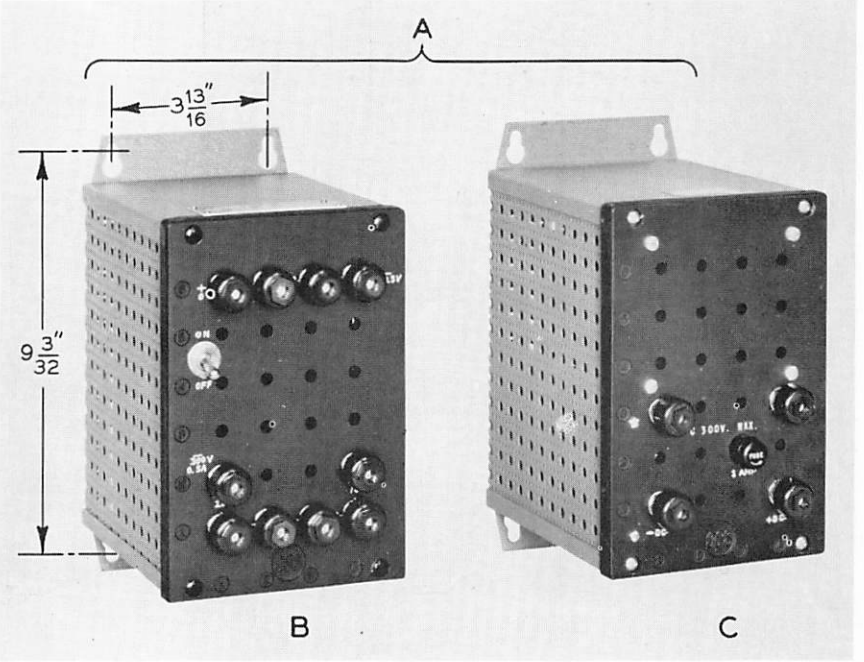
Operation is from 110-125 volts, 50/60 cycle a-c. Maximum power consumption is approximately 135 watts. Taps on transformer units provide for required adjustments.

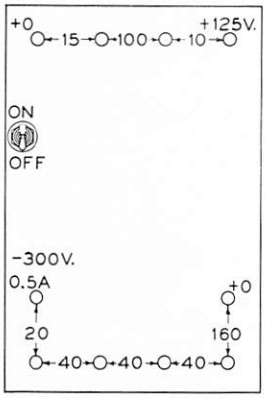
Motor alternators, for standby service, are listed on page 6.

For detailed description, see GRS Development Sheet D99.0501.

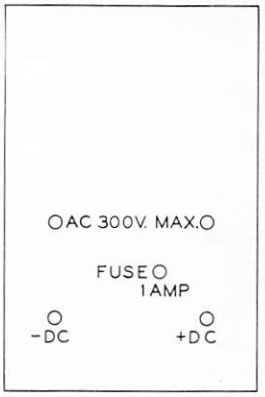
Signed by Israel Jones, texasrails.org 7/16/2026

cTc LINE ENERGY POWER SUPPLY





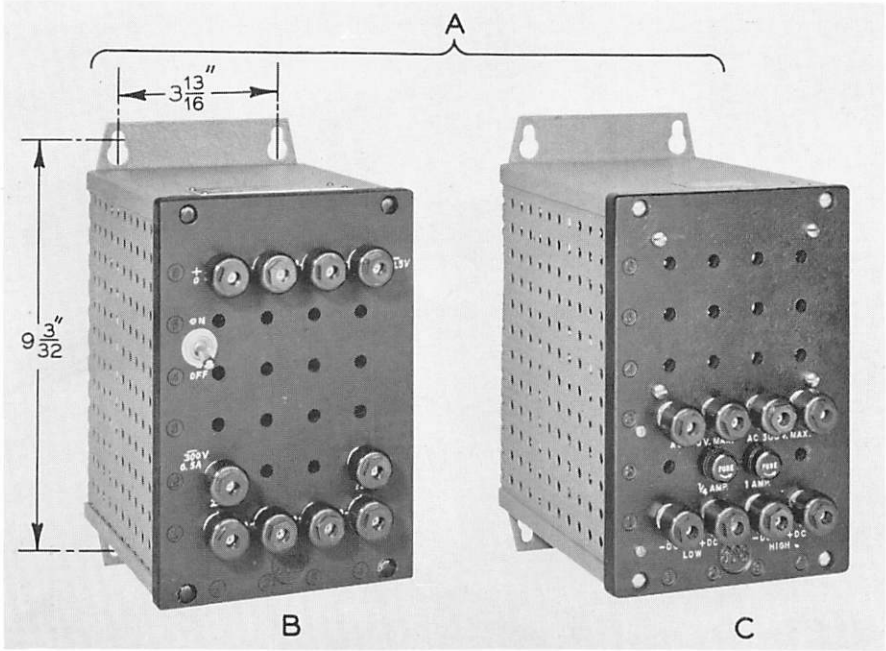
EACH UNIT
- HEIGHT - 9 13/16"
- WIDTH - 5 3/8"
- DEPTH - 8 1/8"

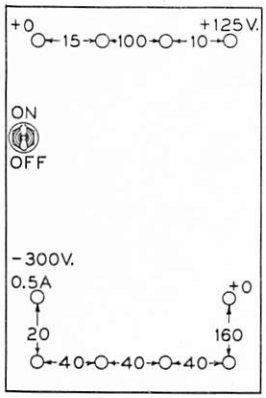


Order by catalog number and name shown in bold type

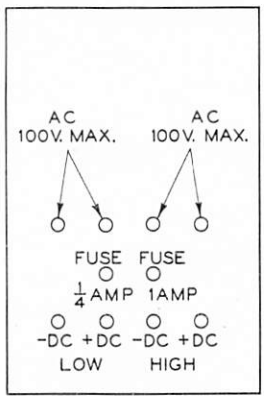
REF	NAME	CATALOG NUMBER
A	cTc LINE ENERGY POWER SUPPLY, complete with one Ref. B and one Ref. C	A53-300
B	TRANSFORMER UNIT with primary taps at 15-100 - 10 volts; secondary taps from 20 to 160 volts in 20- volt steps, and from 160 to 280 volts in 40-volt steps. An additional 20-volt step provides a maximum output of 300 volts. An ON-OFF switch is inserted in the primary leads	A53-305
C	LINE ENERGY RECTIFIER - FILTER UNIT with maximum input of 300 volts a-c and maximum d-c output of 255 volts for a 500 ma. load	A53-310

cTc LINE AND RELAY ENERGY POWER SUPPLY





EACH UNIT
- HEIGHT - 9 13/16"
- WIDTH - 5 3/8"
- DEPTH - 8 1/8"



Order by catalog number and name shown in bold type

REF	NAME	CATALOG NUMBER
A	cTc LINE AND RELAY ENERGY POWER SUPPLY, complete with one Ref. B and one Ref. C	A53-320
B	TRANSFORMER UNIT with primary taps at 15-100 -10 volts; secondary taps from 20 to 160 volts in 20-volt steps, and from 160 to 280 volts in 40-volt steps. An additional 20-volt step provides a maximum output of 300 volts. An ON-OFF switch is inserted in the primary leads	A53-305
C	LINE AND RELAY ENERGY RECTIFIER-FILTER UNIT with maximum input of 300 volts a-c and maximum d-c outputs of: 255 volts (500 ma. load) from the line energy rectifier-filter section, 100 volts (150 ma. load) from the relay energy rectifier filter section	A53-325

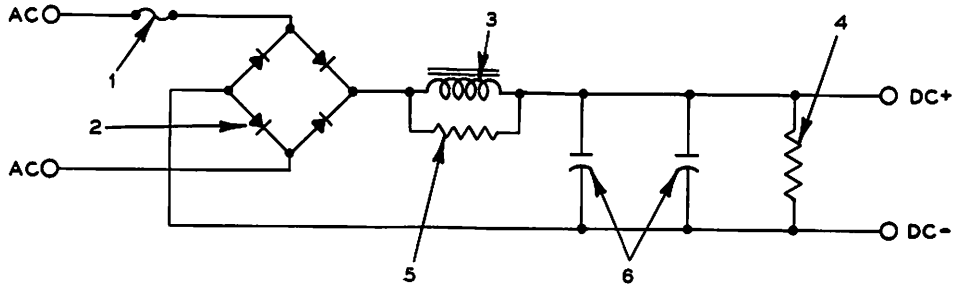
Signed by Israel Jones, texasrails.org 7/16/2026

REPLACEMENT PARTS

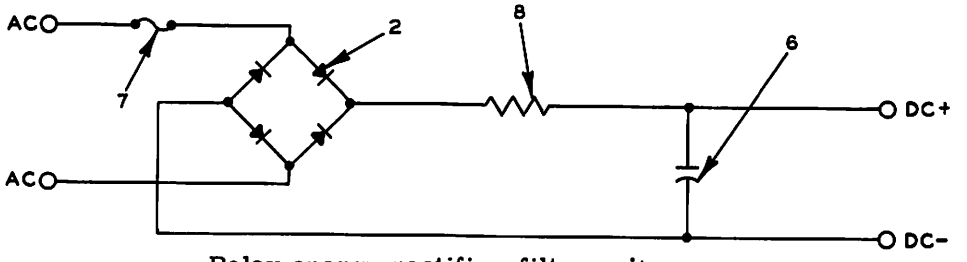
Order by catalog number and name shown in bold type

REF	NAME	CATALOG NUMBER
*	SWITCH, DPST, two-position toggle switch. CUTLER-HAMMER - catalog number 82607, for transformer unit catalog number A53-305	P53-301
	THE FOLLOWING ARE FOR FILTER UNITS, CATALOG NUMBER A53-310 and A53-325.	
* 1	FUSE, 1 ampere, LITTLE FUSE, 3AG-312001	P53-303
1A	FUSE HOLDER, for above	P53-305
* 2	DIODE, silicon, 600 volts peak inverse voltage, 750 ma. maximum forward current. TEXAS INSTRUMENT, 1N2071 . .	~~P5-307~~ P53-307
3	CHOKE	P53-309
4	RESISTOR, 20 K ohms ± 5%, 10 watts.	P53-311
5	RESISTOR, 10 K ohms ± 5%, 10 watts.	P53-313
* 6	CAPACITOR, 80 mfd, 450 vdcw, dry electroletic. SPRAGUE, Type 17D	P53-315
	THE FOLLOWING ARE FOR FILTER UNIT, CATALOG NUMBER A53-325 ONLY.	
* 7	FUSE, 0.25 ampere SLO-BLO, LITTLE FUSE, 3AG 313.250	P53-317
7A	FUSE HOLDER, for above	P53-305
8	RESISTOR, 10 ohms, ± 10%, 2 watts, composition	P53-319

* Commercial items.



Line energy rectifier-filter unit.



Relay energy rectifier-filter unit.

MOTOR ALTERNATORS

Alternators are equipped with 18" flexible leads for both input and output.

To order specify, "alternator" and give catalog number

NAME	CATALOG NUMBER
MOTOR ALTERNATOR, with rating as follows: Input: 24 volts d-c, 6 amperes Output: 115 volts a-c, 60 cycles, 80 watts	A53-330
MOTOR ALTERNATOR, with rating as follows: Input: 28 volts d-c, 3 amperes Output: 115 volts a-c, 60 cycles, 40 watts	A53-332

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CATALOG SECTION 53

Rectifiers

CONTENTS

	Page
Type S - rectifying unit in case	24
Type ST - rectifying unit with adjustable reactive transformer	22
Type SC - unit for half-wave rectified track circuits, for instrument case mounting	28
Type SVA - unit for half-wave rectified track circuits, for tie mounting	26
Type SP - large capacity rectifiers, with adjustable charging rate	30
Type S 1/4 - low capacity rectifiers for special application	34
Type S 1/2 - low capacity rectifier for special application	32
Types SQ 1/2, and SQA 1/2 - low capacity rectifiers for special applications	32

For rectifiers used with relays, switch machines, coded track and Trakode® equipment, etc., refer to corresponding catalog sections. For resistors, arresters etc., see Catalog Section 3.

GENERAL RAILWAY SIGNAL COMPANY

A UNIT OF GENERAL SIGNAL CORPORATION

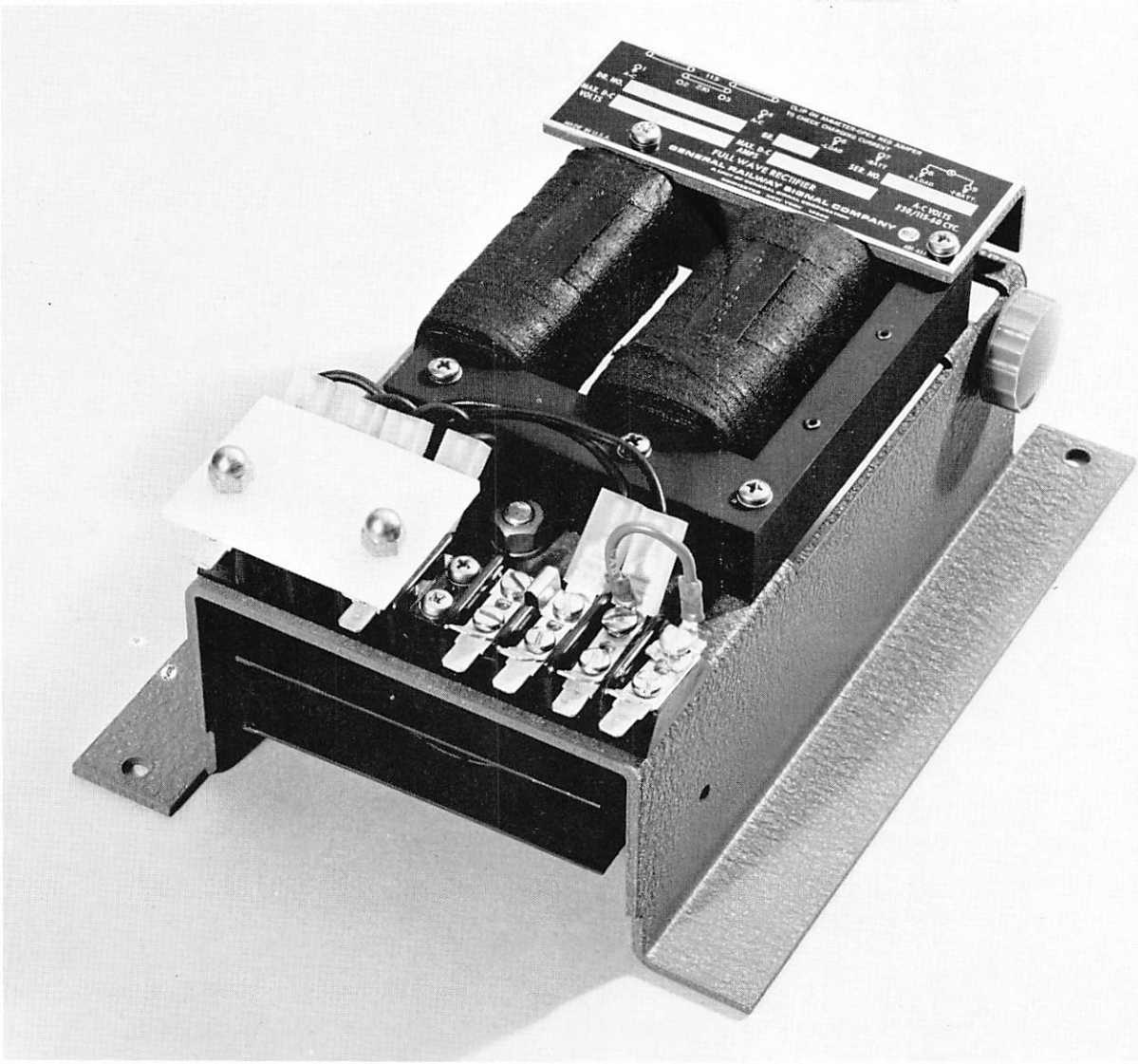
ROCHESTER NEW YORK 14602

PRINTED IN U.S.A.

A2087

September 1969

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A

Height - 4-1/8"
Width - 7-1/2"
Length - 9-7/16"

Mounting Centers
6-1/4" x 8-13/16" (2 holes)

Type ST rectifier.

TYPE ST RECTIFIER
SELENIUM

The Type ST rectifier comprises a rectifying unit with an adjustable, reactive transformer which provides, by means of the micrometer screw adjustment of the laminated yoke, an easy, gradual adjustment of the charging current from minimum to maximum rating.

The primary of the transformer is made up of two coils which can be connected in series for use on 230 volt a-c supply or connected in multiple for use on 115 volt a-c supply.

To order, specify "ST Rectifier" and give catalog number

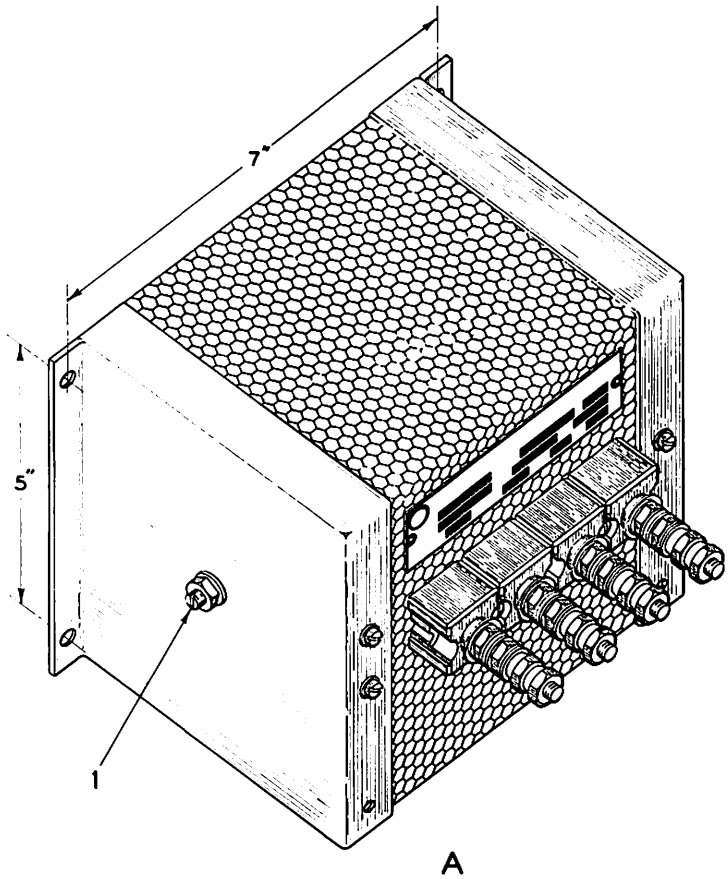
ORDERING INFORMATION FOR COMPLETE RECTIFIER

REF.	A-C INPUT		D-C OUTPUT		FOR CHARGING	CATALOG
	VOLTS	CYCLES	VOLTS	AMPS.	LEAD CELLS	NUMBER
A	230/115	50/60	3.0	2.5	1	A53-525
A1	"	"	3.0	5.0	1	A53-532
A2	"	"	13.5 15.5	0.6 0.5	5-7	A53-526
A3	"	"	13.5 15.5	1.75 1.5	5-7	A53-527
A4	"	"	13.5 15.5	3.25 3.0	5-7	A53-528
A6	"	"	31.0	1.5	12-14	A53-530
A7	"	"	120.0	0.3	55	A53-531

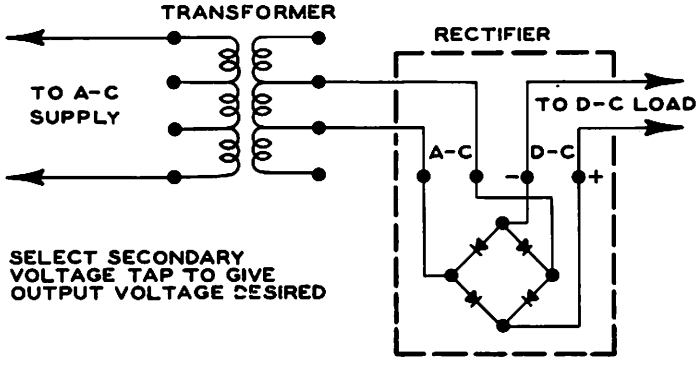
ORDERING INFORMATION FOR RECTIFYING UNIT ONLY
(without case, terminal posts, leads etc.)

FOR USE WITH RECTIFIER	RECTIFYING UNIT	
	REF.	CATALOG NO.
Ref. A	1	P53-534
Ref. A1	1A	P53-535
Ref. A2	1B	P53-532
Ref. A3	1C	P53-534
Ref. A4	1D	P53-535
Ref. A6	1F	P53-533
Ref. A7	1G	P53-537

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A



Typical circuit showing application of rectifier.

Type S rectifier.

TYPE S RECTIFIER
SELENIUM

The Type S rectifier comprises a rectifying unit enclosed in a ventilated steel case.

The Type S rectifier is for use with separate transformer having a suitable secondary voltage to supply a load, such as d-c relays, direct without battery. It can also be used for battery charging where a suitable low-voltage secondary is available on an existing transformer. adjustable resistor may be used for regulating the charge.

A 0.4 ohm, 28 watt, adjustable resistor should be used for regulating the charge and to prevent undue overload of the rectifier after a power off situation.

To order, specify "S Rectifier" and give catalog number

ORDERING INFORMATION FOR COMPLETE RECTIFIER

REF.	A-C INPUT		D-C OUTPUT		CATALOG NUMBER
	VOLTS	CYCLES	VOLTS	AMPS.	
A	35 Max.	any	30 Max.	0.6	A53-535
A1	"	"	"	1.75	A53-536
A2	"	"	"	3.25	A53-537
A3	"	"	"	6.0	A53-538

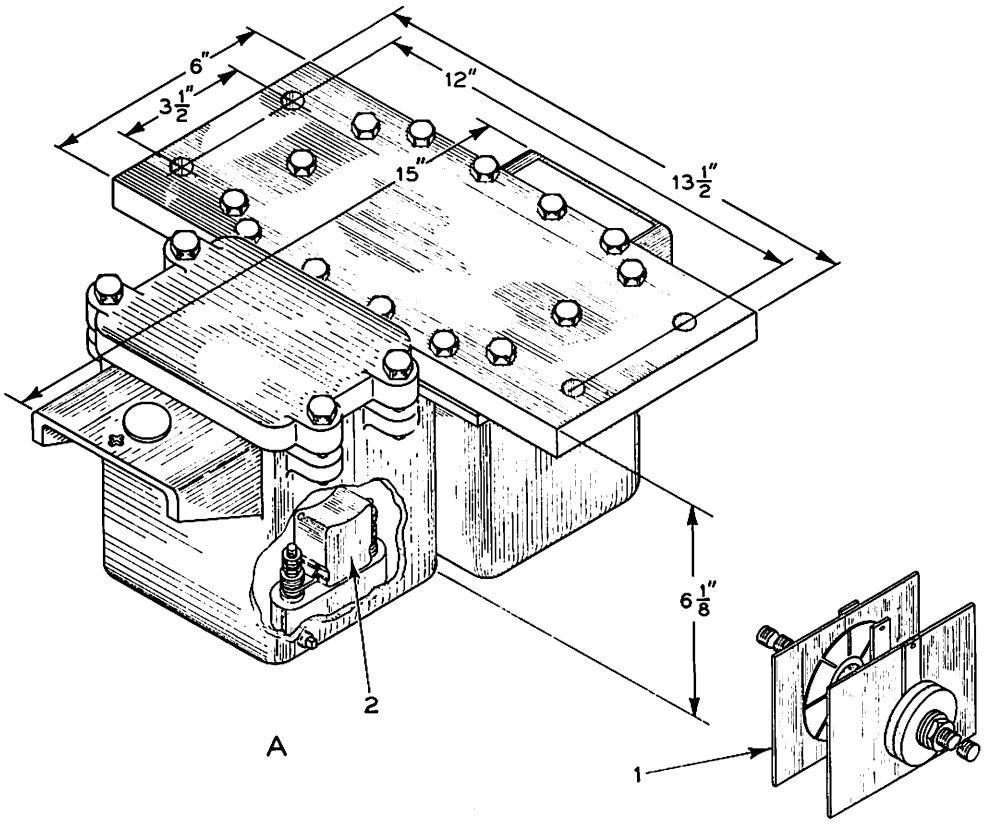
ORDERING INFORMATION FOR RECTIFYING UNIT ONLY
(without case, terminal posts, leads etc.)

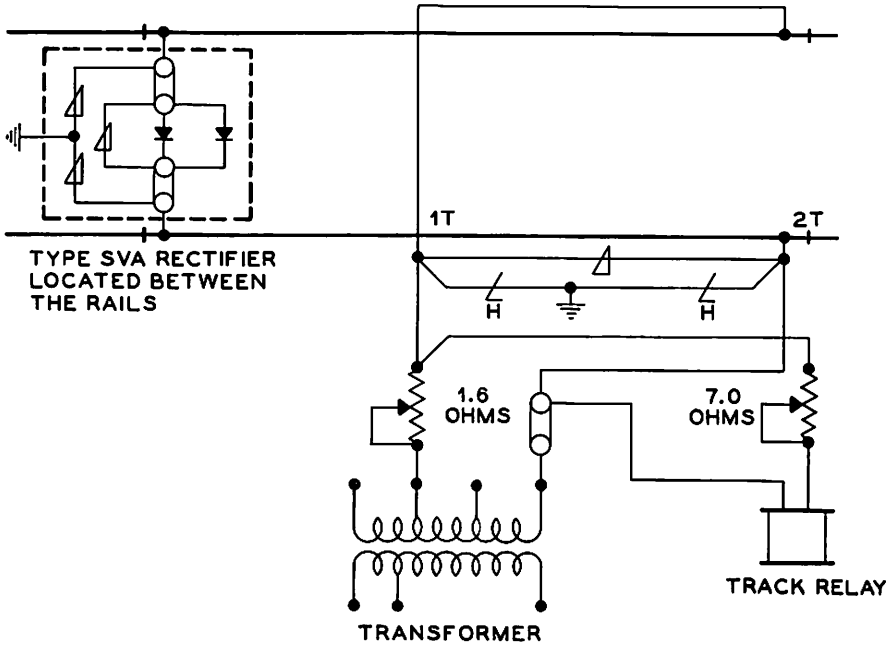
FOR USE WITH RECTIFIER	RECTIFYING UNIT	
	REF.	CATALOG NUMBER
Ref. A	1	P53-530
Ref. A1	1A	P53-527
Ref. A2	1B	P53-526
Ref. A3	1C	P53-548

For transformers, see Catalog Section 95, page 5, Catalog numbers A95-15 and A95-21.

For resistors, arresters, etc., see Catalog Section 3.

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Typical use of Type SVA rectifier

Type SVA rectifier.

TYPE SVA RECTIFIER
SELENIUM

The Type SVA rectifier consists of a rectifying unit and three lightning arresters (Equalizers) mounted, without additional housing, between ties and rails.

This rectifier is for use in a-c half-wave rectified d-c track circuits. It is, of course, not suitable for use where the rails carry propulsion current.

When operating a 2 or 4-ohm relay, the rectifier can be used on track circuits:

1. 1500 feet long with minimum ballast resistance of 2.5 ohms per 1000 feet.
2. 2000 feet long with minimum ballast resistance of 4.0 ohms per 1000 feet.

When operating 1-ohm relay, the rectifier can be used on track circuits:

1. 6000 feet long with minimum ballast resistance of 5.0 ohms per 1000 feet.
2. 4000 feet long with minimum ballast resistance of 2.5 ohms per 1000 feet.

The use of this rectifier in track circuits as illustrated is ideal for highway crossing protection.

To order, specify "SVA Rectifier" and give catalog number

ORDERING INFORMATION FOR COMPLETE RECTIFIER

REF.	RATING		CATALOG NUMBER
	A-C VOLTS	D-C AMPS.	
A	5.0	2.2	A53-505
* A1	5.0	2.2	A53-506

* Complete with track connections

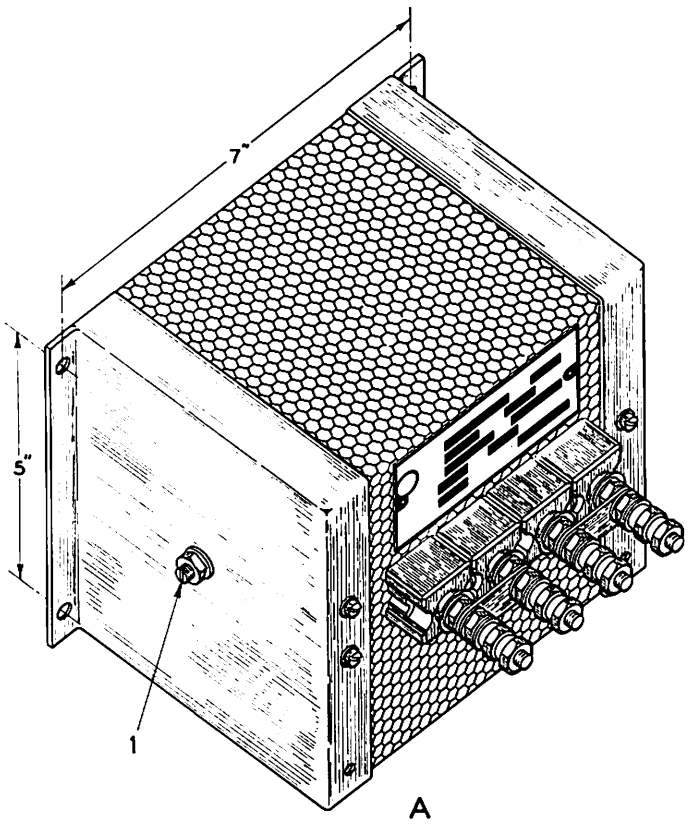
ORDERING INFORMATION FOR RECTIFYING UNIT
AND LIGHTNING ARRESTERS ONLY
(without case, terminal posts, leads etc.)

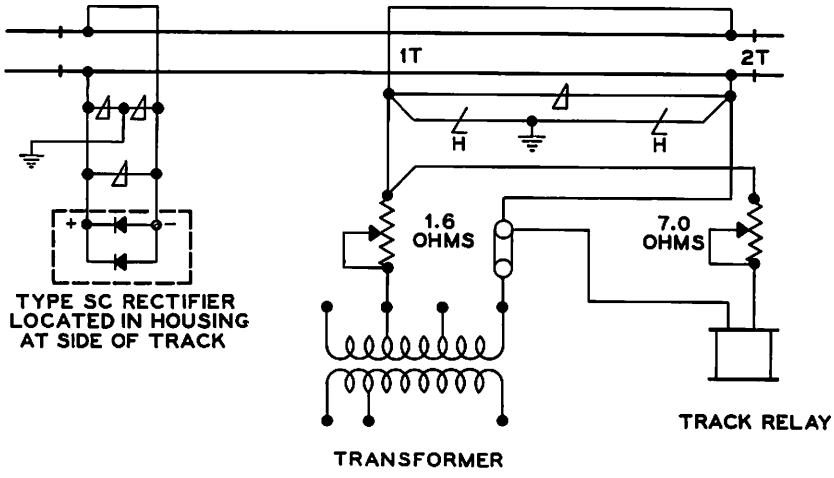
FOR USE WITH RECTIFIER	RECTIFYING UNIT		LIGHTNING ARRESTER (unit only)	
	REF. NO.	CATALOG NUMBER	REF. NO.	CATALOG NUMBER
Ref. A	1	P53-525	2	P3-252
Ref. A1	1	P53-525	2	P3-252

For transformers, see Catalog Section 95.

For resistors, arresters, etc., see Catalog Section 3.

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Typical use of Type SC rectifier.

Type SC rectifier.

TYPE SC RECTIFIER
SELENIUM

The Type SC rectifier consists of a rectifying unit enclosed in a ventilated steel case for mounting in a separate dry and well ventilated weatherproof housing.

This rectifier is for use in a-c half-wave rectified d-c track circuits. It is, of course, not suitable for use where the rails carry propulsion current.

When operating a 2 or 4-ohm relay, the rectifier can be used on track circuits:

1. 1500 feet long with minimum ballast resistance of 2.5 ohms per 1000 feet.
2. 2000 feet long with minimum ballast resistance of 4.0 ohms per 1000 feet.

When operating 1-ohm relay, the rectifier can be used on track circuits:

1. 6000 feet long with minimum ballast resistance of 5.0 ohms per 1000 feet.
2. 4000 feet long with minimum ballast resistance of 2.5 ohms per 1000 feet.

The use of this rectifier in track circuits as illustrated is ideal for highway crossing protection.

To order, specify "SC Rectifier" and give catalog number

ORDERING INFORMATION FOR COMPLETE RECTIFIER

REF.	RATING		CATALOG NUMBER
	A-C VOLTS	D-C AMPS.	
A	5.0	2.2	A53-500

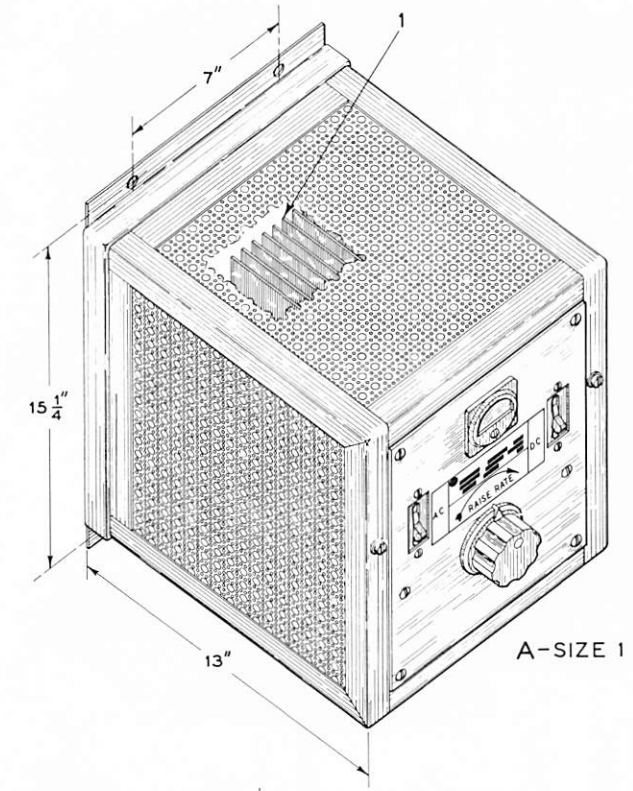
ORDERING INFORMATION FOR RECTIFYING UNIT ONLY
(without case, terminal posts, leads etc.)

FOR USE WITH RECTIFIER	RECTIFYING UNIT	
	REF. NO.	CATALOG NUMBER
Ref. A	1	P53-525

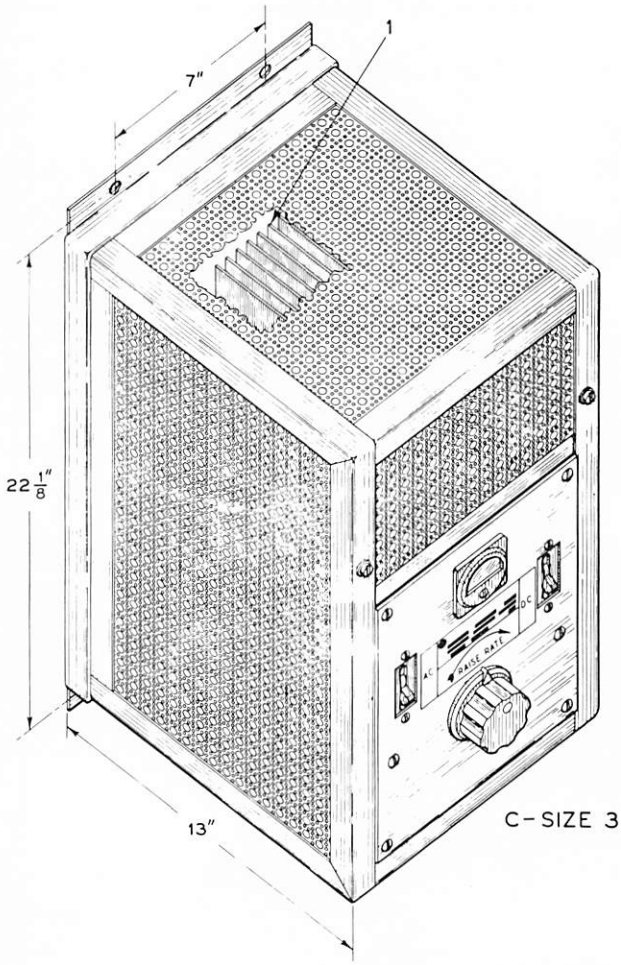
For transformers, see Catalog Section 95.

For resistors, arresters, etc., see Catalog Section 3.

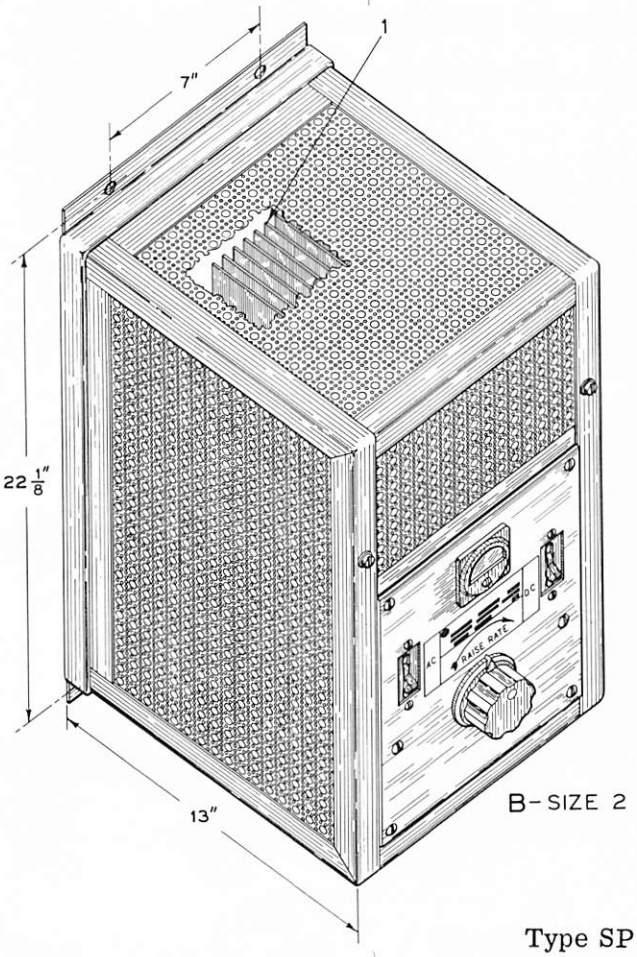
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A-SIZE 1



C-SIZE 3



B-SIZE 2

Type SP rectifiers.

TYPE SP RECTIFIERS
SELENIUM

The Type SP rectifier comprises a rectifying unit and tapped transformer enclosed in a ventilated steel case. It also includes a control panel on which are mounted "on" and "off" switches and a means of adjusting the charging rate.

Taps on the transformer primary provide adjustments for variations in line voltage.

The ratings of the Type SP rectifiers are based on use in towers or places where the air temperature does not exceed 120 degrees F.

This rectifier can be supplied in several sizes as listed below.

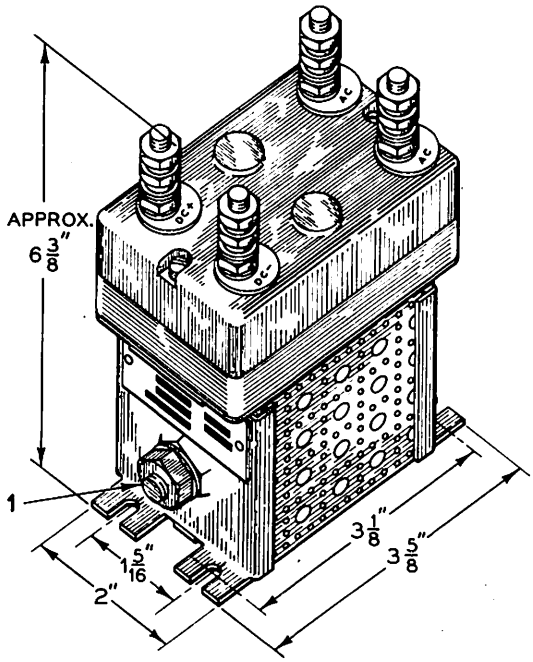
To order, specify "SP Rectifier" and give catalog number

ORDERING INFORMATION FOR COMPLETE RECTIFIER

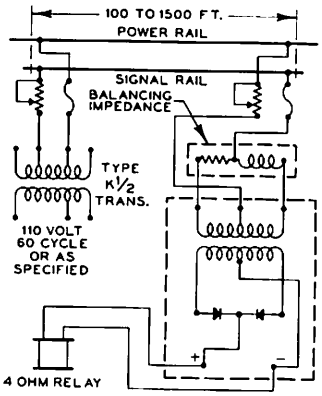
REF.	A-C INPUT		D-C OUTPUT		FOR CHARGING LEAD CELLS	CATALOG NUMBER
	VOLTS	CYCLES	VOLTS	AMPS.		
A	115	60	15.5	6.0	4-7	A53-566
A1	230	"	"	"	"	A53-568
A2	115	"	31	6.0	12-14	A53-565
A3	230	"	"	"	"	A53-567
A4	115	"	145	3.0	55-66	A53-550
B	115	60	15.5	25.0	4-7	A53-554
B1	230	"	"	"	"	A53-555
B2	115	"	31	12.5	12-14	A53-557
C	115	60	31	25.0	12-14	A53-573

ORDERING INFORMATION FOR RECTIFYING UNIT ONLY
(without case, terminal posts, leads, etc.)

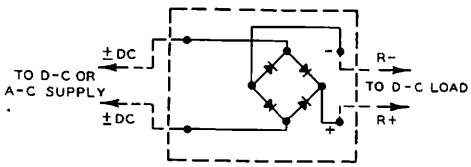
FOR USE WITH RECTIFIER	RECTIFYING UNIT	
	REF.	CATALOG NO.
Ref. A	1	P53-526
Ref. A1	1A	P53-526
Ref. A2	1B	P53-526
Ref. A3	1C	P53-526
Ref. A4	1D	P53-521
Ref. B	1F	P53-520
Ref. B1	1G	P53-520
Ref. B2	1H	P53-523
Ref. C	1K	P53-520



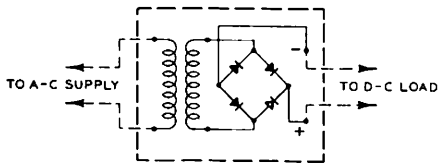
A-Type SQ rectifier.



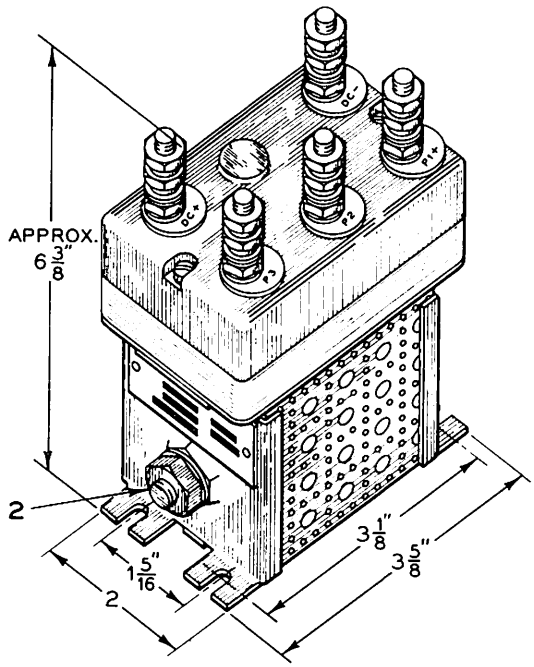
Typical circuit showing application of Type SQA rectifier.



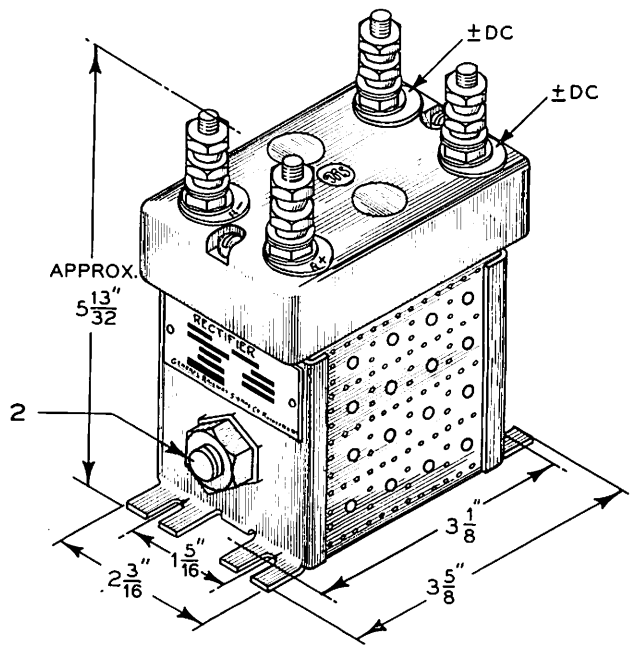
Typical circuit showing application of Type S rectifier.



Typical circuit showing application of SQ rectifier.



B-Type SQA rectifier.



C-Type S rectifier.

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TYPES SQ and SQA RECTIFIERS

SIZE 1/2 – SELENIUM

The Type SQ Size 1/2 is a low-capacity rectifier with an insulating transformer built in as part of the rectifier assembly. These can be used to supply d-c without storage battery standby. These can also be used to operate a d-c relay on short a-c track circuits in yards.

The Type SQA Size 1/2 is a low-capacity rectifier for the operation of d-c track relays in a single-rail, a-c track circuit with d-c propulsion. It contains a transformer with a center-tapped primary winding.

The Type S Size 1/2 is a low-capacity rectifier, without a built-in transformer, and may be used in similar applications to the Types SQA and SQ Size 1/2 when a transformer is not required.

To order, specify "S, SQ or SQA Rectifier" and give catalog number

ORDERING INFORMATION FOR COMPLETE RECTIFIER

REF.	TYPE	A-C INPUT		D-C OUTPUT		CATALOG NUMBER
		VOLTS	CYCLES	VOLTS	AMPS.	
A	SQ 1/2	115	50/100	12.5	0.30	A53-590
A2	SQ 1/2	115	50/100	25.0	0.20	A53-592
A3	SQ 1/2	2	50/100	1.5	0.30	A53-596
A4	SQ 1/2	2	50/100	5.0	0.20	A53-597
B	SQA 1/2	4	50/100	1.2	0.30	A53-610
C	S 1/2	35	50/100	25.0	0.30	A53-615

ORDERING INFORMATION FOR RECTIFYING UNIT

FOR USE WITH RECTIFIER	RECTIFYING UNIT	
	REF.	CATALOG NO.
Ref. A	1	P53-561
Ref. A2	1B	P53-561
Ref. A3	1C	P53-561
Ref. A4	1D	P53-561
Ref. B	2	P53-561
Ref. C	2	P53-561

TYPE S RECTIFIERS

SIZE 1/4 – SELENIUM

These are small rectifiers or valves for general use. They may be mounted on a terminal block or on an insulated strap as shown on opposite page.

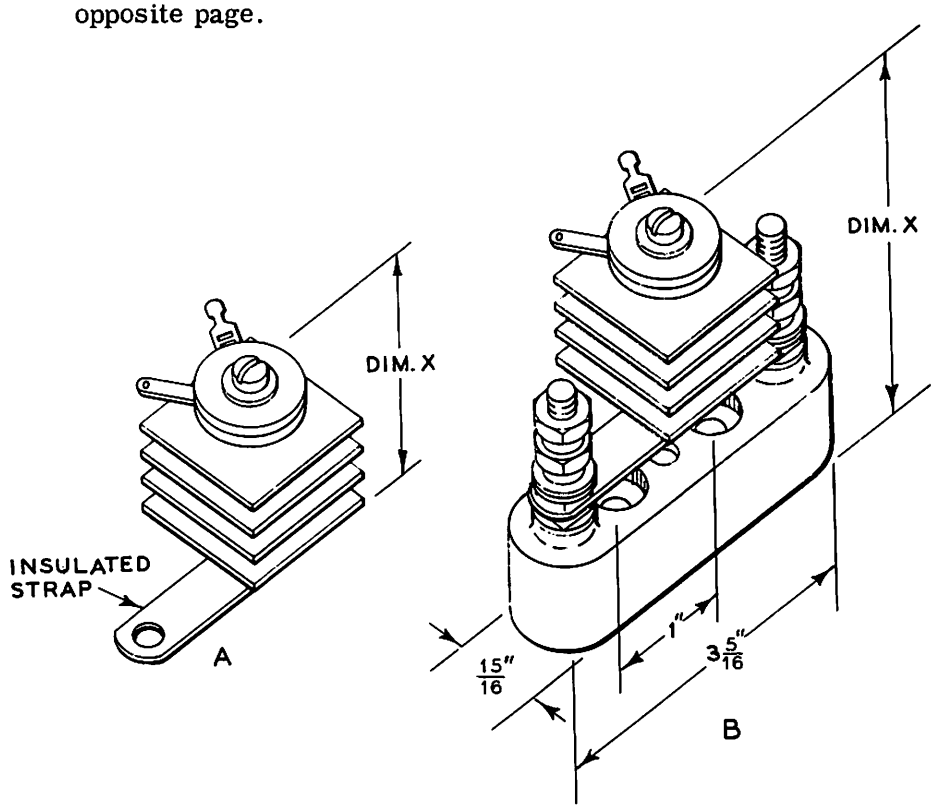


FIG. 1

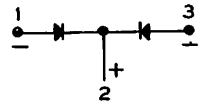


FIG. 2

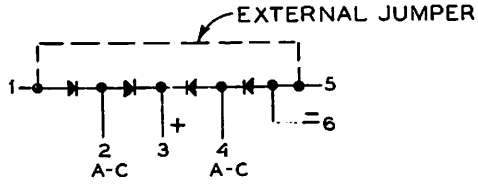


FIG. 3

To order, specify "S Rectifier" and give catalog number

REF.	MAX. AC. VOLTS	D-C RATING		CIRCUIT	DIM. "X"	CATALOG NUMBER
		VOLTS	AMPS			
A	-	15	0.200	Fig. 1	1 5/16"	A53-539
A1	-	15	0.300	Fig. 2	1 11/16"	A53-540
A2	35	25	0.300	Fig. 3	2 7/16"	A53-541
B	-	15	0.200	Fig. 1	2 3/8"	A53-542
B1	-	15	0.300	Fig. 2	2 3/4"	A53-543
B2	35	25	0.300	Fig. 3	3 1/2"	A53-544

Type S rectifiers

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CATALOG SECTION A53

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POWER SUPPLIES & RECTIFIERS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A53-100	54728-62GR1 (SEE A62)		RECTIFIER	9
A53-102	59306-1GR2 (SEE P71)		RECTIFIER	
A53-103	400-2GR1 (SEE P71)		RECTIFIER	
A53-104	59306-2GR2 (SEE P71)		RECTIFIER	
A53-115	400-4GR1 (SEE A62)		RECTIFIER	10
A53-120	378 GR1 (SEE A62)		RECTIFIER	
A53-122	19375-1GR1 (SEE A62)		RECTIFIER	11
A53-135	54728-78GR1 (SEE P65)		RECTIFIER	26
A53-300			CTC LINE ENERGY POWER SUPPLY	
	59761-40GR1		POWER SUPPLY	
	54940-103 GR54		XFMR AU-276	
A53-305	54940-103 GR54		U1 XFMR AU-276	
A53-310	59761-40GR1		POWER SUPPLY	
A53-320			CTC LINE & RELAY POWER SUPPLY	
	59761-40GR2		POWER SUPPLY	
	54940-103 GR54		U1 XFMR AU-276	
A53-321	29174-11 (SEE P85)		RECT UNIT	7, 9, 47
A53-322	29174-10 (SEE P85)		RECT UNIT	7, 9, 47
A53-324			RECTIFIER	51
	54728-82GR1		RECTIFIER	
	01272-7		NUT	
	01273-4		WASHER	
	03610-120 (SEE P85)		SCREW	
A53-325	59761-40GR2		POWER SUPPLY	51
A53-330	59638-11		ALTERNATOR	
A53-332	59638-9		ALTERNATOR	
A53-335	54728-82GR1		RECTIFIER	
A53-337	29804-61 (SEE P85)		RECTIFIER	127, 131
A53-365	29174-22 (SEE P62)		RECTIFIER	39
A53-500	59848 GR1		SC RECT	
A53-505	59849 GR1		SVA RECT	27
A53-506			SVA RECT	27
	59849 GR1		SVA RECT	
	49770-6GR2	2	CONNECTOR	
	0566	4	SCREW	
	10350-2		PIN	
	0268-1	10	STAPLE	
	80613 GR1	10	#6 WIRE	
A53-525			ST RECT	23
	59897-5GR1		RECT	
	59649-8GR11		KIT	
A53-526			ST RECT	23
	59897-5GR2		ST RECT	
	59649-8GR11		KIT	
A53-527			ST RECT	23
	59897-5GR3		RECT	
	59649-8GR11		KIT	
A53-528			ST RECT	23
	59897-5GR4		ST RECT	
	59649-8GR11		KIT	
A53-530			ST RECT	23
	59897-5GR6		ST RECT	
	59649-8GR11		KIT	
A53-531			ST RECT	23
	59897-5GR7		ST RECT	
	59649-8GR11		KIT	
A53-532			ST RECT	
	59897-5GR8		ST RECT	
	59649-8GR11		KIT	
A53-535	59899-4GR1		S RECT	25
A53-536	59899-4GR2		S RECT	25

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POWER SUPPLIES & RECTIFIERS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A53-537	59899-4GR3		S RECT	25
A53-538	59899-4GR4		S RECT	25
A53-539	59899-5GR1		S 1/4 RECT	34
A53-540	59899-5GR2		S 1/4 RECT	34
A53-541	59899-5GR3		S 1/4 RECT	34
A53-542	59899-5GR4		S 1/4 RECT	34
A53-543	59899-5GR5		S 1/4 RECT	34
A53-544	59899-5GR6		S 1/4 RECT	34
A53-550	59894 GR1		SP RECT	
A53-554	59894-1GR4		SP RECT	31
A53-555	59894-1GR1		SP RECT	31
A53-557	59894-1GR3		SP RECT	31
A53-565	59894-2GR1		SP RECT	31
A53-566	59894-2GR2		SP RECT	31
A53-567	59894-2GR3		SP RECT	31
A53-568	59894-2GR4		SP RECT	31
A53-573	59894-3GR1		SP RECT	31
A53-590	59847-2GR1		SQ RECT	33
A53-592	59847-2GR3		SQ 1/2 RECT	33
A53-596	59847-2GR7		SQ 1/2 RECT	33
A53-597	59847-2GR8		SQ 1/2 RECT	33
A53-610	59847-4GR1		SQA 1/2 RECT	33
A53-615	59847-1GR1		S 1/2 RECT	33

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CATALOG SECTION A53

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POWER SUPPLIES & RECTIFIERS

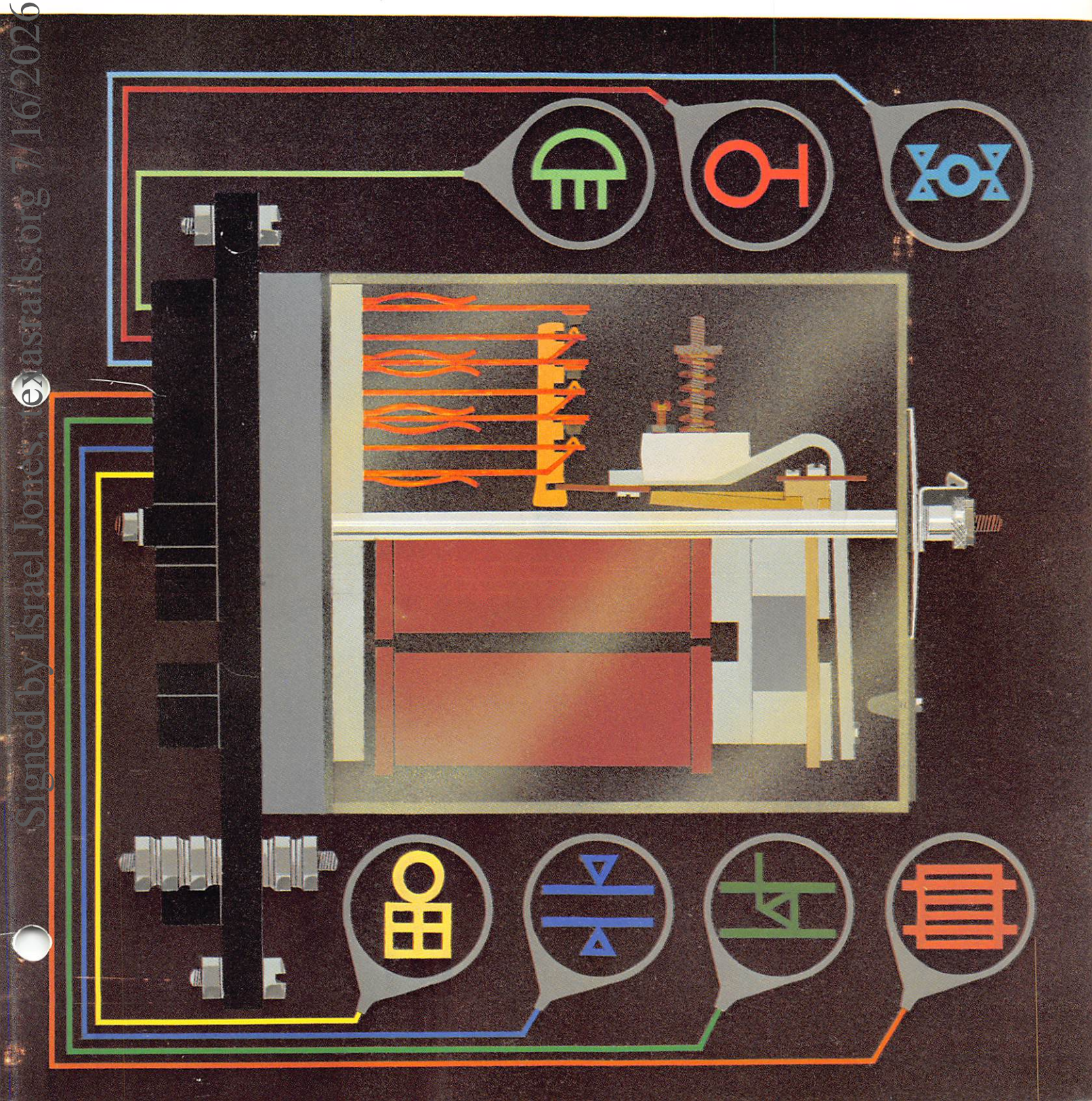
CAT.NO.	DRAWING NO. QTY	NAME	PG.
P53-105	400-1GR1	RECTIFIER	
	(SEE P71)		
P53-106	29804-64	RECTIFIER	
	(SEE P71)		
P53-301	58861-1	SWITCH	
P53-303	59524	FUSE	
P53-305	27925-2	HOLDER	
P53-307	59776-21	DIODE	
P53-309	56208-18GR7	XFMR	
P53-311	19943-5	RESISTOR	
P53-313	59723-36	RESISTOR	
P53-317	59524-14	FUSE	
P53-319	19943-1	RESISTOR	
P53-520	29026	RECT.UNIT	
P53-521	29026-1	RECT.UNIT	
P53-523	29026-3	RECT.UNIT	
P53-525	29074-1	RECT UNIT	
P53-526	29074-5	RECT UNIT	
P53-527	29074-6	RECT UNIT	
P53-530	29074-9	RECT UNIT	
P53-531	29074-10	RECT UNIT	
P53-532	29074-11	RECT UNIT	
P53-533	29074-12	RECT UNIT	
P53-534	29074-13	RECT UNIT	
P53-535	29074-14	RECT UNIT	
P53-537	29074-16	RECT UNIT	
P53-548	29074-17	RECT UNIT	
P53-561	29174-21	RECT UNIT	

CAT.NO.	DRAWING NO. QTY	NAME	PG.

TYPE B AND TYPE VTB PLUG-IN RELAYS

FOR VITAL CIRCUITS

GRS CATALOG **62-1**



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Biased-Neutral Relay 10
Neutral Relay 11
Primary-Secondary Relay Combination 11
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Thermal Relay 13
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Code Transmitter Relay 15
Flasher Relay 16
Lamp-Control Relay 16
Light-Out Neutral Relay 17
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INTRODUCTION

For over 45 years GRS has continually perfected and expanded the plug-in line of Type B vital circuit relays until, today, they are the standard of the signaling industry. Types B and VTB relays meet all applicable specifications of the Association of American Railroads.

There are 21 kinds of Type B relays, available in over 200 configurations, to meet your requirements for reliability, long life, and low maintenance.

Type B relays mount on individual plugboards which are rack-installed in equipment rooms and in wayside cases and housings. They are made in two Sizes, 1 and 2, and are referred to as Type B1 and Type B2. Two Type B1 relays occupy the same space as one Type B2 relay. There is, in addition, a special-size relay, Type VTB code-responsive, which occupies the plugboard space of a Type B2 relay, but is not the same depth.

This publication includes complete ordering information. Procedures for periodic testing, as well as more detailed descriptions, can be found in GRS Pamphlet 1457. For further information, please contact your GRS sales engineer.

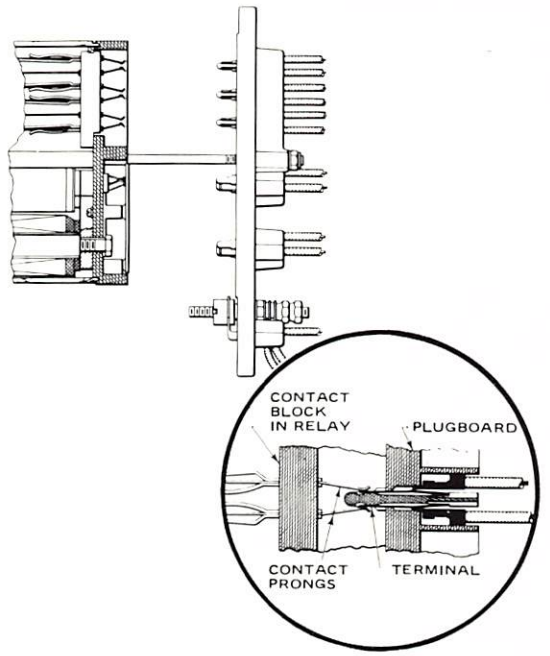
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GENERAL DESCRIPTION

GRS Type B relays install quickly and easily, making positive mechanical and electrical connection to their plugboard terminals.

The contact and coil structures are brought out through the base of the relay as prongs. The plugboard has wedge-shaped plug insulators with flat metal terminals on the two faces of the wedge. When a relay is plugged in, it is guided on two guide rods so the pairs of prongs meet the corresponding wedges and spread apart. The prongs slide onto their respective plugboard terminals, thus making contact. Installation is completed in seconds. Wires connected to the plugboard terminals are formed into cables behind the plugboard.

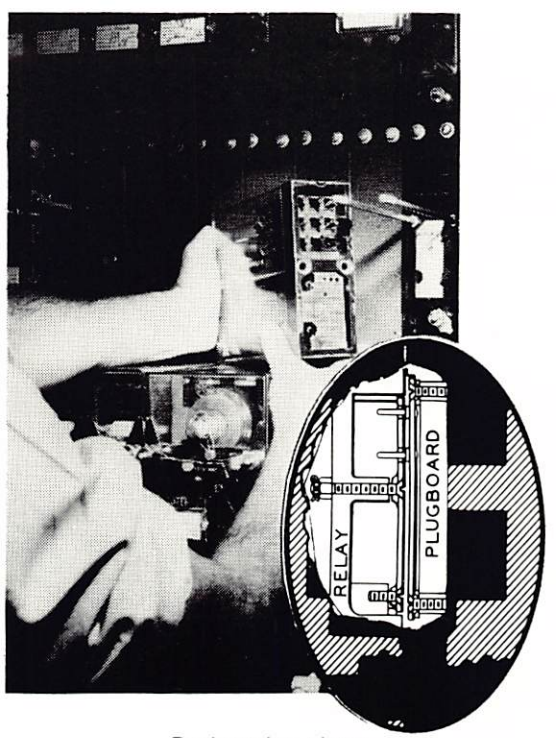


All circuits are made through plug connections.

Registration Feature Eliminates Errors

The registration feature prevents plugging a relay onto the wrong plugboard. It consists of two plates, one with holes, the other with pins. The plate with holes is attached to the base of the relay; the plate with pins is attached to the plugboard. If a relay not belonging to that plugboard should be slipped onto the guide rods, it cannot be pressed into contact because the registration pins and holes do not correspond.

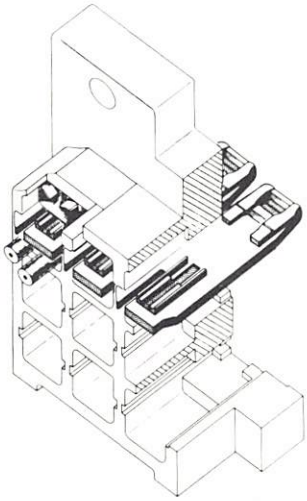
Both male and female registration plates, along with hardware to mount the male plate to the plugboard, come with a relay.



Registration plates.

Plugboard Insulators

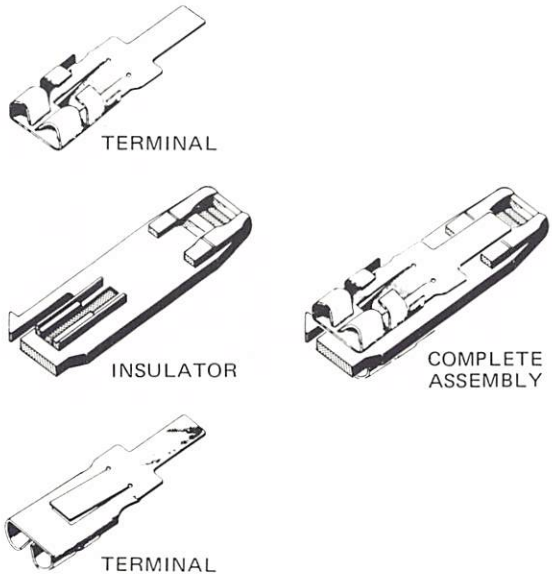
Molded plastic insulators fit into slots in the back of the plugboard. An integral beam latcher secures the insulator to the plugboard.



View showing the insulator in the plugboard.

Plugboard Terminals

There are two easily installed terminals per insulator – just connect the wire and push the terminal into place above or below the insulator in the proper slot in the plugboard.



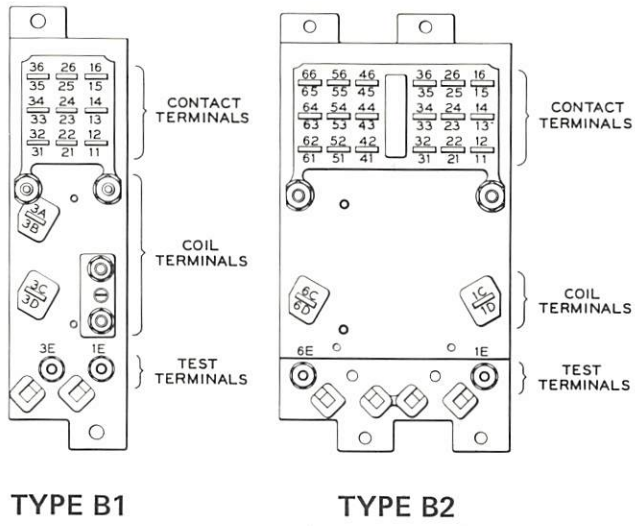
The insulator insulates one terminal from the other.

Wiring changes are easy – just insert an extractor to release the terminal and insert it into the new slot in the plugboard.

Plugboard Terminal Numbering

Relay contact terminals are designated on the plugboard by a two-digit number. The first digit indicates the vertical row; the second digit indicates the position the terminal occupies in that row (counting from the bottom).

Coil terminals are designated by a one-digit number and a letter (A-D) for identification. Letter E is assigned to the test terminals.



Plugboard terminal numbering, rear view.

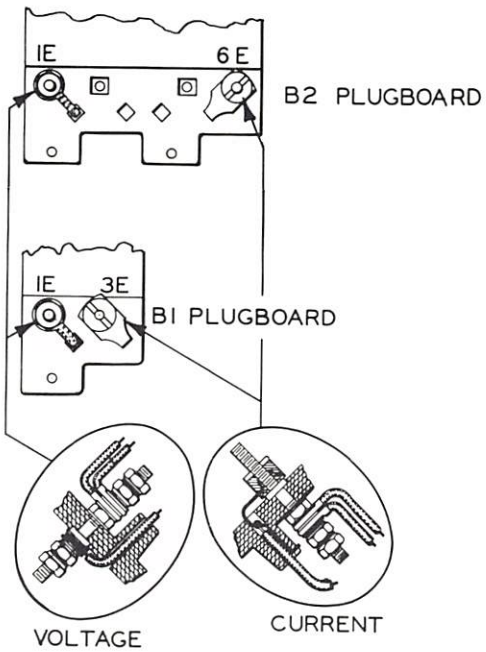
Easy Current and Voltage Testing

Current and voltage tests are conveniently made on the front of the plugboard without removing the relay or interrupting the circuit.

The current flowing through the coils is measured at the current test terminal by using a special tool which permits the insertion of a milliammeter into the coil circuit.

The voltage across the relay coils is measured by connecting a voltmeter between the voltage and current test terminals.

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Plugboard test terminals, front view.

Contacts

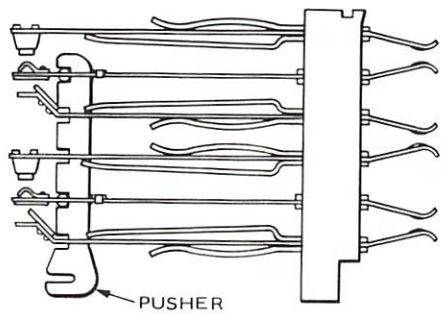
Type B relays, unless otherwise described, have a .050-inch front contact opening and are equipped with metal to metal-carbon front contacts and metal to metal back contacts. The contact assemblies (called groups) consist of metal leaf springs molded in phenolic blocks. The electrical contacting surfaces (usually silver or silver-carbon) are affixed near one end of each leaf spring. The other end of each spring is formed into a prong that makes contact with the plugboard terminal.

There are six springs per group, furnished in various combinations of contacts. For example, a contact group may have two dependent front-back contacts, or it may have three independent contacts (front and back).

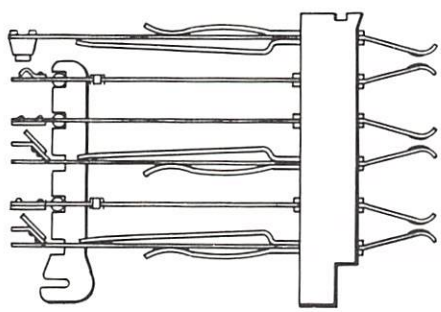
A dependent front-back contact uses three springs: one for the stationary front, one for the stationary back, and one for the movable heel.

An independent contact uses two springs: one for the stationary contact (be it front or back) and one for the movable heel.

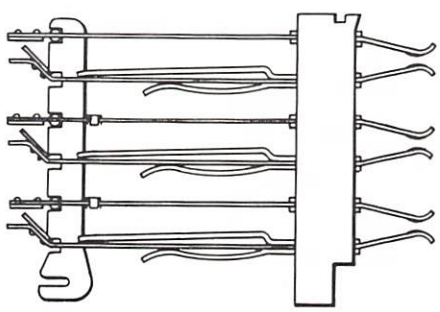
The heel contact has a roller which engages the pusher. The pusher, in turn, is moved up and down by the relay armature.



2 front-back (FB) dependent contacts



1 front (F) 2 back (B) independent contacts



3 back (B) independent contacts

Three different contact groups.

Contact Combinations

The Type B1 relay has space for 3 contact groups; the Type B2 relay has space for 6. The following tabulations show the contact combinations normally furnished:

TYPE B1 RELAYS	
Neutral	2FB, 4FB, 4F-2B, 4FB-2F-1B, 6FB
Biased-neutral	4FB-2F-1B, 6FB
Magnetic-stick	4NR
Power-transfer	2FB, 6FB
Light-out	4FB, 4F-2B, 6FB

TYPE B2 RELAYS	
Neutral	12FB, 8FB-2F, 8FB-4F-2B
Biased-neutral	8FB-4F-2B, 12FB
Polarized	4FB-4NR, 6NR, 4NR-2FB-2F

NOTE: FB stands for front-back dependent contacts
F stands for front independent contacts
B stands for back independent contacts
NR stands for normal-reverse dependent contacts

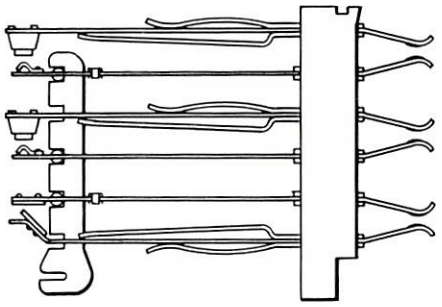
Contact Types

Type B relays are provided with either regular, heavy-duty, or heavy-duty with magnetic blowout contacts, depending upon the requirements of the particular application.

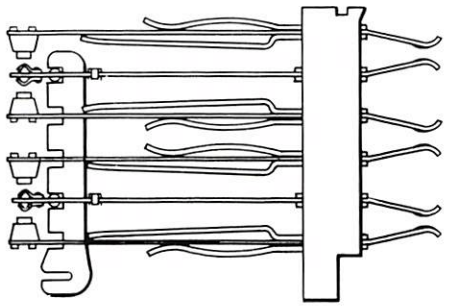
Regular contacts are for normal service, designed to carry a resistive load of 4 amperes continuously. Front contacts are metal to metal-carbon; back contacts are usually metal to metal.

Heavy-duty contacts are usually used in circuits of the first and second voltage ranges where the continuous resistive load current is more than 4 amperes. The first voltage range is 30 volts or less; the second voltage range is over 30 volts, to and including 175 volts. Front and back contacts are usually metal to metal-carbon.

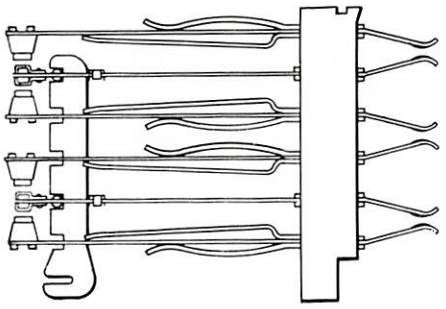
Heavy-duty contacts equipped with magnetic blowouts are generally used in d-c circuits carrying inductive loads where the continuous current is more than 4 amperes and where operation is in the second or third voltage ranges. The third voltage range is over 175 volts to and including 250 volts. The front and back contacts of the heavy-duty type just described include magnets which are held in clips close to the contacts. The effect is to "blow" or disperse the electric arc before it has a chance to grow and burn. The use of magnetic blowout contacts sacrifices a contact group.



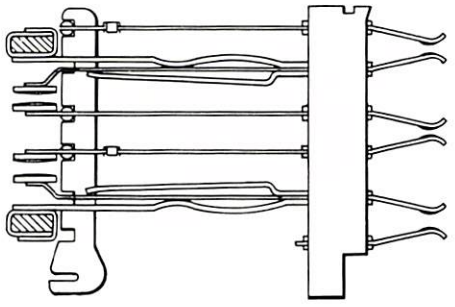
2 front (F) and 1 back (B) independent regular contacts.



2 front-back (FB) silver-carbon contacts.



2 front-back (FB) dependent heavy-duty contacts.



One front and one back independent heavy-duty contacts, with magnetic blowouts.

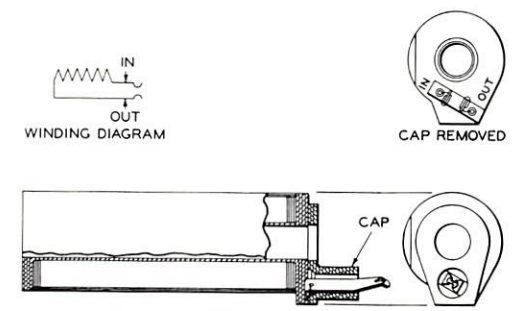
Signed by Israel Jones, texasrails.org 7/16/2026

Coils

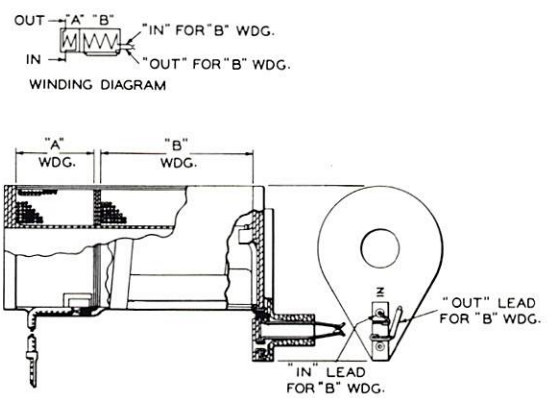
Some Type B relays have one coil, while others have two. A typical coil is wound on a phenolic spool which slips over the core of the relay.

Relays with one coil may have one or two windings, and relays with two coils may have up to three windings. Leads from these windings are fastened to prongs which engage the plugboard terminals. The windings may be connected on the back of the plugboard to change the timing characteristics of the relay (see Pamphlet 1457).

Slow-acting relays are made by putting copper washers or copper/aluminum slugs on the cores. The more washers, or the longer the slugs, the slower acting the relay.



Coil construction - one winding.



Coil construction - two windings.

Relay Name Plate and Test Tag

All Type B relays carry name plates displaying the catalog number, drawing number, serial number, and nominal coil resistance. The relay ordering reference is also shown on the registration plate located on the back of the relay.

On the relay cover is a tag holder with slots for two separate tags: a tag for relay operating and testing data and a tag for circuit designation. Perforated sheets containing 60 blanks are available for filling in circuit designations.

Dimensions and Weights

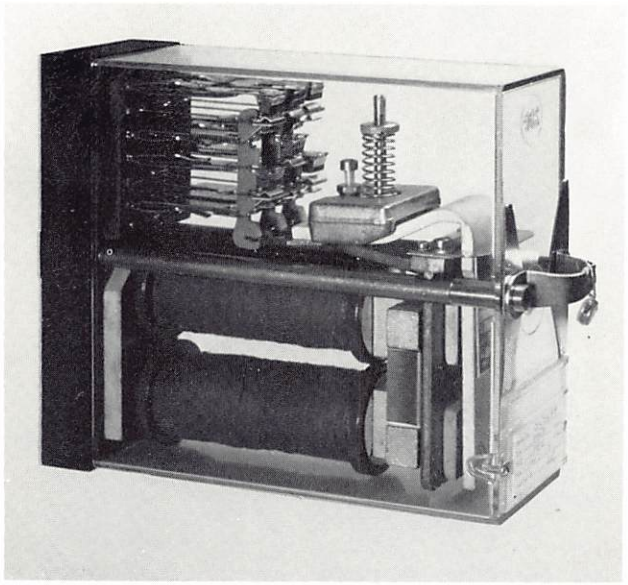
	Type B1	Type B2	Type VTB
Height of relay	6-5/16 in.	6-5/16 in.	7-11/16 in.
Width of relay	2-7/16 in.	4-15/16 in.	4-15/16 in.
Depth without plugboard	8-9/16 in.	8-9/16 in.	6-7/16 in.
Depth including plugboard fully wired (approx)	15-1/2 in.	15-1/2 in.	13-3/8 in.
Weight of relay with plugboard (weight of wiring not included)	7 to 10 lbs	10 to 15 lbs	6 to 7 lbs
Weight of plugboard alone without wiring	1 lb	2 lbs	2 lbs

D-C LINE RELAYS

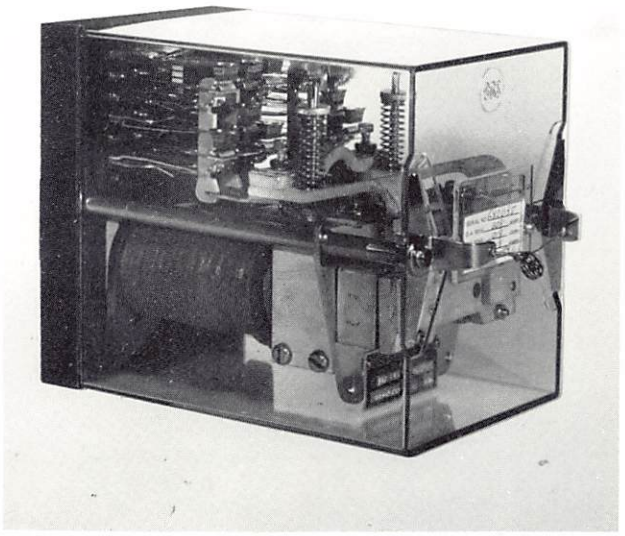
BIASED-NEUTRAL RELAY
Types B1 and B2

Biased-neutral relays pick up only if a voltage of the proper polarity is applied to the coils—a characteristic provided by two permanent magnets and a leakage strip bridging the cores and placed between the coils and the armature.

The magnitude of the reverse voltage and the time it is applied do not affect the operating characteristics of the relay.



Biased-Neutral, Type B1

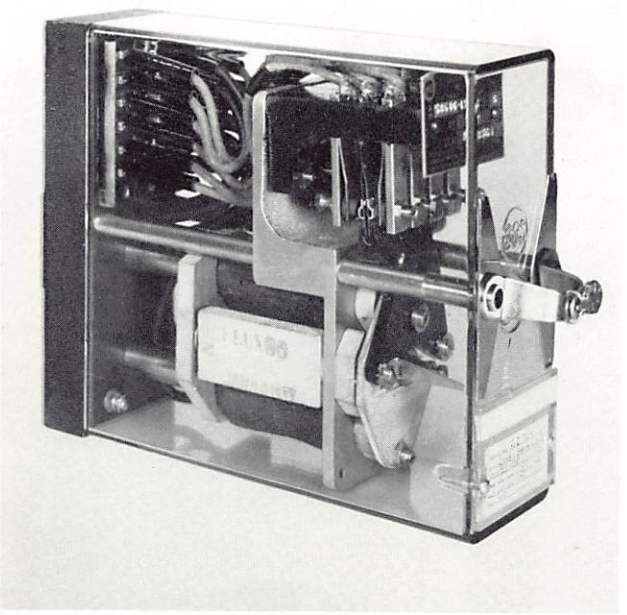


Biased-Neutral, Type B2

MAGNETIC-STICK RELAY
Type B1

Magnetic-stick relays operate in response to a change in the direction of current flow through their coils. The armature stays in its last operated position when energy is cut off. These relays are also referred to as "polar-stick" relays.

They are commonly used in switch control and indication circuits. The armature is polarized by two permanent magnets. Internal 150-ohm resistors can be connected by plugboard jumpers for operation on 2, 10, or 20 volts. Contacts are metal-carbon to metal or metal to metal.



Magnetic-Stick, Type B1

NEUTRAL RELAY

Types B1 and B2

Neutral line relays can be energized by d-c of either polarity. They are available in the following configurations:

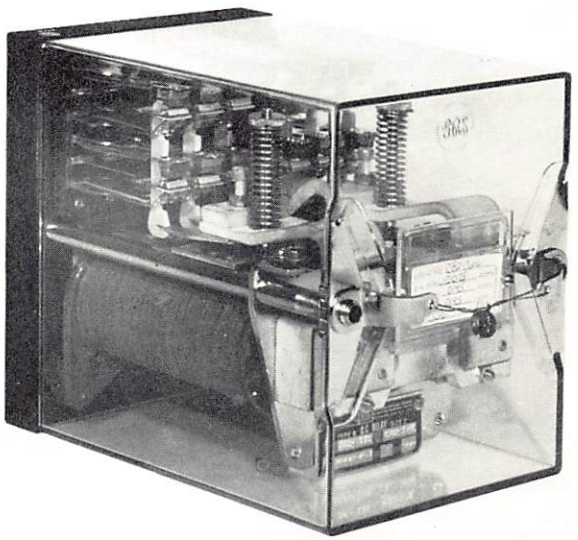
- Regular-release
- Quick-pickup
- Slow-pickup
- Slow-pickup and slow-release
- Slow-release
- Slow-pickup, slow-release, quick-crossover

There is a wide variety of regular-release Types B1 and B2 relays, many designed for specific applications. These relays have two full-length coils.

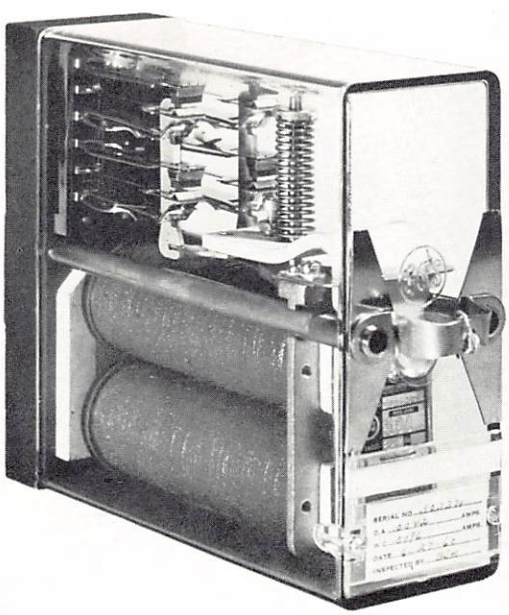
Time of release is the time required to open the front contacts after energy is removed from the relay. Time of pickup is the time required to make the front contacts after energy is applied to the relay.

In slow-release and slow-pickup relays, coils of different lengths are used to make room for copper/aluminum slugs or copper washers on the cores.

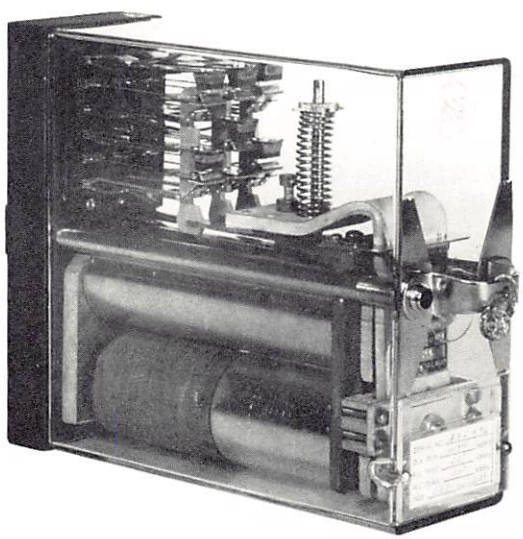
The slow-pickup, slow-release, and quick-crossover relay is slightly different in that the relay maintains full contact pressure for the entire time of pickup and release and then operates very rapidly. This quick-crossover feature (both pickup and release) is desirable for use in pole-change circuits that must remain energized during the period the circuit is open.



Neutral, Type B2



Neutral, Type B1



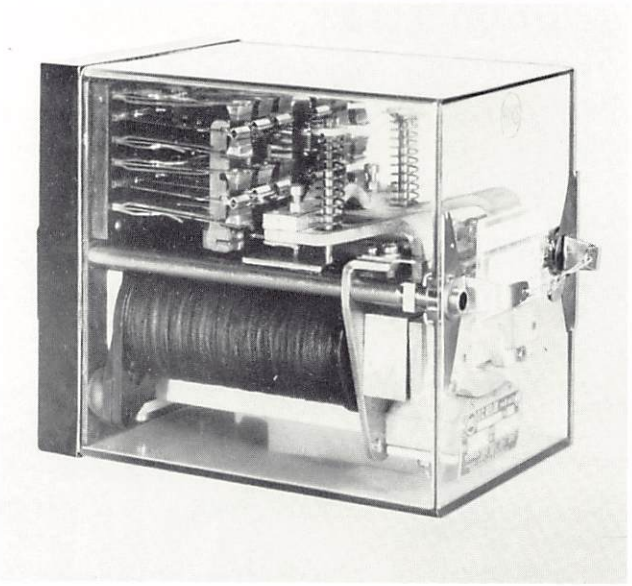
Slow-Pickup, Slow-Release, Quick-Crossover, Type B1

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POLARIZED RELAY
Types B1 and B2

A polarized relay is basically a combination of a neutral relay and a magnetic-stick relay. The neutral armature picks up and drops whenever energy is applied and removed. The polar armature rocks from normal to reverse with reversal of the polarity of the energy applied. If the polarity is not changed, the polar armature stays in the last-operated position.

There is always considerable spread between the polar pickup value and the neutral pickup value – the polar is less. Hence the polar contacts operate first and the neutral contacts second.



Polarized, Type B2

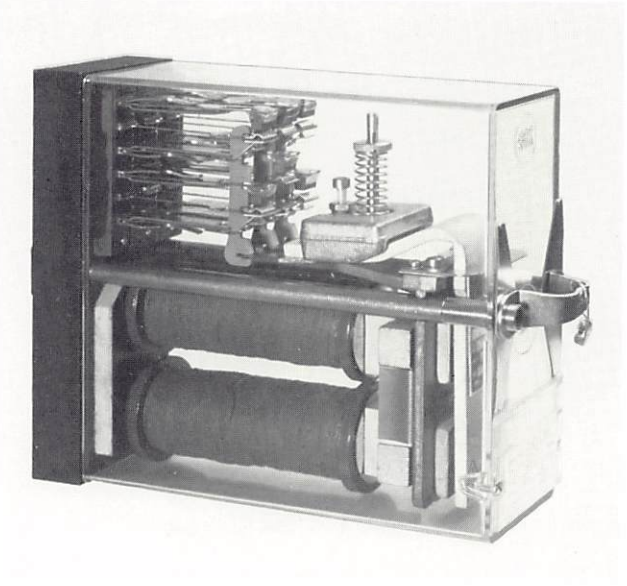
D-C TRACK RELAYS

BIASED-NEUTRAL RELAY
Type B1

Biased-neutral relays pick up only if a voltage of the proper polarity is applied to the coils — a characteristic provided by two permanent magnets and a leakage strip bridging the cores and placed between the coils and the armature.

The magnitude of the reverse voltage and the time it is applied do not affect the operating characteristics of the relay.

These relays are available in normal percentage release (approx. 50%) or high percentage release (minimum 70%). Percentage release is the relay drop-away value divided by its pick-up value.

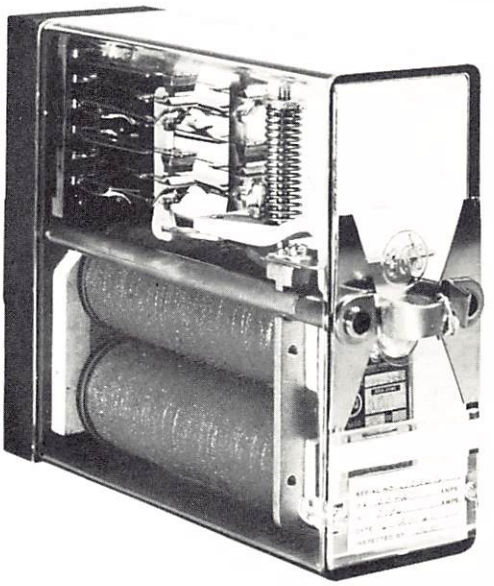


Biased-Neutral, Type B1

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NEUTRAL RELAY
Type B1

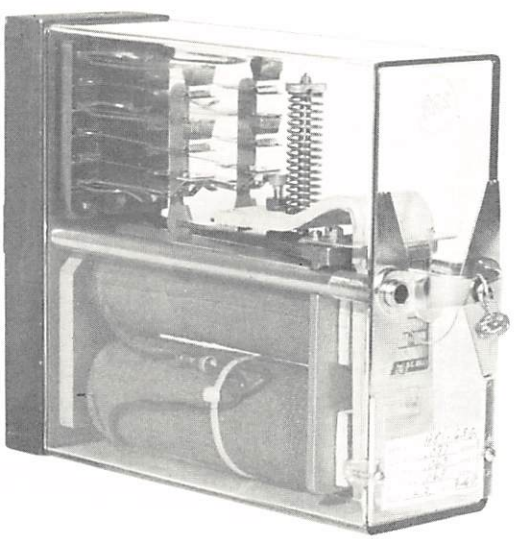
Neutral track relays have normal pickup and release, and are called "regular-release" relays. They may be energized by current of either polarity. A variety of neutral track relays is available to meet your circuit requirements.



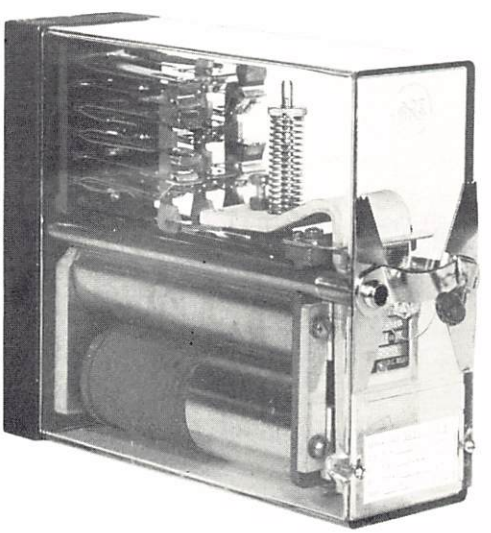
Neutral, Type B1

PRIMARY-SECONDARY RELAY COMBINATION
Types B1 and B2

This combination of a track relay and a repeater is strongly recommended where extra high shunting sensitivity and protection against momentary loss of shunt are required. The repeater, or secondary relay, when picked up, cuts out part of the winding of the track relay and inserts a corresponding amount of resistance. This, in effect, raises the value of current at which the track relay will release on shunt, yet does not affect the pickup or working current values. The secondary relay, in addition, is made slow in picking up to permit progressive and continous track shunting as the train passes from one track section to another. Front contacts are metal-carbon to metal, and back contacts are metal to metal.



Neutral Primary, Type B1



Neutral Secondary, Type B1

A-C TRACK RELAY

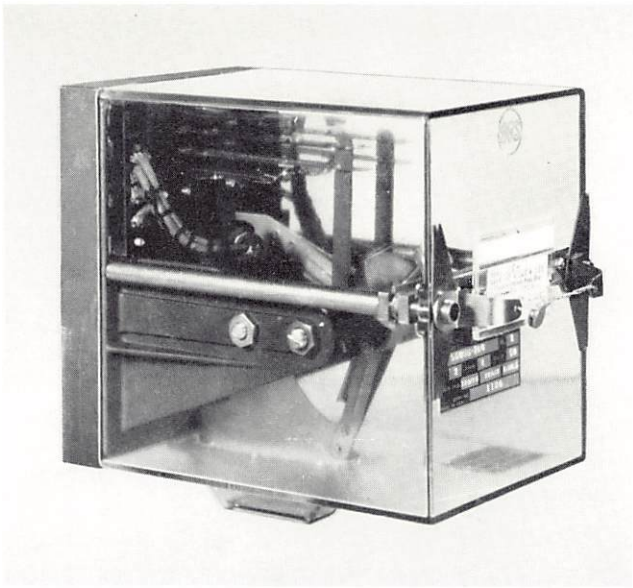
VANE RELAY
Two-Position, Type B2

Alternating-current vane relays are made principally for track circuits. They are high efficiency relays requiring low wattage in the track element for operation.

A vane of aluminum alloy, specially annealed to prevent warping, is secured to a horizontal shaft. The shaft is supported at the ends by steel pivots rotating in jewel bearings to position the vane in the air gap between two magnetic field structures – the local and track electromagnets. The electromagnets are constantly energized while the relay is picked up, but the magnetism produced by one of the electromagnets lags in time with respect to the other. The reaction on the vane of the two independent magnetisms, which are out of step, produces rotation.

The local coil is double-wound so that the two windings can be hooked up in series or in multiple. When connected in multiple, they are operated on half-voltage, and it becomes possible to connect a phase-shifting device, should track operating conditions make it necessary. Track windings are furnished the same way.

Pushers of insulated material transmit the movement of the vane shaft to the contacts. These contacts are similar to the ones used in d-c relays, being flat springs molded in a bakelite block. Front contacts are metal-carbon to metal. Back contacts are metal to metal.



Vane, Type B2

TIMING RELAYS

MICROCHRON™ RELAY
Type B2, A-c and D-c

The microprocessor-based vital timer relay (called Microchron) uses solid-state timing components and two types of logic controls: one, Safety Assurance Logic™ that continuously verifies the microprocessor functions, and the second that accurately energizes the integral relay structure at the selected time. The Microchron is precisely set by a thumb-wheel switch at one second intervals from one second to 19 minutes and 59 seconds. With proper circuiting, it can replace existing GRS d-c motor-operated timer relays. For further details, see GRS Pamphlet 1777.

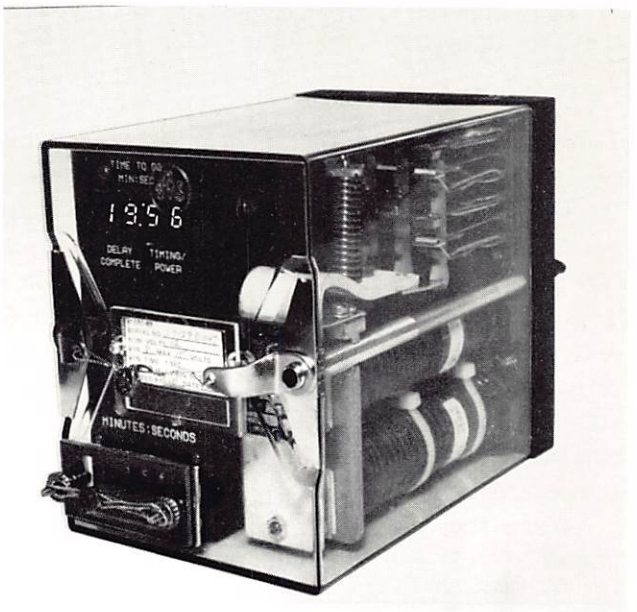
The Microchron provides a vital time delay and any interruption of the power causes an immediate reset to the beginning of the selected time delay. The "instant reset" feature eliminates the need for back-check contacts that were necessary on GRS motor-operated timers. Accuracy of the time setting is ±0.1%, plus a nominal delay of 250 milliseconds (750 ms maximum).

A four-digit light emitting diode (LED) display shows the time remaining before the contacts are actuated. A red LED indicates power is applied to the timer, with the intensity of the LED pulsed during the actual timing period and then going steady bright red upon completion of the time

period. A green LED illuminates at the end of the timing cycle.

The Microchron has the following contact arrangement: two front-backs (metal-carbon to metal and metal to metal), three fronts (metal-carbon to metal), and two backs (metal to metal-carbon).

Two Microchron timing relays are available - one operates in the 8 to 15 d-c voltage range at 0.35 ampere and the other in the 26.5 to 31.5 d-c voltage range at 0.17 ampere. By adding a filter unit, the 8-15 volt relay can operate from unfiltered, fullwave, rectified a-c. The 26.5-31.5 volt relay can be operated from either battery or regulated d-c input power.



Microchron, Type B2

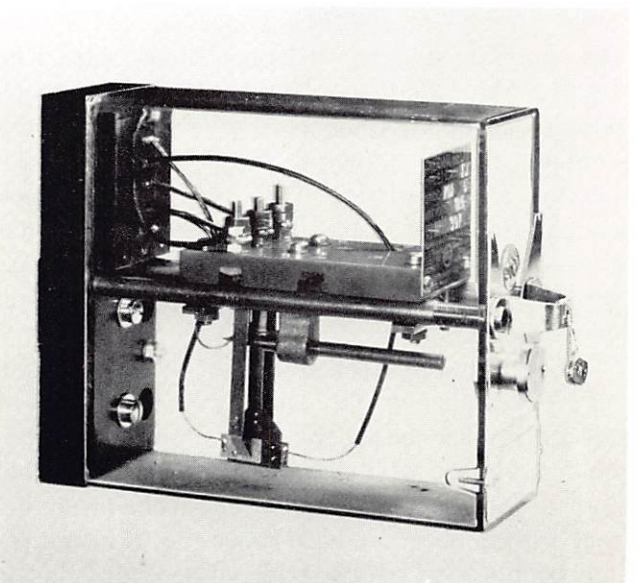
THERMAL RELAY

Type B1, A-c and D-c

A thermal timing relay has one independent normally-closed check contact and one independent normally-open time contact; both metal to metal. It has an external time adjustment which can be sealed to prevent unauthorized changes. The relay is shipped adjusted to the maximum time. Time ranges are for a complete cycle of heating and cooling. Both of the contacts and the heating unit are externally connected.

The heaters are nichrome wire wound on a bimetallic strip which bends when the heater is energized. Variations in supply voltage affect the operating time; hence it is necessary to maintain a constant supply voltage for best operation.

Thermal timing relays made for specific applications have one normally-open, metal to metal time contact, and no check contact. Timing is preset and sealed at the factory. Time periods are for heating only. A single external connection is common to the contact and heating unit.



Thermal, Type B1

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SPECIAL PURPOSE RELAYS

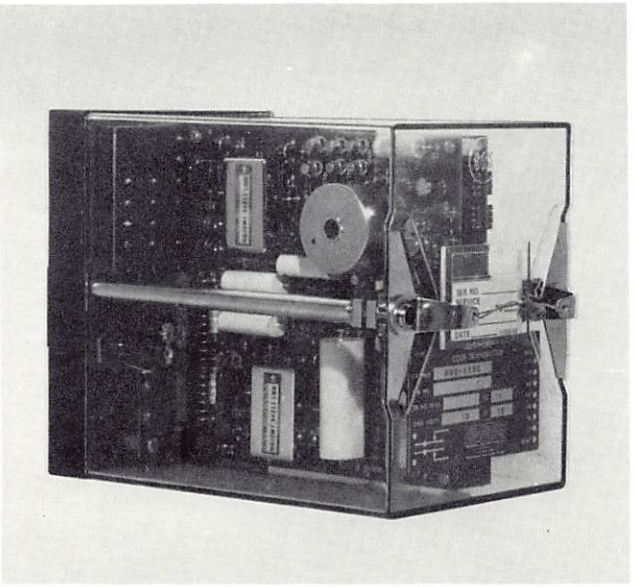
CODE RATE GENERATOR RELAY, SOLID-STATE

Type B2, A-c and D-c

This solid-state vital code rate generator is capable of generating seven commonly-used code rates, thereby reducing the number of types of units a user needs to stock.

The code rate generator relay is housed in a Type B2 relay enclosure and is interchangeable with the existing line of electromechanical code rate transmitters. Code rate accuracy is ± 1% and stability with temperature and power supply variations is better than ± 0.1%. The operating temperature range is from -40° C to +70° C.

When the unit is installed, it becomes "programmed" by a wire jumper to generate one of the following rates: 75, 96, 120, 147, 180, 220, or 270. A light-emitting diode (LED) indicates at which rate the generator is operating.



Solid-State Code Rate Generator, Type B2

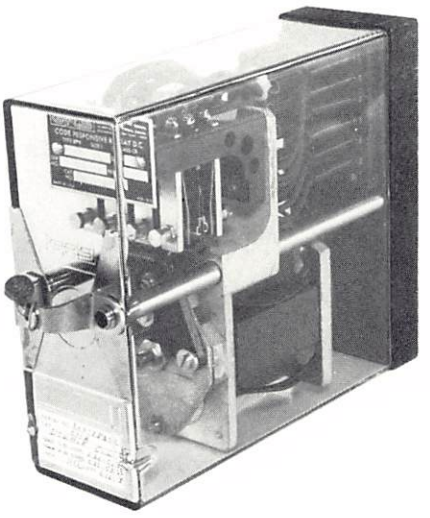
CODE-RESPONSIVE RELAY

Type B1, Direct-Current

Code-responsive relays are made with an armature and contact structure that responds quickly to pulses of coded energy, even when the pulse frequency is as high as four per second. Three basic internal structures are available. The first has two dependent front-back contacts. The second has four dependent front-back contacts, and is usually supplied for heavy service, as the contact design provides more effective non-bounce characteristics. The third, a polar-stick code-responsive relay, is constructed similar to the first structure with the omission of the bias spring assembly. All three have metal to metal contacts.

The armatures are polarized by two permanent magnets which, with the exception of the polar-stick, allow the front contacts to close only if voltage of the proper polarity is applied (polar-biased). When the relay is deenergized, the bias spring, together with magnetic bias, returns the armature to the deenergized position, closing the back contacts.

The polar-stick relay operates in response to a change in the direction of the current flow in its coils. The armature stays in its last-operated position when the energy is cut off, held by the two permanent magnets.



Code-Responsive, Two Front-Back Contacts, Type B1

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CODE TRANSMITTER RELAY

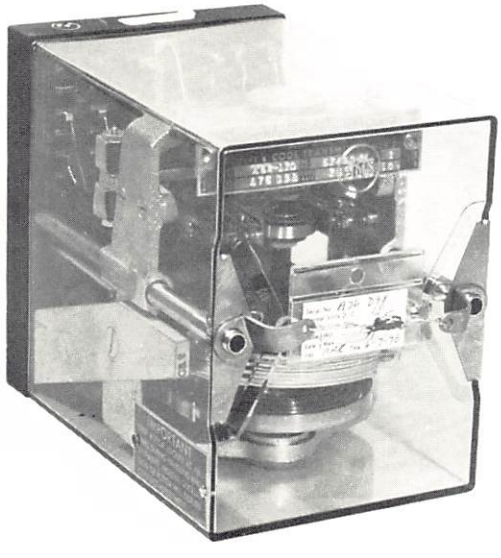
Type B2, Direct-Current

Code transmitters have an oscillating armature on a vertical shaft which carries cams. The cams open and close contacts in the field circuit. These contacts interrupt the energy to the driving coil to keep the armature oscillating. The other contacts interrupt circuits at the rate for which the transmitter is designed. Contacts are metal to metal.

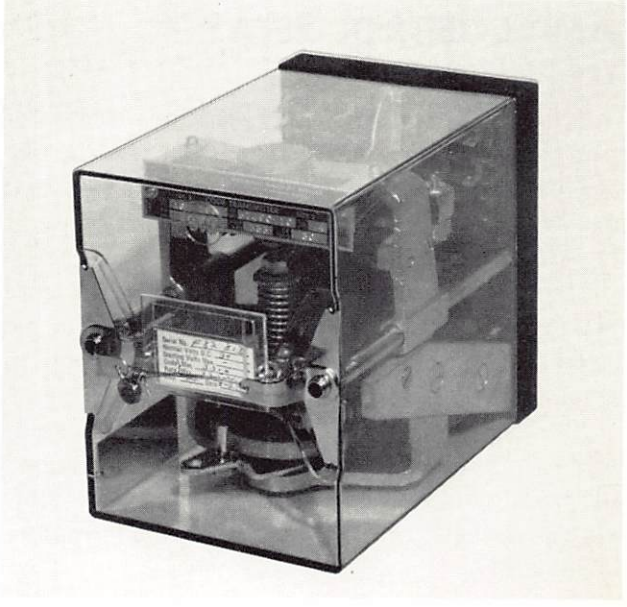
The locking-type code transmitter provides a limited number of pulses at a predetermined rate. When the rotary pendulum spring is energized it is held wound up, and when deenergized it oscillates and actuates the contacts to provide the desired pulse.

The "rate" of the oscillating armature is determined by its mass and the length of the spiral coil spring. These transmitters are furnished to produce either 50, 75, 96, 120, 180, 220, 270, or 333 1/3 impulses per minute.

The rotor shaft, suspended on a steel ribbon, oscillates in nylon bushings which are lubricated in the factory during assembly.



Code Transmitter, Non-Locking, Type B2



Code Transmitter, Locking, Type B2

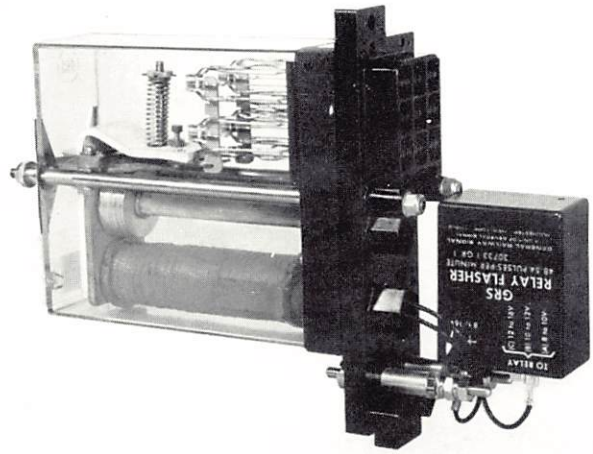
FLASHER RELAY

Type B1, Direct-Current

The electronically-driven highway crossing flasher consists of a Type B1 neutral relay and a solid-state flasher module. The flasher module establishes and maintains a flashing rate of 48 to 54 flashes per minute for highway crossing signals, and 56 to 64 flashes per minute for flashing wayside signal aspects.

The flasher module drives the Type B1 neutral relay which is equipped with four dependent front-back, heavy-duty, lamp-control contacts (silver-cadmium-oxide). Full back contact pressure is maintained while the relay is not operating.

An internal tapped resistor in the flasher limits the output current to the relay. Three taps on this resistor permit the proper connections in accordance with the supply voltage. The flasher is designed for d-c operation from battery or rectified and filtered a-c. It operates at a constant rate through an 8 to 16 voltage range, and maintains a constant ratio of "on-off" time throughout a temperature range from -40° to +160° F (-40° to +71° C).



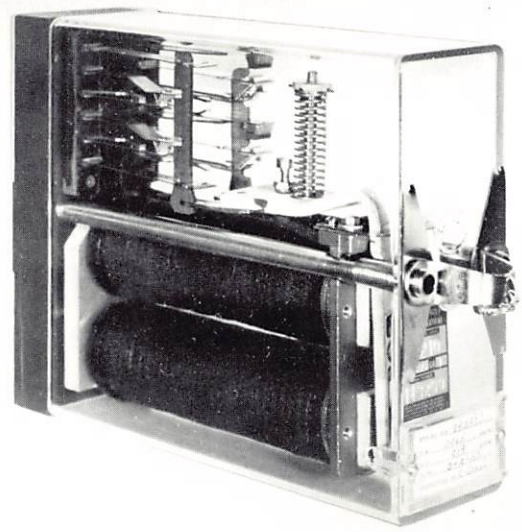
Flasher, Type B1

LAMP-CONTROL RELAY

Type B1, Direct-Current

The lamp-control relay is used primarily for controlling lamp circuits at highway grade crossings equipped with flashing lights. It has two regular front-back contacts and two back contacts for handling the heavy surge current characteristic of highway crossing lamps. The back contacts are rated at 15 amperes at 12 volts a-c or d-c. The front contacts are metal-carbon to metal, and the back contacts are metal to metal.

Coil resistance is lower than the resistance of regular line relays to obtain fast pickup and open the back contacts as rapidly as possible. Slow release washers on the cores let the armature down gently.



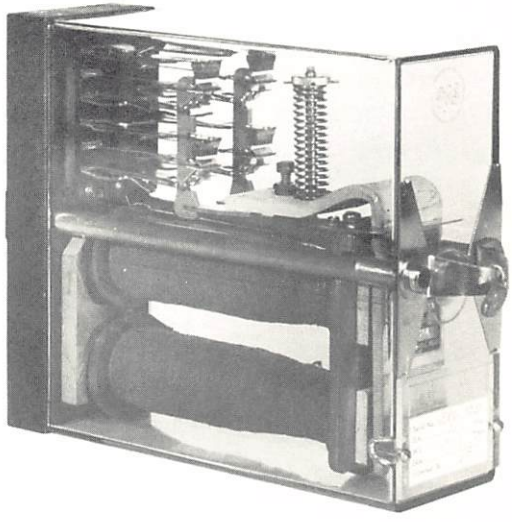
Lamp-Control, Type B1

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LIGHT-OUT NEUTRAL RELAY

Type B1, A-c or D-c

Light-out relays are used to detect failures of signal lamps. They operate on direct current or alternating current. Relays with low-resistance windings are used for hot filament checks; relays with both low- and high-resistance windings are used for hot and cold filament checks. Where double filament lamps are used, the relays can be furnished to either hold up or drop out when the main filament opens. A reactor is not usually needed in the other lamp circuits to compensate for the relay's reactance, because the voltage drop across the relay is very small. Front contacts are metal-carbon to metal, and back contacts are metal to metal. An external rectifier is required for operation.

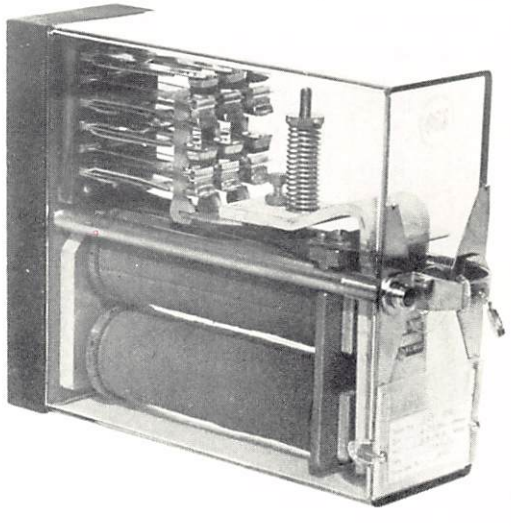


Light-Out Neutral, Type B1

POWER-TRANSFER NEUTRAL RELAY

Type B1, Rectified A-c

The power-transfer neutral relay is essentially a d-c line relay operating on rectified a-c. If a-c energy fails, the relay armature drops, automatically transferring the circuits onto a local battery. The ratio of release voltage to pickup voltage is about 75 percent, to provide transfer before signal aspects are impaired. Contacts are heavy-duty, metal to metal, or metal-carbon to metal, with a capacity of 15 amperes at 15 volts. An external rectifier is required for operation.

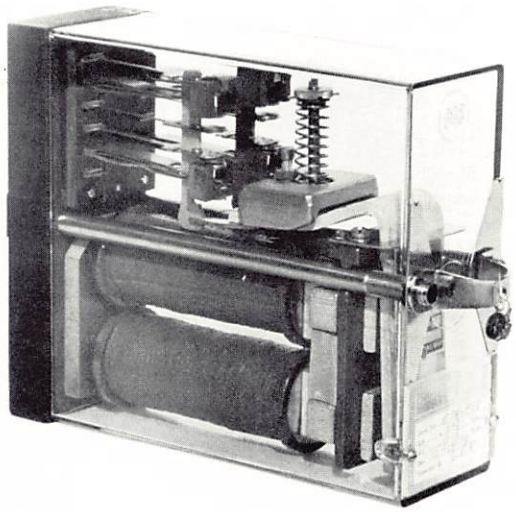


Power-Transfer, Type B1

SWITCH-CONTROL RELAY

Type B1, Direct-Current

The switch-control relay is available either as a neutral relay with heavy-duty contacts or a biased-neutral relay with extra heavy-duty contacts. It is used to control operating energy to switch machines. Contacts are silver-cadmium-oxide.

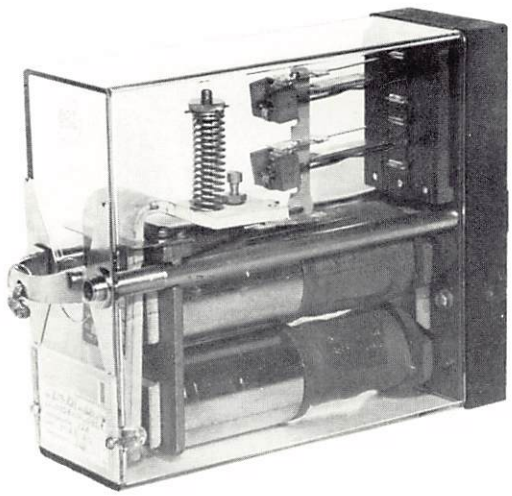


Switch-Control, Type B1

SWITCH-OVERLOAD NEUTRAL RELAY

Type B1, Direct-Current

The switch-overload relay is used to cut off energy from a switch-control relay when the switch machine motor is overloaded because of an obstruction, and to provide for automatic resetting when polarity of the control circuit is reversed. The relay picks up on the overload current and remains picked up until the current in the control circuit is reversed. Built-in thermal slow-pickup characteristics prevent pickup on the normal current surges through the switch machine motor when starting. This feature permits repeated switch operation which may dislodge the switch obstruction causing the overload. The relay has metal to metal, close-before-open (CBO) contacts with .030-inch front openings. These relays are available for low- or high-voltage switch machines.



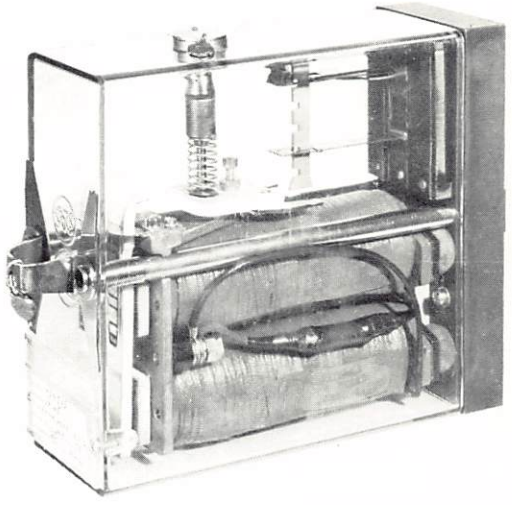
Switch-Overload, Type B1

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TWO-RATE CHARGE-CONTROL NEUTRAL RELAY

Type B1, Direct-Current

The two-rate charge-control neutral relay (operated by another relay, which is actuated periodically) is used in battery charging circuits to start a high-rate charge when a load is thrown on the battery. When the battery reaches its full charge, the relay operates, transferring from a high to a continous low charge rate to ensure a fully charged battery under varying load and temperature conditions. Contacts are metal to metal.



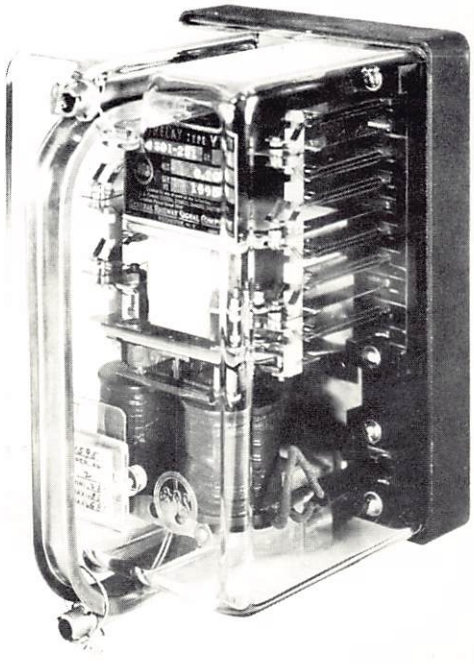
Two-Rate Charge-Control, Type B1

TYPE VTB POLAR-BIASED RELAY

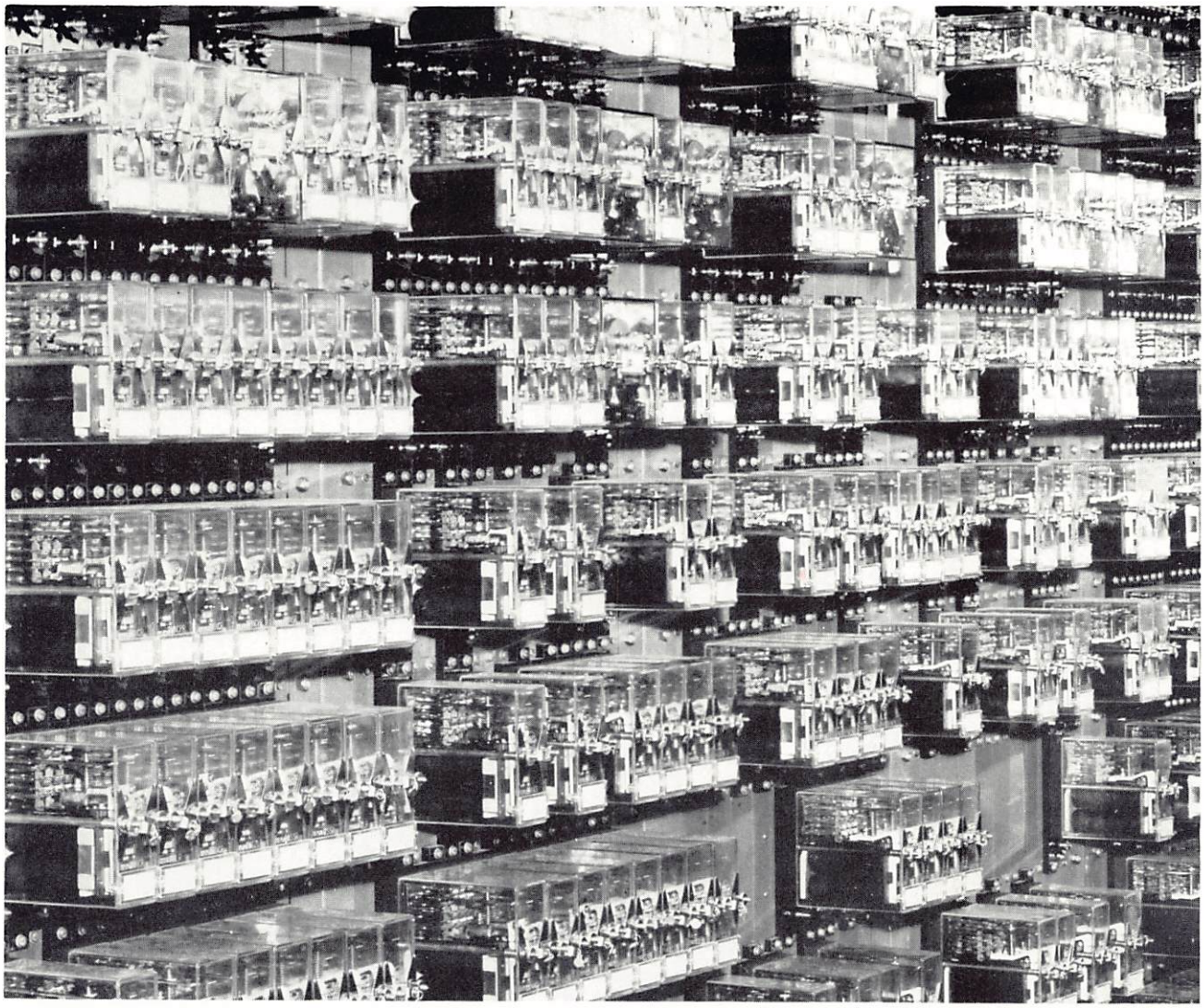
Type VTB code-following relays are used in coded track circuits and coded line circuits for signal control where quick response is essential.

The relay occupies the plugboard space of a Type B2 relay. It can be equipped with one or two armatures, depending upon circuit application. Contacts are metal to metal, front and back.

The two-armature relay may be used with each armature controlled independently by separate coding circuits. The circuits must be arranged to avoid simultaneous energization of the two coils. With the coils in series to provide opposite magnetization, the armatures respond selectively to reversal of current in a single coding circuit.



Polar-Biased, Type VTB



ORDERING INFORMATION

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The following abbreviations are used in relay listings to designate contacts:

ABBREVIATION	MEANING	SYMBOL
F	Front	
FB	Front-Back	
B	Back	
NR	Normal-Reverse	
CBO MB	Close-Before-Open Make-Before-Break	
HD	Heavy-Duty	
EHD	Extra Heavy-Duty, with magnetic blowouts	

Operating values of relays are based on 70° F (21° C).

Please order all Type B relays by name, catalog number, and quantity. Listings of individual relay mountings, plugboards, tools, and accessories are located on pages 33 through 35 of this catalog; please order separately.

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BIASED-NEUTRAL RELAY

Types B1 and B2, Direct-Current

Size	Contacts	Nominal Resistance Ohms	Maximum Pickup And Working Amperes	Notes	Catalog Number
1	2F-2B	2100	.0088	24-v, EHD contacts	*A62-604
1	4FB-2F-1B	0.5***	.316		A62-120
1	4FB-2F-1B	500	.0121		A62-122
1	6FB	500	.0121		A62-125
1	4FB-2F-1B	100	.026	FSO	*A62-126
1	**4FB-1F-2B	750	.0084	Trakode®	*A62-128
1	4FB-1F-2B	750	.0084	Trakode	*A62-129
1	4FB-2F-1B	63	.0305		*A62-130
1	4FB-2F-1B	375	.0126		*A62-131
1	4FB-2F-1B	750	.0084	Trakode	*A62-132
1	6FB	63	.0305		*A62-140
1	6FB	250	.0168		*A62-549
1	6FB	100	.026		*A62-543
1	6FB	1.0	.236		*A62-550
1	6FB	30	.042		*A62-551
1	2FB-4F-2B	100	.026	HD contacts	A62-608
1	2FB-4F-2B	1000	.0088		*A62-552
1	2FB-3F-3B	1000	.0088		*A62-553
1	4FB-2F-1B	2100	.0058		*A62-554
1	2FB-4F-2B	2100	.0058		*A62-555
1	2FB-4F-2B	2100	.0058		*A62-578
1	4FB-2F-1B	2100	.0058	2FB gold contacts	*A62-603
1	4FB-2F-1B	500	.0121	HD contacts	A62-613
1	4FB-2F-1B	2.0	.0158	HD contacts	A62-623
1	4FB-2F-1B	1000	.009		A62-624
1	5F-4B	0.5***	.320	High % release	*A62-633
1	2FB-2F-4B	2100	.0058		A62-634
1	5F-4B	0.5***	.374	High % release	*A62-639
1	4FB-2F-1B	0.5***	.374	High % release	*A62-646
1	4FB-2F-1B	2100	.0058		A62-648
1	6FB	2	.124	MD contacts	A62-654
2	8FB-4F-2B	350	.0189		A62-145
2	12FB	350	.0189		A62-150
2	8FB-4F-2B	350	.0189	HD contacts	A62-620

*Specific application relay.

**Special adjustment on contacts 35 and 36.

***Resistance and electrical value with coils in parallel.

CODE RATE GENERATOR RELAY, SOLID-STATE

Type B2, A-c and D-c

Nominal System Voltage	Nominal Working Amperes	Contacts	Code Rates	Catalog Number
12	.25	2F-2B	75, 96, 120, 147, 180, 220, 270	A92-1135

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CODE-RESPONSIVE RELAY

Type B1, Direct-Current

Nominal System Voltage	Contacts	Nominal Resistance Ohms	Notes	Catalog Number
2	**2FB	.14	Track relay	A62-155
2	**2FB	.13-.55	Track relay	A62-589
4	***2FB	200	Line code repeater	A62-575
10	**2FB	200	Line code repeater	A62-156
10	**4FB	80	Line code repeater	A62-157
10	**2F-***2B	200	Line code repeater	*A62-595
12	**2FB-***2FB	80	Line code repeater	A62-598
4	**2FB	40	Impulse relay for inverse code (line relay)	*A62-161
10	**2FB	60	Line code repeater to obtain delayed release	*A62-162
10	**2FB	300	Trakode (line relay)	*A62-164
10	**2FB	1400	Line code repeater to obtain delayed pickup.	*A62-163
2	**2NR	22-22	Polar-stick relay	*A62-600
12	***2FB-2FB (F** B***)	200	Line code repeater	*A62-610
10	***4FB	80	Line code repeater	A62-622
---	**2NR-***2NR	34	Polar-stick line relay	A62-626
---	**4NR	34	Polar-stick line relay	A62-638
2	**1NR-***1NR	22-22	Polar-stick relay	A62-645

*Specific application relay.
**Silver-platinum contacts for 30 volts or less.
***Tungsten contacts for over 30 volts.

CODE TRANSMITTER RELAY

Type B2, Direct-Current

(Non-Locking Type)

Nominal Code Rate	Contacts	Nominal Resistance Ohms	Nominal System Voltage	Catalog Number
50	*2F-2B	150	10	A62-642
75	*2F-2B	150	10	A62-170
96	*2F-2B	150	10	A62-591
120	*2F-2B	150	10	A62-171
180	*2F-2B	150	10	A62-172
270	*2F-2B	150	10	A62-173
50	**2F-2B	150	10	A62-643
75	**2F-2B	150	10	A62-175
96	**2F-2B	150	10	A62-653
120	**2F-2B	150	10	A62-176
180	**2F-2B	150	10	A62-177
270	**2F-2B	150	10	A62-178

(Locking Type)

270	2F-2B	150	28	A62-185
333⅓	2F-2B	150	28	A62-186

*Silver-platinum contacts for 30 volts or less.
**Tungsten contacts for over 30 volts.

FLASHER RELAY

Type B1, Direct-Current

Contacts	Nominal System Voltage	Catalog Number: Relay Only	Catalog Number: Relay With Flasher	Catalog Number: Flasher Only (Incl. Mod. Kit)	Flashing Rate
4FB	8 to 16	A62-577	A62-195	P62-769	48-54 Flashes Per Minute
			A62-197	P62-784	56-64 Flashes Per Minute

NOTE: An arrester (see Assemblies Catalog Section 3), not in excess of 1000 volts breakdown, must be used for surge protection if d-c energy is on line outside of case. The plugboard and two voltage test posts required for this relay must be ordered separately. See Refs. G and J, page 33.

LAMP-CONTROL RELAY

Type B1, Direct-Current

Contacts	Nominal Resistance Ohms	Nominal System Voltage	Catalog Number
*2FB-2B	210	10	A62-205

*Independent back contacts rated at 15 amperes, 12 volts a-c or d-c.

LIGHT-OUT NEUTRAL RELAY

Type B1, A-c or D-c

Contacts	Nominal Resistance Ohms	For Use With Lamp: Volts @ 60 Hz	For Use With Lamp: Watts	Maximum Working Amperes A-c or D-c For Low Resistance Winding	Catalog Number: Rectifier Only***	Catalog Number: Relay Only
*4FB	.24	10	5+3.5	.680	A53-100	A62-211
**4FB	.4	10	13+3.5	.294	A53-100	A62-213
4FB	450-.45	10	5	.3885	A53-100	A62-215
*4FB	450-.069	10	18+3.5	1.52	A53-100	A62-217
****4FB	450-.069	10	18+3.5	1.52	A53-100	A62-616
4FB	450-.12	12-16	21 (C.P.)	.883	A53-100	A62-221
6FB	450-.2	10	10	.840	A53-100	A62-231
**4F-2B	450-.61	10	18+3.5	.300	A53-100	A62-236

*Drops when major filament burns out. **Picks up on minor filament. ***See page 17. ****Carbon-back contacts.

MAGNETIC-STICK RELAY

Type B1, Direct-Current

Contacts	Nominal Resistance Ohms	Max Normal and Reverse Working Amperes (Double Coil Operation)	Catalog Number
4NR, carbon-to-metal	7	.089	A62-245
4NR, carbon-to-metal	34	.036	A62-246
4NR, carbon-to-metal	500	.011	A62-247
2NR (Ag pt.), 2NR (tung)	34	.036	A62-626

NEUTRAL REGULAR-RELEASE RELAY

Types B1 and B2, Direct-Current, Line and Track

Size	Contacts	Nominal Resistance Ohms	Maximum Pickup And Working Amperes	Notes	Catalog Number
1	6FB	1.8	.130		A62-260
1	6FB	4	.089	Track relay	A62-261
1	6FB	500	.0121		A62-262
1	4F-2B	1.8	.106	Track relay	A62-270
1	4F-2B	4	.0735	Track relay	A62-271
1	4FB-2F-1B	1.8	.130	Track relay	A62-275
1	4FB-2F-1B	4	.089	Track relay	A62-276
1	4FB-2F-1B	500	.0121		A62-277
1	4FB-1F-2B	900	.0117		A62-278
2	12FB	500	.0152		A62-330
2	8FB-2F	330	.0294	EHD contacts (2F)	A62-331
2	8FB-4F-2B	500	.0153		A62-606
2	8FB-4F-2B	500	.0168	*HD contacts	A62-619
1	6FB	84	.0195		A62-295
1	6FB	900	.0084		A62-296
1	6FB	500	.0157	**HD contacts	A62-580
1	4F-2B	350	.0086		A62-300
1	4FB-2F-1B	84	.0195		A62-305
1	4FB-2F-1B	350	.0137		A62-306
1	4FB-2F-1B	900	.0084		A62-308
1	4FB-2F-1B	350	.0136	HD contacts (silver backs)	A62-309
1	4FB-2F-1B	500	.121	HD contacts (silver backs)	A62-310
1	4FB-2F-1B	900	.0084	HD contacts (silver backs)	A62-311
1	4FB-2F-1B	2500	.0084	HD contacts (silver backs)	A62-640
1	4FB-2F-1B	500	.0121	HD contacts (carbon backs)	A62-612
1	4FB-2F-1B	100	.0192	HD contacts (carbon backs)	A62-615
				Coded Track:	
1	2FB-3F-2B	42	.043	Operated from master transformer.	A62-313
1	6FB	9	.055	Operated from decoder unit.	A62-314
1	4FB-2F-1B	50	.037	Pulse bridging. Rectifier required.	A62-315
	---	---	---	Rectifier for above.	A53-115
1	4FB	6	.116	Overlay track circuit	A62-293
1	4F-2B	100	.0157	Overlay track circuit	A62-317
1	4FB-2F-1B	1800	.0047	Trakode	A62-318
1	4FB-1F-2B	1800	.0042	Trakode	A62-320
1	4FB-2F-1B	450/8	.017/.116	Trakode	A62-312
1	4FB-2F-1B	100	.0192	Trakode	A62-319
1	1F-1B	200	.0068	Impulse track circuits	A62-323
1	2F-1B	1400	.0032	System clearout	A62-324
1	2FB-3F-3B	28.5	.163	A-c rectified track circuits	A62-325
1	4FB	460	.0315		A62-556
1	6FB	60	.033		A62-557
1	6FB	100	.0252		A62-558
1	4FB-1F-2B	500	.0166	.090" front contact opening	A62-544
1	2FB-1B-2F	500	.0158	EHD fronts on 2F; med. duty backs on 2FB-1B	A62-546
1	2FB-1B-2F	1300	.0158	EHD fronts on 2F; med. duty backs on 2FB-1B	A62-641
1	4FB-1F-2B	36	.043		A62-559
1	1F-2B	.24	.400		A62-560
1	4F-2B	1	2.3	Intermittent train control, HD contacts (carbon backs)	A62-522
1	9F	900	.0084		A62-625
1	4FB-2F-1B	135/65	.109/.107	Quick-acting	A62-335

*Carbon fronts and backs. **Silver-cadmium oxide fronts and backs.

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NEUTRAL SLOW-ACTING RELAY

Types B1 and B2, Direct-Current

Size	Characteristics	Contacts	Nominal Resistance Ohms	Maximum Pickup And Working Volts/Amperes	Minimum Time of Pickup And/or Release	Catalog Number
1	Slow-p.u., line	4FB-2F-1B	220	9.45-v	1.35 sec at .050A	A62-340
1	Slow-p.u., line	4FB-2F-1B	300	.034A	1.4 sec at 13.2-v	A62-341
1	Slow-p.u., line	4FB-2F-1B	220	9.1-v	1.2 sec at .050A	A62-611
1	Slow-p.u., line	6FB	220	9.45-v	1.35 sec at .050A	A62-345
1	Slow-pickup and slow-release, line	4FB-2F-1B	194	.046A	1.1 sec pickup at 10.5-v .9-1.1 sec release at 10-v	A62-350
1	Slow-rel, line	2FB	460	.014A	3-3.75 sec at 9-v	A62-353
1	Slow-rel, line	4FB	450	.013A	.9-1.1 sec at 10-v	A62-355
1	Slow-rel, line	4FB	194	.031A	3.0-3.75 sec at 12-v	A62-360
1	Slow-rel, line	4FB-2F-1B	*194	.035A	1-1.25 sec at 10-v	A62-357
1	Slow-rel, line	4FB-2F-1B	194	.0335A	2.8-3.5 sec at 10-v	A62-358
1	Slow-rel, line	4FB-2F-1B	194	.0347A	1.0-1.25 sec at 10-v	A62-614
1	Slow-rel, line	6FB	*194	.035A	1-1.25 sec at 10-v	A62-359
1	Slow-rel, line	4FB	194	.0305A	2.5-2.75 sec at 9-v	A62-602
2	Slow-rel, line	12FB	260	.0231A	.825-1.1 sec at 10-v	A62-607
1	Slow-rel, line	4FB	194	.0315A	3-3.75 at 12-v	A62-617
1	Slow-pickup, slow-release, quick-cross-over	4FB-2F-1B	124	.070A	1.25 sec pickup at 11-v 1.5 sec release at 11-v	A62-425

*Values given for relays with aluminum slugs.

SPECIFIC APPLICATION RELAY

Slow-Release, Line

Size	Contacts	Nominal Resistance Ohms	Maximum Pickup And Working Amperes	Minimum Time of Release	Notes	Catalog Number
1	2FB	24	.023	Partial slow release	Approach line	A62-365
1	2FB	80	.0116	Partial slow release		A62-596
1	4FB-2F-1B	300	.0283	1.7 sec at 8.4-v		A62-369
1	4FB-2F-1B	800	.0121	.9 sec at 10-v	Primary battery	A62-370
1	4FB-2F-1B	460-460	.036	.8 min - .9 max at 21.6-v (lower coil only)	Obstruction in switch points	A62-372
1	2F-4B	80	.0242	.1 sec at 2-v		A62-380
1	2FB-4F-2B	460	.022	2.0 sec at 32-v	*HD contacts	A62-542
1	2F-1B	460	.0252	2.9 sec at 32-v		A62-562
1	4F-2B	460	.025	2.0 sec at 32-v		A62-563
1	4FB	460	.0315	Partial slow release		A62-564
1	4FB-1F-2B	460	.021	2.0 sec at 32-v		A62-565
1	2FB-3F-3B	460	.022	2.5 sec at 32-v	HD front contacts	A62-566
1	4FB	210	.0109	Partial slow release	HD contacts	A62-601
1	4FB	194	.0315	3-3.75 sec at 12-v	*HD contacts	A62-617

*Carbon backs.

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POLARIZED RELAY

Types B1 and B2, Direct-Current

Size	Contacts	Nominal Resistance Ohms	Normal and Reverse Operating Amperes	Maximum Polar Pickup And Working Amperes	Notes	Catalog Number
1	2NR	520	.010 to .012	–––	Ground detector relay	A62-567
2	4NR-2FB-2F	125/.14	–––	.0116	HD contacts	A62-585
2	4FB-4NR	500	–––	.0049		A62-391
2	6NR	500	–––	.0062		A62-609

POWER-TRANSFER NEUTRAL RELAY

Type B1 Rectified, Alternating-Current

Contacts, Heavy-Duty 15A, 15V	Rated Voltage A-c	Nominal Resistance Each Side Ohms	Catalog Number	
			Rectifier Only***	Relay Only
*2FB	10	50 - 50	A53-541	A62-401
*6FB	10	100 - 100	A53-541	A62-406
**6FB	10	100 - 100	A53-541	A62-579
*6FB	12	100 - 100	A53-541	A62-407

*Metal-to-metal. **Carbon-to-metal fronts. ***See page 17.

PRIMARY-SECONDARY RELAY COMBINATION

Types B1 and B2, Direct-Current

Size	Purpose	Contacts	Nominal Resistance Ohms	Maximum Pickup And Working Volts/Amperes	Minimum Time of Pickup	Catalog Number
1	Primary	4F-2B	4	.063-.065A	–––	A62-410
1	Secondary	3FB-3B-1CBO	220	9.45-v	1.35 sec at .050A	A62-415
1	Secondary	2FB-2F-4B	3100	.0058A	.39 to .42 sec at 30-v	A62-417
2	Secondary	11FB-1CBO	400	.0289A	1.35 sec at .0275A	A62-541

SWITCH-CONTROL RELAY

Type B1, Direct-Current

Contacts	Nominal Resistance Ohms	Switch Machine Operating Voltage	Maximum Pickup And Working Amperes	Notes	Catalog Number
4FB	500	Low	.0136	Neutral relay. HD contacts. .090" front contact opening.	A62-427
2F-2B	500	Low or High	.019	Biased-neutral relay. EHD contacts. .125" front contact opening.	A62-429
2FB-5F-1B	.045-450	High	.0315	Neutral relay. HD contacts, .090" front contact opening. For Model 6 switch machine control.	A62-424

SWITCH-OVERLOAD NEUTRAL RELAY

Type B1, Direct-Current

Contacts	Nominal Resistance Ohms	Switch Machine Operating Voltage	Overload Rating Amperes	Catalog Number
2CBO	.064-135	Low	18	A62-430
2CBO	.064-135	High	12	A62-431
2CBO	1.85-220	High	*	A62-433
2B	.068-1225	High	12	A62-432
2FB (MB)	.064-530	High	12	A62-605
2FB (MB)	.068-230	High	11.5	A62-545

*Requires resistor A62-631 for 7½A operation or resistor A62-632 for 10A operation.

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TIMING RELAY, MICROCHRON

Type B2, A-c and D-c

Nominal System Voltage*	Contacts**	Time Range		Catalog Number
		Min	Max	
8-15	2FB-3F-2B	1 sec	19 min 59 sec	A62-627
26.5-31.5	2FB-3F-2B	1 sec	19 min 59 sec	A62-628

*For unfiltered rectified a-c system voltage, order separately filter A62-630.

**2FB metal-carbon-to-metal and metal-to-metal,
3F metal-carbon-to-metal, 2B metal-to-metal-carbon

TIMING RELAY, THERMAL

Type B1, A-c and D-c

Contacts	Nominal System Voltage	Time Range—Sec		Nominal Resistance Of Heater—Ohms	Catalog Number
		Min	Max		
1F-1B	10	18	30	11.3	A62-458
1F-1B	12	18	30	18.6	A62-459
1F-1B	10	25	45	11.3	A62-464
1F-1B	12	25	45	18.6	A62-465
1F-1B	10	45	130	11.3	A62-462
1F-1B	12	45	130	18.6	A62-463
1F	10	9	11	11.3	*A62-470
1F	12	9	11	18.6	*A62-471

*Specific application relays - no external time adjustment.

TWO-RATE CHARGE-CONTROL NEUTRAL RELAY

Type B1, Direct-Current

Contacts	Nominal Resistance Ohms	Number Cells (Lead Battery)	Catalog Number
1B	705	4 to 7	A62-475
1B	1580	10 to 14	A62-476
1B	14105	50 to 60	A62-477

VANE RELAY

Type B2, Alternating-Current, Two-Position, Track Relay

Contacts	Local Winding Volts	Track Winding Volts	Frequency (Hz)	Catalog Number
2F-2B	110/55	1.0/0.5	50	A62-485
2F-2B	110/55	1.0/0.5	60	A62-486
4F-4B	110/55	1.0/0.5	60	A62-547
4F-4B	110/55	2.0/1.0	100	A62-597
2F-2B	110	5.0	60	A62-548
2F-2B	110	5.0	50	A62-644

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TYPE VTB POLAR-BIASED RELAY

Single Armature

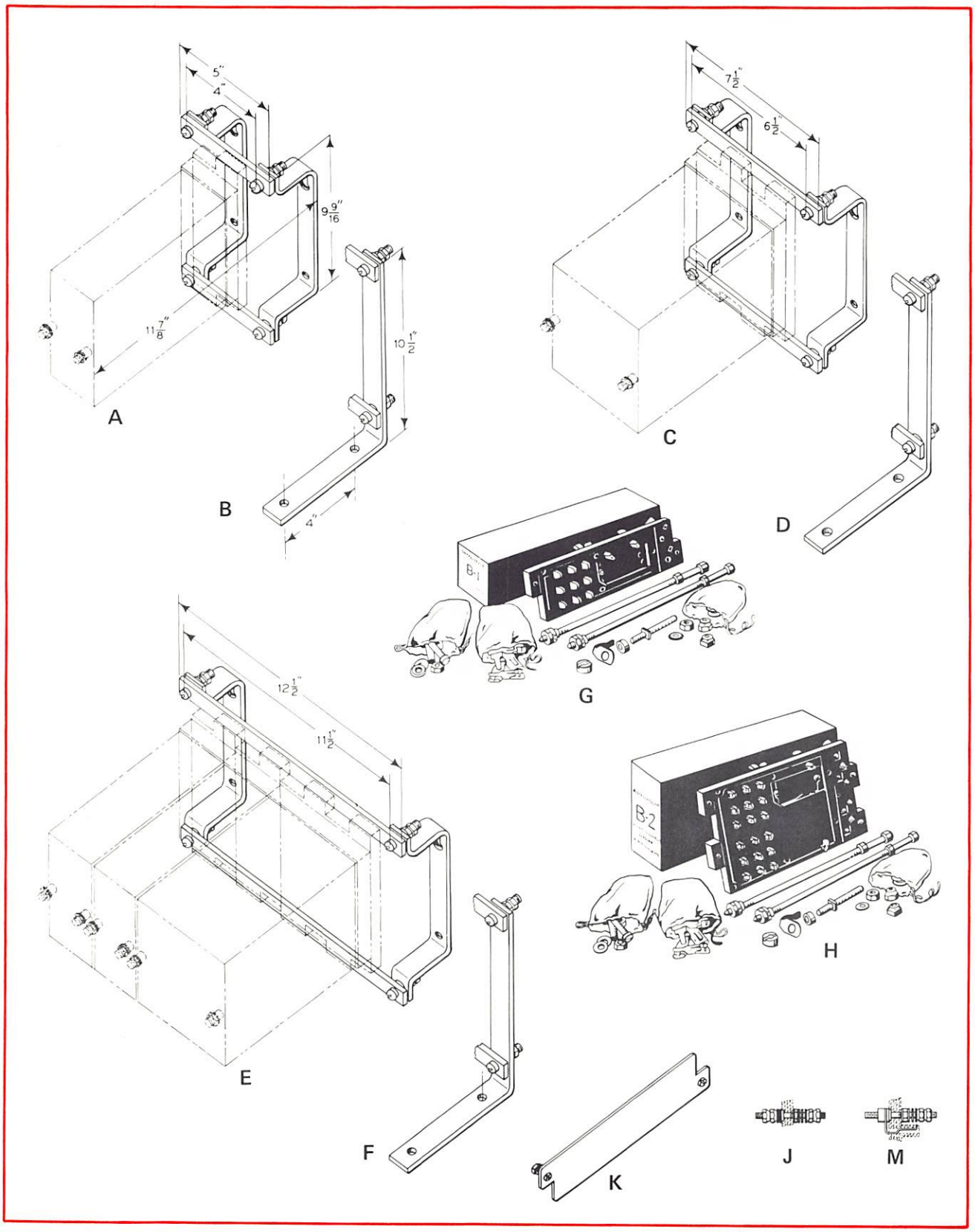
Nominal Coding Current Amperes	Nominal System Voltage	Contacts Per Armature*	Nominal Resistance Ohms	Notes	Catalog Number
.150	10 or 12	2FB	34	Line repeater	A62-497
.030	10 or 12	2FB	200	Line	A62-490
.100	10 or 12	1FB-2F-1B	34	Line repeater	A62-535
.080	10 or 12	1FB-2F-1B	100	Line	A62-536
.565	———	2FB	0.24	Track	A62-491
.760	———	2FB	0.20	Track	A62-537
.600	———	3FB	0.24	Track	A62-492
.080	———	3FB	34	Track repeater	A62-538
.250	———	2FB	4	Approach track	A62-498

Double Armature

.200	10 or 12	1FB-1F-2B	17-17	Line	**A62-493
.081	10 or 12	1FB-2F-1B	100-100	Line	A62-494
.900	———	1FB-1F-1B	0.20	Track	A62-530
.250	———	2FB	4-4	Approach track	A62-532
.900	———	3FB	0.20	Track	A62-495
.170	10 or 12	3FB	17-17	Line	A62-533
.065	10 or 12	3FB	100-100	Line	A62-534
1.500	———	1FB-2F-1B	0.20-0.20	Track	A62-629
1.500	———	1FB-1F-2B	0.25-0.25	Track	A62-647

*Silver platinum contacts for 30 volts or less.

**Relay has a ventilated cover, also 1FB-1B is silver platinum, 1F-1B tungsten in each space.



Individual relay mountings and plugboards.

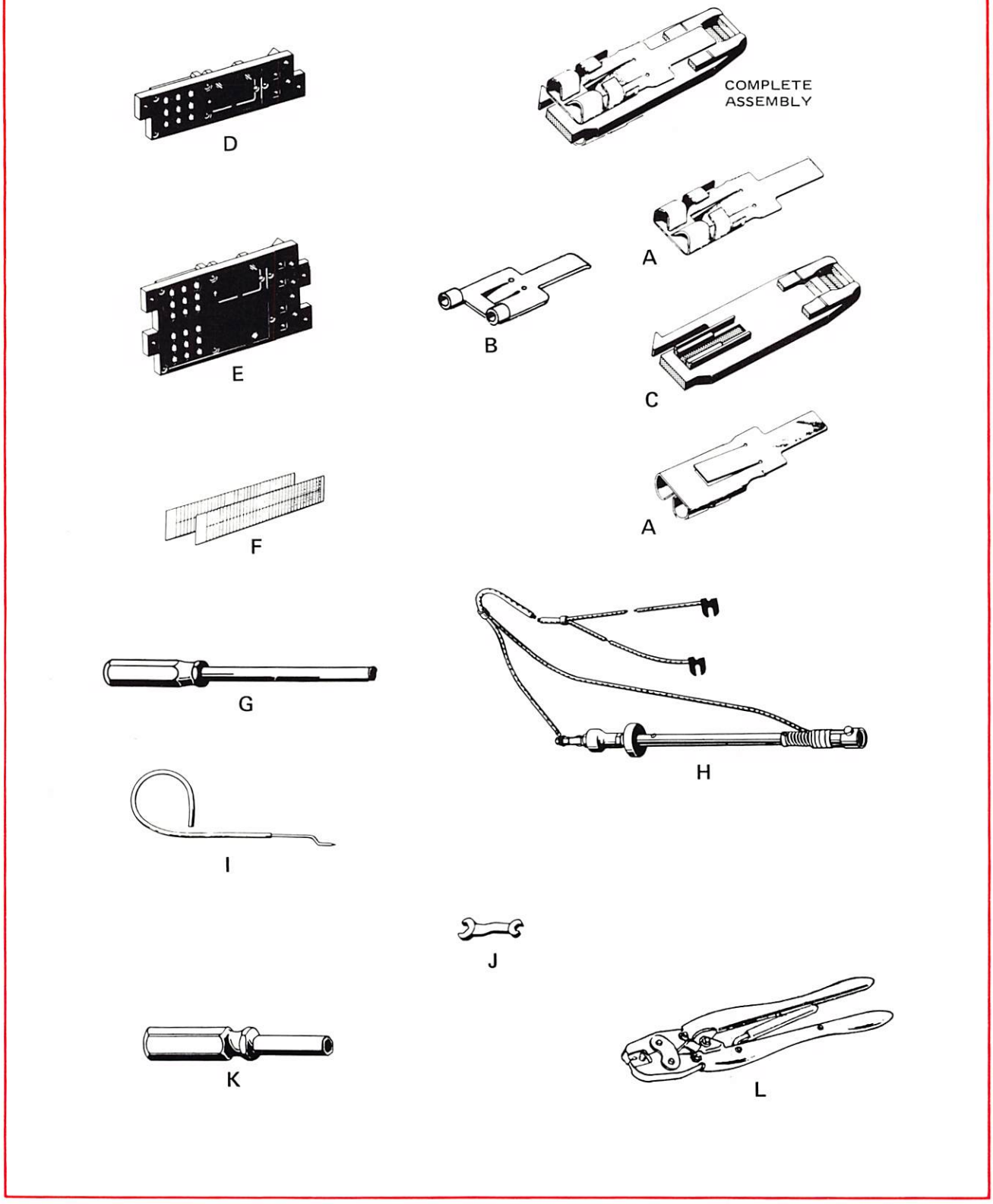
INDIVIDUAL RELAY MOUNTINGS AND PLUGBOARDS

To order rack mountings for installation in cases and housings, see Assemblies Catalog Section 5, Cases and Housings.

Order by catalog number and name shown in bold type.

Ref.	Name	Catalog Number
A	**Relay Mounting,** for wall mounting one Type B1 relay. Does not include plugboard	A62-500
B	As above, except for shelf mounting	A62-501
C	**Relay Mounting,** for wall mounting two Type B1 relays or one Type B2 relay. Does not include plugboards	A62-502
D	As above, except for shelf mounting	A62-503
E	**Relay Mounting,** for wall mounting two Type B1 relays and one Type B2 relay; or two Type B2 relays; or four Type B1 relays. Does not include plugboards.	A62-504
F	As above, except for shelf mounting	A62-505
G	**Plugboard Kit,** for all Type B1 relays, includes plugboard, two relay-mounting guide rods, terminals, insulators, current test terminal, and mounting hardware. Does not include voltage test post Ref. J	A62-506
G1	Same as above, except has crimp type terminals for #16-20 AWG wire	A62-586
G2	Same as above, except has crimp type terminals for #10-14 AWG wire	A62-650
H	**Plugboard Kit,** for all Type B2 relays except vane relays and VTB relays, includes plugboard, two relay-mounting guide rods, terminals, insulators, current test terminal and mounting hardware. Does not include voltage test post Ref. J	A62-508
H1	As above, except for vane relay	A62-509
H2	Same as Ref. H, except for VTB relay and includes two current test terminals and two voltage test terminals	A62-510
H3	Same as Ref. H2, except has crimp type terminals for #10-14 AWG.	A62-651
H4	Same as Ref. H3, except for # 16-20 AWG	A62-652
H5	Same as Ref. H, except has crimp type terminals for use with #16-20 AWG.	A62-587
H6	Same as Ref. H1, except has crimp type terminals for use with #16-20 AWG.	A62-588
H7	Same as Ref. H, except has crimp type terminals for use with #10-14 AWG.	A62-635
H8	Same as Ref. H1, except has crimp type terminals for use with #10-14 AWG.	A62-636
J	**Voltage Test Terminal Kit,** fits plugboards for all Type B relays, except Type VTB	A62-515
K	**Filler Plate Kit,** with mounting hardware	A62-520
M	**Current Test Terminal Kit,** fits plugboards for all Type B relays, except Type VTB	A62-525

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Tools and accessories.

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TOOLS AND ACCESSORIES

Order by catalog number and name shown in bold type.

Ref.	Name	Catalog Number
A	**Terminal,** solder-type, for plugboards	**P62-466**
B	**Terminal,** crimp type for use with #16-20 AWG for plugboards	**P3-326**
B1	Same as above, except for use with #10-14 AWG	**P3-327**
C	**Insulators,** for plugboards	**P62-457**
D	**Blank Plugboard,** for all Type B1 relays except approach; does not include terminals, insulators, test posts, or mounting screws	**P62-572**
E	**Blank Plugboard,** for all Type B2 relays; does not include terminals, insulators, test posts, or mounting screws.	**P62-571**
F	**Wire Tags,** wrap-around: For Type B1 relays. For Type B2 relays.	 **P3-305** **P3-306**
G	**Terminal Nut Wrench** (E post wrench), 11 inches long, 7-1/4-inch shank	**P3-320**
H	**Current Reading Tool,** for taking current readings through E post; has 4-foot leads with terminals for attaching to meter	**P3-319**
I	**Extractor,** 1/16-inch steel wire, covered with insulating tubing, for removing terminals	**P3-308**
J	**Open End Wrench,** 3 inches long, for 3/8-inch and 1/2-inch terminal post and guide rod nuts; polished nickel plated	**P65-913**
K	**Socket Wrench,** 1/2-inch hex, insulated, plastic handle; for terminal post nuts.	**P65-901**
L	**Crimping Tool,** for Ref. B	**A3-306**
L1	Same as above, except for Ref. B1	**A3-307**

GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL

MAIN OFFICE AND PLANT
PO BOX 600 ROCHESTER NY 14692 Phone: 716 • 436-2020 Cable: GENRASIG (ROCHESTER NY)
Telex: 978317

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3379 PEACHTREE ROAD NE ATLANTA GA 30326 Phone: 404 • 233-7373

CHICAGO OFFICE
PRUDENTIAL PLAZA SUITE 2120 CHICAGO IL 60601 Phone: 312 • 467-1221

JACKSONVILLE OFFICE
7948 BAYMEADOWS WAY SUITE 374 JACKSONVILLE FL 32216 Phone: 904 • 739-1900/1973

KANSAS CITY OFFICE
10220 NORTH EXECUTIVE HILLS BOULEVARD SUITE 456 KANSAS CITY MO 64153 Phone: 816 • 891-7211

MONTREAL OFFICE
POINTE-CLAIRE COMMERCE CENTER 6600 TRANSCANADA HIGHWAY SUITE 320 POINTE-CLAIRE QUEBEC H9R 4S2
Phone: 514 • 694-7350

NEW YORK OFFICE
230 PARK AVENUE ROOM 928 NEW YORK NY 10169 Phone: 212 • 697-3681

OAKLAND OFFICE
FIRST INTERSTATE BANK OF CALIFORNIA BUILDING 1330 BROADWAY SUITE 1440 OAKLAND CA 94612
Phone: 415 • 893-3100

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GEC-GENERAL SIGNAL LIMITED
ELSTREE WAY BOREHAMWOOD HERTFORDSHIRE WD6 1RX ENGLAND Phone: 44-1-953-2030
Cable: RAILSIGKO BOREHAMWOOD (ENGLAND) Telex: 851-22777 GECBWD G BOREHAMWOOD (ENGLAND)

ALGEMENE SEIN INDUSTRIE B.V.
CROESELAAN 28 3521 CB UTRECHT NETHERLANDS Phone: 31-30-94-26-46
Cable: GENRASIG UTRECHT (NETHERLANDS) Telex: 844-47455 GRASI NL UTRECHT (NETHERLANDS)

REPRESENTATIVES AND LICENSEES THROUGHOUT THE WORLD

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TYPE B RELAYS

CAT.NO.	QTY	DRAWING NO.	ED NO.	PG.
A62-122		56001-921GR7	ED60-136	6
A62-125		56001-922GR7	ED60-103	6
A62-126		56001-921GR2	ED60-269	6
A62-128		56001-885GR8	ED60-257	6
A62-129		56001-925GR10	ED60-143	6
A62-130		56001-921GR5	ED60-196	6
A62-131		56001-921GR14	ED(DWG.NO)	6
A62-132		56001-921GR10	ED(DWG.NO)	6
A62-140		56001-922GR5	ED60-274	6
A62-145		56002-719GR1	ED60-254	6
A62-150		56002-720GR1	ED60-258	6
A62-155		56001-663GR7	ED60-255	7
A62-156		56001-672GR1	ED60-189	7
A62-157		58640-172GR3	ED60-108	7
A62-161		56001-672GR3	ED60-256	7
A62-162		56001-674GR1	ED60-113	7
A62-163		56001-674GR2	ED60-114	7
A62-164		58640-179GR22	ED60-109	7
A62-170		57490-95GR1	ED60-159	8
A62-171		57490-96GR1	ED60-158	8
A62-172		57490-97GR1	ED60-157	8
A62-173		57490-98GR1	ED(DWG.NO)	8
A62-175		57490-91GR1	ED60-246	8
A62-176		57490-92GR1	ED60-244	8
A62-177		57490-93GR1	ED60-243	8
A62-178		57490-94GR1	ED(DWG.NO)	8
A62-185		57490-10GR3	ED(DWG.NO)	
A62-195		56001-930GR1	ED(DWG.NO)	9
		30733-1GR4		
		17550-71GR1		
A62-197		56001-930GR1	ED(DWG.NO)	9
		30733-1GR5		
		17550-71GR1		
A62-205		56001-880GR1	ED60-173	7
A62-211		56001-785GR35	ED60-318	9
A62-213		56001-785GR55	ED60-317	9
A62-215		56001-785GR59	ED60-166	9
A62-217		56001-785GR61	ED60-151	9
A62-221		56001-873GR1	ED60-321	9
A62-231		56001-785GR10	ED60-127	9
A62-236		56001-865GR1	ED60-320	9
A62-245		58645-172GR6	ED60-322	8
A62-246		58645-172GR4	ED60-110	8
A62-247		58645-172GR5	ED60-163	8
A62-260		56001-714GR3	ED60-257	10
A62-261		56001-714GR1	ED60-286	10
A62-262		56001-762GR2	ED60-272	10
A62-270		56001-734GR2	ED60-146	10
A62-271		56001-734GR1	ED60-206	10
A62-275		56001-787GR2	ED60-129	10
A62-276		56001-787GR1	ED60-165	10
A62-277		56001-783GR2	ED60-131	10
A62-278		56001-763GR1	ED60-207	10
A62-293		56001-785GR91	ED60-101	10
A62-295		56001-785GR31	ED60-277	10
A62-296		56001-762GR1	ED60-297	10
A62-300		56001-789GR5	ED60-130	10
A62-305		56001-785GR37	ED60-194	10
A62-306		56001-783GR6	ED(DWG.NO)	10
A62-308		56001-783GR1	ED60-193	10
A62-309		56001-822GR6	ED60-276	10
A62-310		56001-822GR2	ED60-123	10
A62-311		56001-822GR1	ED60-195	10
A62-312		56001-785GR83	ED60-219	10
A62-313		56001-785GR15	ED60-234	10
A62-314		56001-785GR12	ED60-145	10
A62-315		56001-872GR1	ED60-148	10
A62-317		56001-789GR3	ED(DWG.NO)	10
A62-318		56001-875GR1	ED60-176	10
A62-319		56001-787GR5	ED60-177	10
A62-320		56001-908GR1	ED60-138	10
A62-323		56001-670GR13	ED60-215	10
A62-324		56001-911GR1	ED60-228	10
A62-325		56001-838GR1	ED60-295	10
A62-330		56002-703GR1	ED60-181	
A62-331		56002-710GR1	ED(DWG.NO)	
A62-335		56001-909GR1	ED(DWG.NO)	11
A62-340		56001-807GR1	ED60-134	11
A62-341		56001-790GR1	ED60-179	11
A62-345		56001-736GR1	ED60-287	11
A62-350		56001-851GR1	ED60-140	11
A62-353		56001-830GR1	ED60-294	11
A62-355		56001-808GR26	ED60-292	11
A62-357		56001-792GR2	ED60-132	11
A62-358		56001-778GR1	ED60-167	11
A62-359		56001-780GR1	ED60-278	11
A62-360		56001-774GR1	ED60-290	60
A62-365		56001-904GR1	ED60-172	12
A62-369		56001-817GR1	ED60-102	12
A62-370		56001-792GR1	ED60-178	12
A62-372		56001-785GR85	ED60-205	12
A62-380		56001-759GR1	ED(DWG.NO)	12

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CAT.NO.	QTY	DRAWING NO.	ED NO.	PG.
A62-391		56003-701GR2	ED60-188	
A62-401		56001-721GR1	ED60-319	12
A62-406		56001-745GR1	ED60-121	12
A62-407		56001-745GR2	ED60-147	12
A62-410		56001-785GR36	ED60-291	13
A62-415		56001-738GR1	ED60-288	13
A62-417		56001-901GR1	ED60-211	13
A62-424		56001-785GR99	ED60-236	14
A62-425		56001-785GR80	ED60-128	13
A62-427		56001-917GR1	ED60-133	14
A62-429		56001-926GR1	ED60-150	14
A62-430		56001-916GR2	ED60-135	14
A62-431		56001-916GR1	ED60-153	14
A62-432		56001-785GR1	ED60-280	14
A62-433		56001-937GR1	ED60-328	14
A62-450		57263-863GR3	ED(DWG.NO)	15
A62-451		57263-863GR2	ED(DWG.NO)	15
A62-452		57263-862GR3	ED(DWG.NO)	15
A62-453		57263-862GR2	ED(DWG.NO)	15
A62-458		57100-702GR17	ED60-251	15
A62-459		57100-702GR18	ED60-323	15
A62-462		57100-701GR10	ED60-325	15
A62-463		57100-701GR11	ED60-249	15
A62-464		57100-702GR20	ED60-324	15
A62-465		57100-702GR21	ED60-282	16
A62-470		57100-703GR3	ED60-296	16
A62-471		57100-703GR1	ED60-182	16
A62-475		56001-749GR1	ED60-191	16
A62-476		56001-749GR2	ED60-289	16
A62-477		56001-749GR3	ED(DWG.NO)	16
A62-485		56005-100GR8	ED60-170	16
A62-486		56005-100GR9	ED60-126	16
A62-490		59301-101GR1	ED60-812	17
A62-491		59301-151GR2	ED60-815	17
A62-492		59301-151GR5	ED60-803	17
A62-493		59301-201GR12	ED60-807	17
A62-494		59301-201GR14	ED60-808	17
A62-495		59301-251GR1	ED60-809	17
A62-497		59301-101GR5	ED(DWG.NO)	
A62-498		59301-151GR4	ED60-819	
A62-500		58570-13GR1	ED(DWG.NO)	19
A62-501		58570-13GR2	ED(DWG.NO)	19
A62-502		58570-14GR1	ED(DWG.NO)	19
A62-503		58570-14GR2	ED(DWG.NO)	19
A62-504		58570-15GR1	ED(DWG.NO)	19
A62-505		58570-15GR2	ED(DWG.NO)	19
A62-506		59686-5GR1	ED(DWG.NO)	19
A62-507		59686-5GR3	ED(DWG.NO)	
A62-508		59686-7GR1	ED(DWG.NO)	19
A62-509		59686-7GR2	ED(DWG.NO)	19
A62-510		59686-14GR1	ED(DWG.NO)	19
A62-515		42788-1GR2	ED(DWG.NO)	19
A62-520		42812-5GR1	ED(DWG.NO)	19
A62-522		56001-931GR2	ED60-124	10
A62-525		42788-1GR1	ED(DWG.NO)	19
A62-530		59301-251GR4	ED60-810	17
A62-532		59301-251GR2	ED60-813	17
A62-533		59301-201GR1	ED60-805	17
A62-534		59301-201GR3	ED60-821	17
A62-535		59301-101GR3	ED60-801	17
A62-536		59301-101GR2	ED60-816	17
A62-537		59301-151GR6	ED60-804	17
A62-538		59301-101GR4	ED60-802	17
A62-541		56002-723GR1	ED(DWG.NO)	13
A62-542		56001-950GR1	ED(DWG.NO)	12
A62-543		56001-922GR2	ED60-284	6
A62-544		56001-763GR2	ED(DWG.NO)	10
A62-545		56001-785GR21	ED60-198	14
A62-546		56001-881GR1	ED60-226	10
A62-547		56005-100GR1	ED60-199	16
A62-548		56005-100GR18	ED60-119	16
A62-549		56001-922GR1	ED(DWG.NO)	6
A62-550		56001-922GR10	ED60-336	6
A62-551		56001-922GR12	ED(DWG.NO)	6
A62-552		56001-927GR1	ED60-112	6
A62-553		56001-928GR1	ED60-111	6
A62-554		56001-932GR1	ED60-104	6
A62-555		56001-933GR1	ED60-105	6
A62-556		56001-709GR4	ED60-186	6
A62-557		56001-762GR4	ED(DWG.NO)	10
A62-558		56001-762GR5	ED60-271	10
A62-559		56001-910GR8	ED60-268	10
A62-560		56001-914GR1	ED60-155	10
A62-562		56001-709GR1	ED60-184	12
A62-563		56001-709GR3	ED60-185	12
A62-564		56001-709GR5	ED60-186	12
A62-565		56001-709GR6	ED60-180	12
A62-566		56001-935GR1	ED60-264	12
A62-567		56001-681GR2	ED60-220	12
A62-569		56007-66GR1	ED(DWG.NO)	14
A62-570		56007-67GR1	ED60-314	14
A62-571		56007-68GR1	ED60-313	14
A62-572		56007-69GR1	ED(DWG.NO)	14
A62-575		56001-672GR5	ED(DWG.NO)	

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CAT.NO.	QTY	DRAWING NO.	ED NO.	PG.
A62-577		56001-930GR1	ED60-162	
A62-578		56001-946GR1	ED(DWG.NO)	
A62-579		56001-947GR1	ED(DWG.NO)	
A62-580		56001-951GR1	ED(DWG.NO)	
A62-581		57263-866GR2	ED(DWG.NO)	15
A62-582		57263-866GR3	ED(DWG.NO)	15
A62-583		57263-867GR2	ED(DWG.NO)	15
A62-584		57263-867GR3	ED(DWG.NO)	15
A62-585		56003-785GR8	ED(DWG.NO)	
A62-586		59686-5GR5	ED(DWG.NO)	19
A62-587		59686-7GR6	ED(DWG.NO)	19
A62-588		59686-7GR7	ED(DWG.NO)	19
A62-589		56001-670GR10	ED(DWG.NO)	
A62-590		57263-868GR2	ED(DWG.NO)	
A62-591		57490-80GR7	ED(DWG.NO)	
A62-592		57263-864GR2	ED(DWG.NO)	
A62-593		57263-864GR3	ED(DWG.NO)	
A62-594		57263-865GR2	ED(DWG.NO)	
A62-595		58640-172GR1	ED(DWG.NO)	
A62-597		56005-100GR20	ED(DWG.NO)	
A62-598		58640-171GR4	ED(DWG.NO)	
A62-599		56001-952GR1	ED(DWG.NO)	
A62-600		56001-664GR3	ED(DWG.NO)	
A62-601		56001-886GR1	ED(DWG.NO)	
A62-602		56001-891GR1	ED(DWG.NO)	
A62-603		56001-938GR1	ED(DWG.NO)	
A62-604		56001-942GR1	ED(DWG.NO)	
A62-605		56001-943GR1	ED(DWG.NO)	
A62-606		56002-717GR2	ED60-253	
A62-607		56002-722GR1	ED(DWG.NO)	
A62-608		56001-953GR1	ED(DWG.NO)	
A62-609		56003-717GR1	ED(DWG.NO)	
A62-610		58640-172GR4	ED(DWG.NO)	
A62-611		56001-954GR1	ED(DWG.NO)	
A62-612		56001-955GR1	ED(DWG.NO)	
A62-613		56001-956GR1	ED(DWG.NO)	
A62-614		56001-957GR1	ED(DWG.NO)	
A62-615		56001-958GR1	ED(DWG.NO)	
A62-616		56001-959GR1	ED(DWG.NO)	
A62-617		56001-960GR1	ED(DWG.NO)	
A62-618		57263-869GR3	ED(DWG.NO)	
A62-619		56002-724GR1	ED(DWG.NO)	
A62-620		56002-725GR1	ED(DWG.NO)	
A62-621		57263-869GR2	ED(DWG.NO)	
A62-622		58640-171GR3	ED(DWG.NO)	
A62-623		56001-956GR2	ED(DWG.NO)	
A62-624		56001-921GR4	ED(DWG.NO)	
A62-626		58645-172GR8	ED(DWG.NO)	
A62-627		50800-100GR1	ED(DWG.NO)	
A62-628		50800-100GR2	ED(DWG.NO)	
A62-629		59301-251GR5	ED(DWG.NO)	
A62-630		58496-116GR1	ED(DWG.NO)	
A62-631		56971-2GR1	ED(DWG.NO)	
A62-632		56971-2GR2	ED(DWG.NO)	
A62-633		56001-961GR1	ED(DWG.NO)	
A62-634		56001-962GR1	ED(DWG.NO)	
A62-635		59686-7GR4	ED(DWG.NO)	
A62-636		59686-7GR5	ED(DWG.NO)	
A62-637		56001-963GR1	ED(DWG.NO)	
A62-638		58645-172GR9	ED(DWG.NO)	
A62-639		56001-965GR1	ED(DWG.NO)	
A62-640		56001-822GR7	ED(DWG.NO)	
A62-641		56001-881GR2	ED(DWG.NO)	
A62-642		57490-121GR1	ED(DWG.NO)	
A62-643		57490-122GR1	ED(DWG.NO)	
A62-644		56005-100GR21	ED(DWG.NO)	
A62-645		56001-664GR4	ED(DWG.NO)	
A62-646		56001-966GR1	ED(DWG.NO)	
A62-647		59301-251GR6	ED(DWG.NO)	
A62-648		56001-964GR1	ED(DWG.NO)	
A62-649		57100-702GR14	ED(DWG.NO)	
A62-650		59686-5GR4	ED(DWG.NO)	
A62-651		59686-14GR2	ED(DWG.NO)	
A62-652		59686-14GR3	ED(DWG.NO)	
A62-653		57490-80GR8	ED(DWG.NO)	
A62-654		56001-968GR1	ED(DWG.NO)	
A62-655		56001-670GR2	ED(DWG.NO)	
A62-656		57490-80GR1	ED(DWG.NO)	
A62-657		57490-119GR1	ED(DWG.NO)	
A62-658		50800-100GR3	ED(DWG.NO)	
A62-659		56001-664GR5	ED(DWG.NO)	
A62-660		56001-664GR6	ED(DWG.NO)	
A62-661		56001-970GR1	ED(DWG.NO)	
A62-662		59301-151GR1	ED(DWG.NO)	
A62-663		59301-200GR3	ED(DWG.NO)	
A62-664		59301-101GR8	ED(DWG.NO)	
A62-665		56001-945GR1	ED(DWG.NO)	

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CATALOG SECTION A62

NUMERICAL INDEX

TYPE B RELAYS

DRAWING NO.	CAT. NO.	DRAWING NO.	CAT. NO.	DRAWING NO.	CAT. NO.
42788-1GR1	A62-525	56001-783GR1	A62-308	56001-891GR1	A62-602
42788-1GR2	A62-515	56001-783GR2	A62-277	56001-901GR1	A62-417
42812-5GR1	A62-520	56001-783GR6	A62-306	56001-904GR1	A62-365
50800-100GR1	A62-627	56001-785GR1	A62-432	56001-908GR1	A62-320
50800-100GR2	A62-628	56001-785GR10	A62-231	56001-909GR1	A62-335
50800-100GR3	A62-658	56001-785GR12	A62-314	56001-910GR8	A62-559
56001-663GR7	A62-155	56001-785GR15	A62-313	56001-911GR1	A62-324
56001-664GR3	A62-600	56001-785GR21	A62-545	56001-914GR1	A62-560
56001-664GR4	A62-645	56001-785GR31	A62-295	56001-916GR1	A62-431
56001-664GR5	A62-659	56001-785GR35	A62-211	56001-916GR2	A62-430
56001-664GR6	A62-660	56001-785GR36	A62-410	56001-917GR1	A62-427
56001-670GR2	A62-655	56001-785GR37	A62-305	56001-921GR2	A62-126
56001-670GR10	A62-589	56001-785GR55	A62-213	56001-921GR4	A62-624
56001-670GR13	A62-323	56001-785GR59	A62-215	56001-921GR5	A62-130
56001-672GR1	A62-156	56001-785GR61	A62-217	56001-921GR7	A62-122
56001-672GR3	A62-161	56001-785GR80	A62-425	56001-921GR10	A62-132
56001-672GR5	A62-575	56001-785GR83	A62-312	56001-921GR14	A62-131
56001-674GR1	A62-162	56001-785GR85	A62-372	56001-922GR1	A62-549
56001-674GR2	A62-163	56001-785GR91	A62-293	56001-922GR2	A62-543
56001-681GR2	A62-567	56001-785GR99	A62-424	56001-922GR5	A62-140
56001-709GR1	A62-562	56001-787GR1	A62-276	56001-922GR7	A62-125
56001-709GR3	A62-563	56001-787GR2	A62-275	56001-922GR10	A62-550
56001-709GR4	A62-556	56001-787GR5	A62-319	56001-922GR12	A62-551
56001-709GR5	A62-564	56001-789GR3	A62-317	56001-925GR10	A62-129
56001-709GR6	A62-565	56001-789GR5	A62-300	56001-926GR1	A62-429
56001-714GR1	A62-261	56001-790GR1	A62-341	56001-927GR1	A62-552
56001-714GR3	A62-260	56001-792GR1	A62-370	56001-928GR1	A62-553
56001-721GR1	A62-401	56001-792GR2	A62-357	56001-930GR1	A62-577
56001-734GR1	A62-271	56001-807GR1	A62-340	56001-931GR2	A62-522
56001-734GR2	A62-270	56001-808GR26	A62-355	56001-932GR1	A62-554
56001-736GR1	A62-345	56001-817GR1	A62-369	56001-933GR1	A62-555
56001-738GR1	A62-415	56001-822GR1	A62-311	56001-935GR1	A62-566
56001-745GR1	A62-406	56001-822GR2	A62-310	56001-937GR1	A62-433
56001-745GR2	A62-407	56001-822GR6	A62-309	56001-938GR1	A62-603
56001-749GR1	A62-475	56001-822GR7	A62-640	56001-942GR1	A62-604
56001-749GR2	A62-476	56001-830GR1	A62-353	56001-943GR1	A62-605
56001-749GR3	A62-477	56001-838GR1	A62-325	56001-945GR1	A62-665
56001-759GR1	A62-380	56001-851GR1	A62-350	56001-946GR1	A62-578
56001-762GR1	A62-296	56001-865GR1	A62-236	56001-947GR1	A62-579
56001-762GR2	A62-262	56001-872GR1	A62-315	56001-950GR1	A62-542
56001-762GR4	A62-557	56001-873GR1	A62-221	56001-951GR1	A62-580
56001-762GR5	A62-558	56001-875GR1	A62-318	56001-952GR1	A62-599
56001-763GR1	A62-278	56001-880GR1	A62-205	56001-953GR1	A62-608
56001-763GR2	A62-544	56001-881GR1	A62-546	56001-954GR1	A62-611
56001-774GR1	A62-360	56001-881GR2	A62-641	56001-955GR1	A62-612
56001-778GR1	A62-358	56001-885GR8	A62-128	56001-956GR1	A62-613
56001-780GR1	A62-359	56001-886GR1	A62-601	56001-956GR2	A62-623

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TYPE B RELAYS

DRAWING NO.	CAT. NO.	DRAWING NO.	CAT. NO.	DRAWING NO.	CAT. NO.
56001-957GR1	A62-614	57263-863GR2	A62-451	59301-101GR3	A62-535
56001-958GR1	A62-615	57263-863GR3	A62-450	59301-101GR4	A62-538
56001-959GR1	A62-616	57263-864GR2	A62-592	59301-101GR5	A62-497
56001-960GR1	A62-617	57263-864GR3	A62-593	59301-101GR8	A62-664
56001-961GR1	A62-633	57263-865GR2	A62-594	59301-151GR1	A62-662
56001-962GR1	A62-634	57263-866GR2	A62-581	59301-151GR2	A62-491
56001-963GR1	A62-637	57263-866GR3	A62-582	59301-151GR4	A62-498
56001-964GR1	A62-648	57263-867GR2	A62-583	59301-151GR5	A62-492
56001-965GR1	A62-639	57263-867GR3	A62-584	59301-151GR6	A62-537
56001-966GR1	A62-646	57263-868GR2	A62-590	59301-200GR3	A62-663
56001-968GR1	A62-654	57263-869GR2	A62-621	59301-201GR1	A62-533
56001-970GR1	A62-661	57263-869GR3	A62-618	59301-201GR3	A62-534
56002-703GR1	A62-330	57490-10GR3	A62-185	59301-201GR12	A62-493
56002-710GR1	A62-331	57490-80GR1	A62-656	59301-201GR14	A62-494
56002-717GR2	A62-606	57490-80GR7	A62-591	59301-251GR1	A62-495
56002-719GR1	A62-145	57490-80GR8	A62-653	59301-251GR2	A62-532
56002-720GR1	A62-150	57490-91GR1	A62-175	59301-251GR4	A62-530
56002-722GR1	A62-607	57490-92GR1	A62-176	59301-251GR5	A62-629
56002-723GR1	A62-541	57490-93GR1	A62-177	59301-251GR6	A62-647
56002-724GR1	A62-619	57490-94GR1	A62-178	59686-5GR1	A62-506
56002-725GR1	A62-620	57490-95GR1	A62-170	59686-5GR3	A62-507
56003-701GR2	A62-391	57490-96GR1	A62-171	59686-5GR4	A62-650
56003-717GR1	A62-609	57490-97GR1	A62-172	59686-5GR5	A62-586
56003-785GR8	A62-585	57490-98GR1	A62-173	59686-7GR1	A62-508
56005-100GR1	A62-547	57490-119GR1	A62-657	59686-7GR2	A62-509
56005-100GR8	A62-485	57490-121GR1	A62-642	59686-7GR4	A62-635
56005-100GR9	A62-486	57490-122GR1	A62-643	59686-7GR5	A62-636
56005-100GR18	A62-548	58496-116GR1	A62-630	59686-7GR6	A62-587
56005-100GR20	A62-597	58570-13GR1	A62-500	59686-7GR7	A62-588
56005-100GR21	A62-644	58570-13GR2	A62-501	59686-14GR1	A62-510
56007-66GR1	A62-569	58570-14GR1	A62-502	59686-14GR2	A62-651
56007-67GR1	A62-570	58570-14GR2	A62-503	59686-14GR3	A62-652
56007-68GR1	A62-571	58570-15GR1	A62-504		
56007-69GR1	A62-572	58570-15GR2	A62-505		
56971-2GR1	A62-631	58640-171GR3	A62-622		
56971-2GR2	A62-632	58640-171GR4	A62-598		
57100-701GR10	A62-462	58640-172GR1	A62-595		
57100-701GR11	A62-463	58640-172GR3	A62-157		
57100-702GR14	A62-649	58640-172GR4	A62-610		
57100-702GR17	A62-458	58640-179GR22	A62-164		
57100-702GR18	A62-459	58645-172GR4	A62-246		
57100-702GR20	A62-464	58645-172GR5	A62-247		
57100-702GR21	A62-465	58645-172GR6	A62-245		
57100-703GR1	A62-471	58645-172GR8	A62-626		
57100-703GR3	A62-470	58645-172GR9	A62-638		
57263-862GR2	A62-453	59301-101GR1	A62-490		
57263-862GR3	A62-452	59301-101GR2	A62-536		

Signed by Israel Jones on 7/16/2026
texasrails.com

CHANGE NOTIFICATION

FROM

GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL
ROCHESTER NEW YORK 14602

Revision to Assemblies Catalog
Section 65 and Parts Catalog
Section 65 Type K Relays

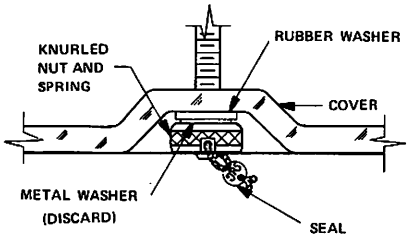
MODIFICATION KIT FOR SECURING POLYCARBONATE COVERS ON TYPE K4 RELAYS

A problem has been discovered with the new polycarbonate K4 relay cover. The cover, held on by Screw 43 (page 22, in GRS Parts Catalog Section 65) cannot be sufficiently tightened on the gasket thus, under severe vibration, the gasket may work out from under the cover. A design change is being made to the cover to correct this problem. For relays already installed with this cover, a modification kit is available (dwg. no. 17550-80 Gr. 1) which includes an additional rubber washer (same as ref. 45, page 22, Section P65, dwg. no. 1333-12) and a metal washer. For replacement covers ordered until the design change is made, a modification kit will be included.

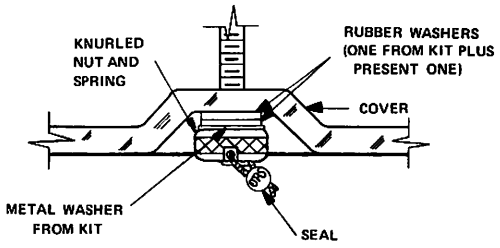
When replacing the cover, discard the present metal washer (ref. 41, page 22, Section P65) and place, in sequence on the screw, the present rubber washer, the rubber washer from the kit, the metal washer from the kit, the spring, and the knurled nut. Tighten the nut until the seal can be inserted in the second hole through the screw.

This modification kit is for use on all polycarbonate covers with Number 373 80-33X P or 37380-33XAP molded in the bottom. When the cover is redesigned, the kit will no longer be necessary. The new covers will have the Number 37380-33XBP molded in the bottom.

Place this sheet in your Catalog Section 65 until the problem has been corrected.



Present view of cover at screw.



View after modification kit installed.

A802-167
Rev: 8-80

CATALOG SECTION 65

Type K Relays

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GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL
ROCHESTER NEW YORK 14602

Signed by Israel Jones, texasrails.org 7/16/2026

GENERAL INFORMATION

Periodic Tests

GRS recommends that Type K relays be inspected and tested at least every two years. The tests and inspections should include: pickup current, dropaway current, timing of slow operating and timing relays, and visual inspection of: contacts for damage or misalignment, corrosion or other contamination of parts, loose parts in cover, broken seal, and cracked or broken cover.

Relays not passing the above stated tests and inspections must be replaced and not returned to service until the operating characteristics and conditions are in accordance with GRS specifications.

Contacts

All Type K relays, unless otherwise described, are furnished with medium duty (MD) contacts with a 0.050" front contact opening and are equipped with metal-impregnated-carbon-to-metal front and metal-to-metal back contacts.

Medium-duty contacts are designed to carry four amperes continuously at first-range voltages (30 volts or less).

Certain Type K relays, as stated in their accompanying descriptions, are furnished with heavy-duty (HD) contacts and some, with extra-heavy duty (EHD) contacts.

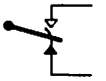
Heavy-duty (HD) contacts are used with loads which exceed the capacity of MD contacts yet do not require extra-heavy-duty contacts.

Extra-heavy-duty (EHD) contacts are for second range voltages (over 30 volts and up to 175 volts inclusive). They are equipped with magnetic blowouts that extinguish the arc instantly. Type K relays with EHD contacts can safely interrupt 50 amperes in a highly inductive 110-volt d-c circuit on loads of very short duration.

Contact post designations are shown on the name plate of each relay. See also diagrams on page 9 keyed to relay ordering descriptions.

NOTE: Always connect POSITIVE to the HEEL of an EHD contact to obtain maximum effect of magnetic blowout.

Contacts are designated under relay descriptions as follows (symbols show de-energized positions):

ABBREVIATION	MEANING	SYMBOL
F	Front	
FB	Front-Back	
B	Back	
NR	Normal-Reverse	
CBO (MB)	Close-Before-Open (Make-Before-Break)	

Mountings

All Type K relays come complete with mounting brackets as shown in the illustrations on pages 3 to 8. These brackets can be used for resiliently mounting Type K relays on a wall or on a shelf.

Dimensions shown include mounting brackets. Depths and heights without brackets are slightly less than shown.

HOW TO ORDER

Order Type K relay and give catalog number and quantity.

CHANGE NOTIFICATION

FROM

GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL
ROCHESTER, NEW YORK 14602

Revision to GRS assemblies
catalog Section 65, Type K Relays

Signed by Israel Jones, texasrails.org 7/16/2026

Please insert this sheet in your catalog section 65 following page 2. The information on page 2 under the heading "Mountings" should be crossed out. The information on this sheet replaces it.

Mountings

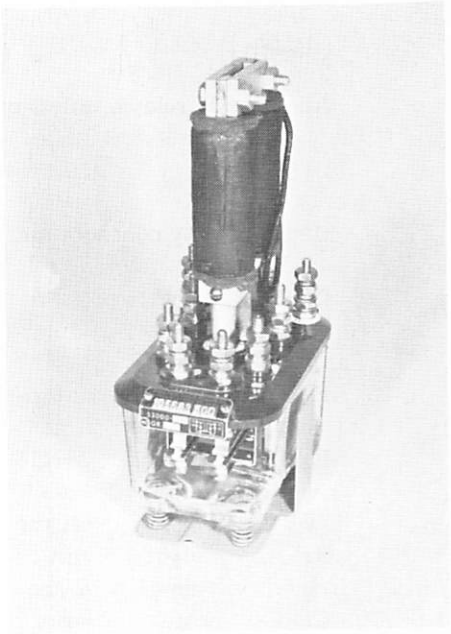
All Type K relays require mounting brackets as shown in the illustrations on pages 3 to 8. These brackets are used for resiliently mounting the relays on a wall or shelf. The brackets are not included with the relays and must be ordered separately if needed. If you require a mounting bracket please order by catalog number as follows:

P65-563 for use with Type K2 relay
P65-566 for use with Type K2 Code Responsive relay
P65-293 for use with Type K4 relay
P65-294 for use with Type K6 relay
P65-568 for use with Type KB Time Element relay
P65-567 for use with Type K Code Transmitter



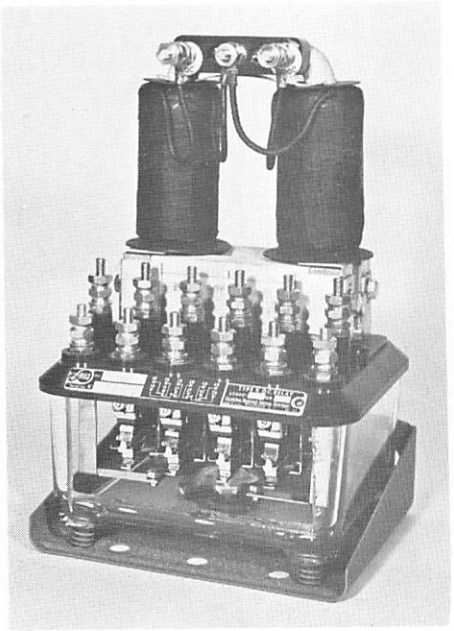
Approach, Size 2

Height 8⅛"—Depth 6¼"—Width 3⅞"
Mounting Centers—2⅜"



Biased-Neutral, Size 2

Height 10"—Depth 6¼"—Width 3⅞"
Mounting Centers 2⅜"



Biased-Neutral, Size 4

Height 11¾"—Depth 6¾"—Width 7⅜"
Mounting Centers—5⅞"



Code-Responsive

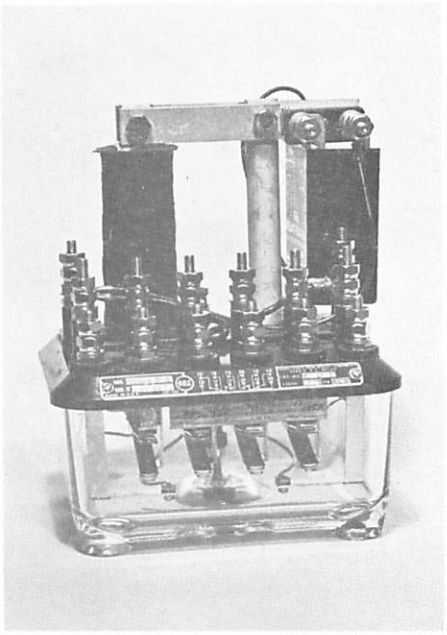
Height 7⅜"—Depth 8 1/16"—Width 4 15/16"
Mounting Centers—3¼"

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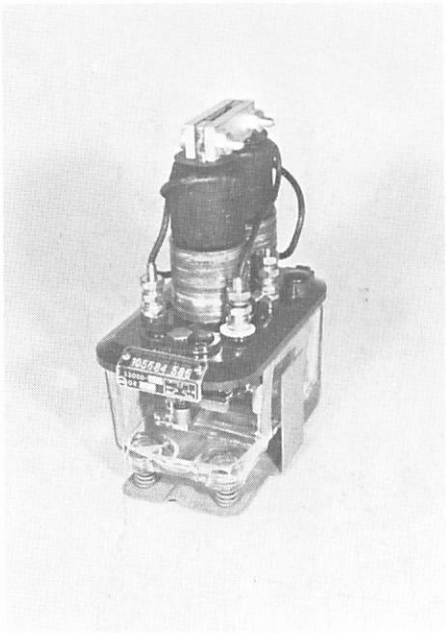
Code Transmitter

Height 9¾″—Depth 7½″—Width 6½″
Mounting Centers—4¾″



Flasher, Size 4

Height 9¼″—Depth 6¾″—Width 7⅝″
Mounting Centers—5⅞″



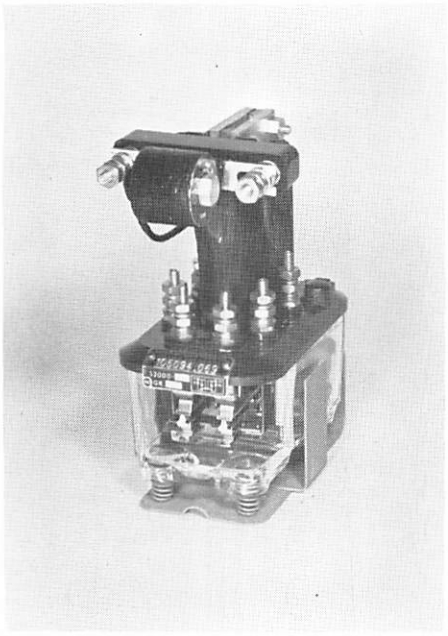
Signal Flasher, Size 2

Height 8⅛″—Depth 6¼″—Width 3⅞″
Mounting Centers—2⅜″



Lamp-Control, Size 4

Height 9¼″—Depth 6¾″—Width 7⅜″
Mounting Centers—5⅞″



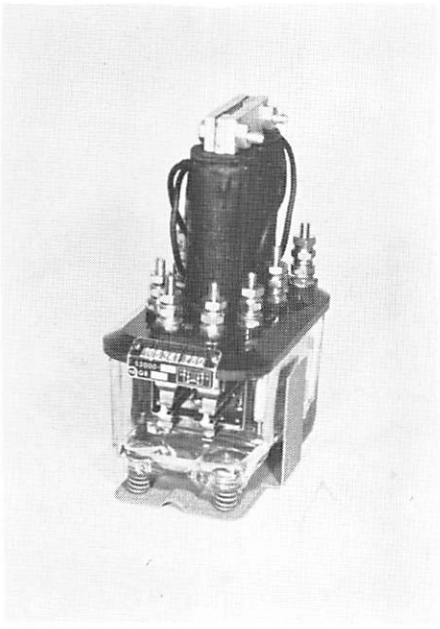
Light-Out, Size 2

Height 8½"—Depth 6¼"—Width 3⅞"
Mounting Centers—2⅜"



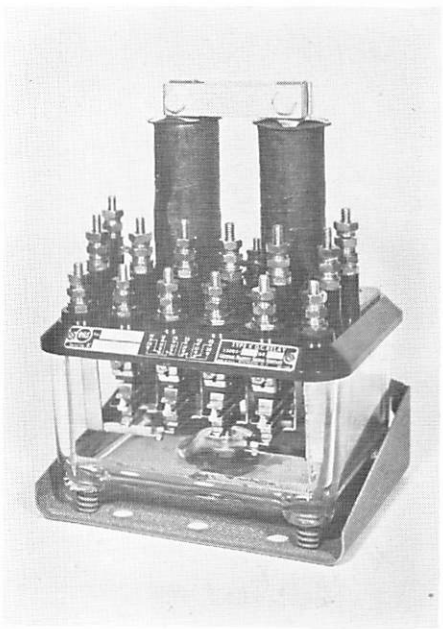
Light-Out, Size 4

Height 9⅝"—Depth 6¾"—Width 7⅜"
Mounting Centers—5⅞"



Neutral, Size 2

Height 8⅛"—Depth 6¼"—Width 3⅞"
Mounting Centers—2⅜"



Neutral, Size 4

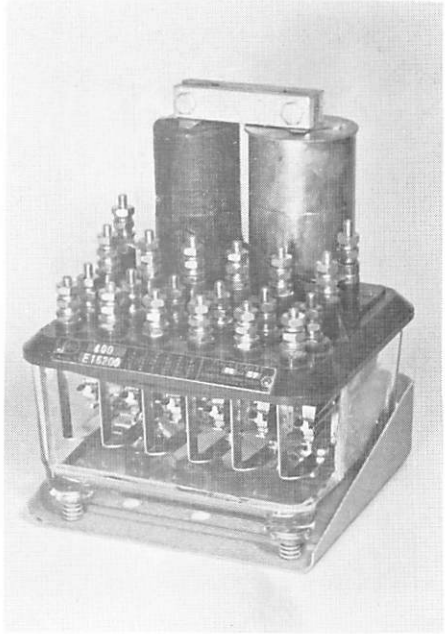
Height 9¼"—Depth 6¾"—Width 7⅜"
Mounting Centers—5⅞"

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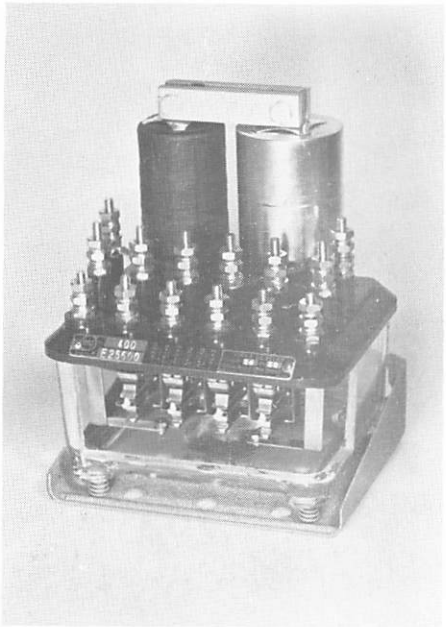
Neutral, Size 6

Height 9¾"—Depth 7¾"—Width 7¾"
Mounting Centers—5⅞"



Slow-Acting, Size 4*

Height 9¼"—Depth 6¾"—Width 7⅜"
Mounting Centers—5⅞"



Slow-Acting, Size 6*

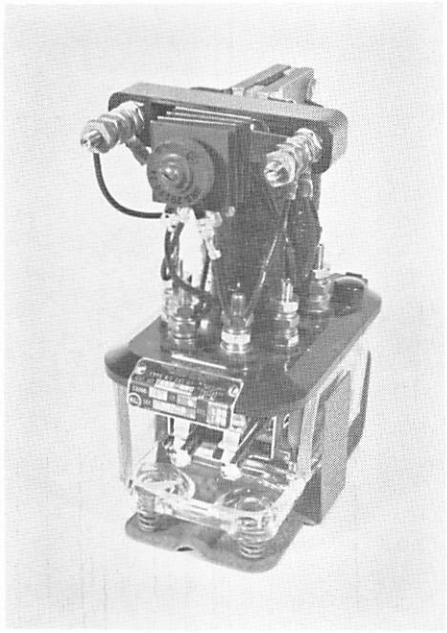
Height 9¾"—Depth 7¾"—Width 7¾"
Mounting Centers—5⅞"



Polarized, Size 6

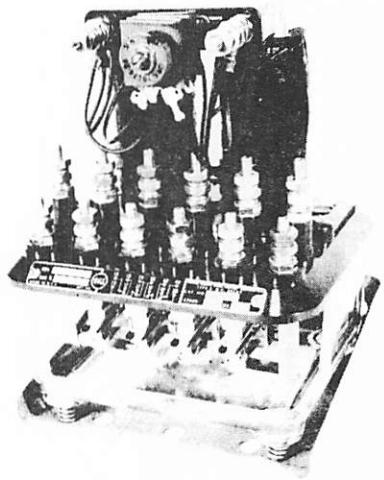
Height 9¾"—Depth 7¾"—Width 7¾"
Mounting Centers—5⅞"

*These illustrations cover all slow-acting relays such as, slow-release; slow-pickup; slow-pickup and slow-release; secondary of primary-secondary combination and slow-pickup, slow-release and quick-crossover relays, the only difference being in the size of slugs, amount of copper washers or their location on the relay cores.



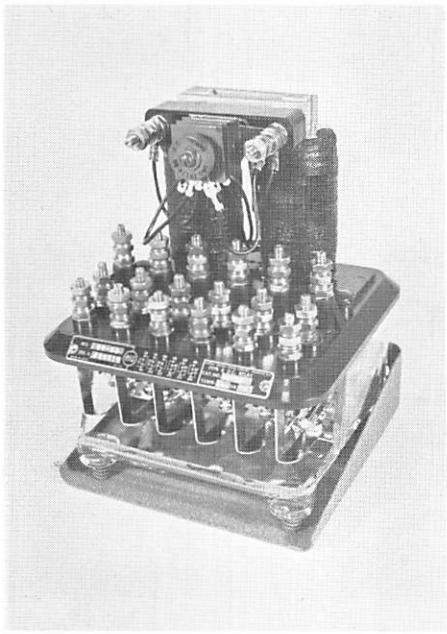
Power-Transfer, Size 2

Height 8½" — Depth 6¼" — Width 3⅞"
Mounting Centers — 2⅜"



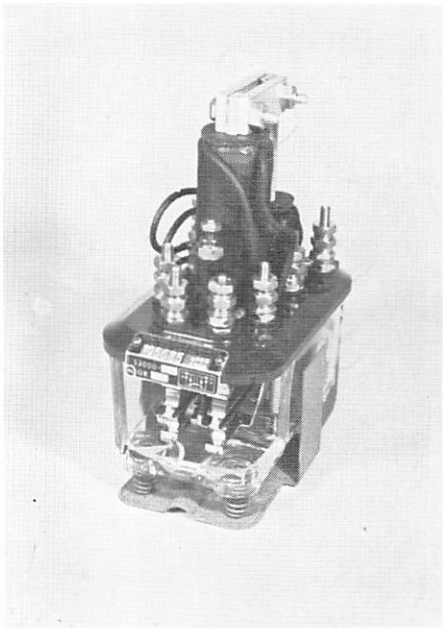
Power-Transfer, Size 4

Height 9⅝" — Depth 6¾" — Width 7⅜"
Mounting Centers — 5⅞"



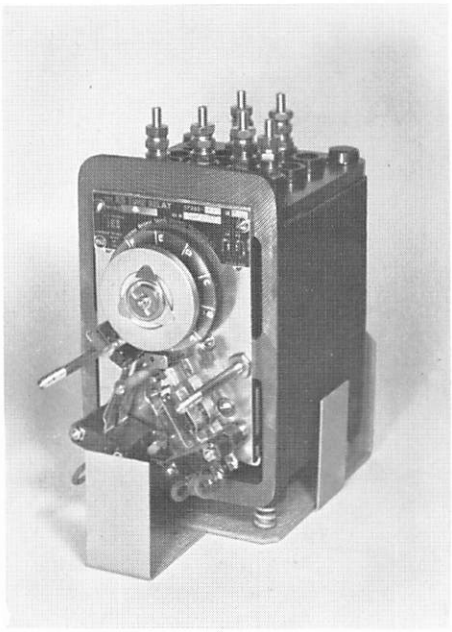
Power-Transfer, Size 6

Height 10⅛" — Depth 7¾" — Width 7¾"
Mounting Centers — 5⅞"



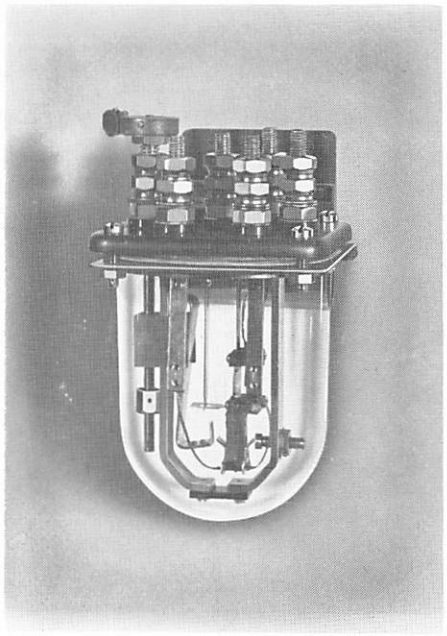
Switch-Overload & Switch Control, Size 2

Height 8⅛" — Depth 6¼" — Width 3⅞"
Mounting Centers — 2⅜"



Timing, Motor-Operated

Height 8 9/16" — Depth 8 3/4" — Width 4 3/4"
Mounting Centers — 3"



Timing, Thermal

Type	Height	Depth	Width
TA	5 3/16"	3 7/8"	2 11/16"
TG & TJ	5 15/16"	4 7/8"	3 1/2"

Mounting Centers — 1 1/2"

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TERMINAL DESIGNATIONS

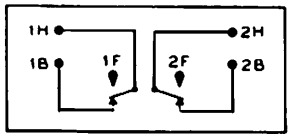


FIG. 1

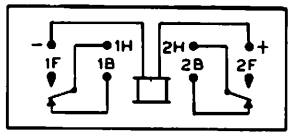


FIG. 2

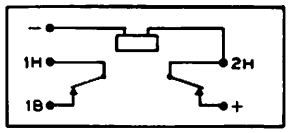


FIG. 3

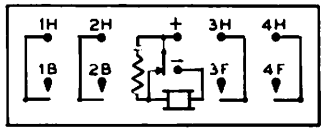


FIG. 4

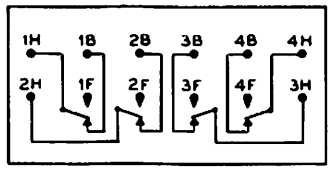


FIG. 5

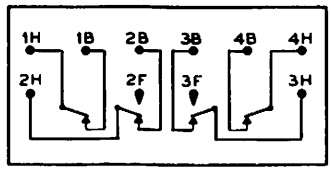


FIG. 6

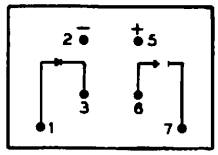


FIG. 7

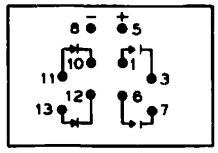


FIG. 8

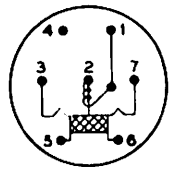


FIG. 9

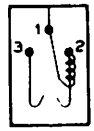


FIG. 10

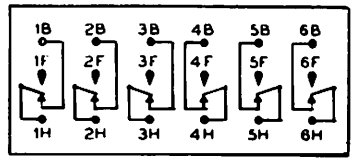


FIG. 11

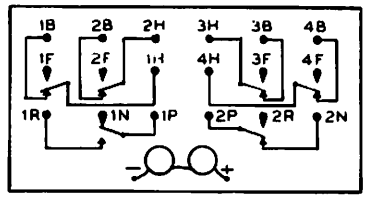


FIG. 12

APPROACH RELAY, SERIES TRACK

Type K Size 2, Direct-Current

This relay, connected in series with the track feed, provides a means to light signal lamps as the train approaches the feed end of the track circuit. An adjustable core provides a means to vary the operating values to suit track circuit conditions. Contacts are metal-to-metal.

CONTACTS	NOMINAL RESISTANCE OHMS	MAXIMUM PICKUP AND WORKING AMPERES*	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
2FB	.42	.296	Fig. 1	A65-100

**Values shown are for adjustable core turned entirely in; to increase values turn core counter-clockwise.*

APPROACH RELAY, SERIES LINE

Type K Size 2, Direct-Current

This relay, connected in series, with a signal control relay or with a searchlight signal mechanism of similar operating amperes, provides a means to light signal lamps in advance of trains.

CONTACTS	NOMINAL RESISTANCE OHMS	MAXIMUM PICKUP AND WORKING AMPERES	MAXIMUM TIME OF RELEASE	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
2FB	17	.0189	.35 sec. @ .021A.	Fig. 1	A65-110
2FB	60	.0114	—	"	A65-112

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BIASED-NEUTRAL RELAY

Type K Sizes 2, 4 and 6 Direct-Current

This relay is biased to pick up on one polarity only; it will not pick up or hold up when the polarity is reversed. The magnitude of reverse voltage, as well as the time it is applied, will not affect its operating characteristics.

STANDARD RELAYS–LINE

CONTACTS	NOMINAL RESISTANCE OHMS	MAXIMUM PICKUP AND WORKING AMPERES	RELAY SIZE	NOTES	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
2FB	500	.0115	2		Fig. 1	A65-120
4FB	500	.0097	4		Fig. 5	A65-127
6FB	670	.0102	6		Fig. 11	A65-700

SPECIFIC APPLICATION RELAYS–LINE

CONTACTS	NOMINAL RESISTANCE OHMS	MAXIMUM PICKUP AND WORKING AMPERES	RELAY SIZE	NOTES	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
2FB	100	.0195	2		Fig. 1	A65-158
2FB	50	.0293	2		Fig. 1	A65-701
6FB (HD)	250	.0145	6		Fig. 11	A65-702

STANDARD RELAYS–TRACK

This high release relay, designed especially for track circuits is biased to pick up on one polarity only; it will not pick up when up to 50 times reverse polarity working energization is applied.

CONTACTS	NOMINAL RESISTANCE OHMS	MAXIMUM PICKUP AND WORKING AMPERES	RELAY SIZE	NOTES	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
2FB	0.50	.346	2		Fig. 1	A65-118

CODE-RESPONSIVE RELAY (CR)

Type K Size 2, Direct-Current

This relay is made with a light armature and contact structure so that it will respond quickly to coded pulses of energy. Contacts are metal-to-metal (silver platinum). It is polar biased, and the armature is spring returned to the normal position.

STANDARD RELAYS

NOMINAL SYSTEM VOLTAGE	CONTACTS	NOMINAL RESISTANCE OHMS	RELAY SIZE	NOTES	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
—	2FB	.16	2	Track	Fig. 2	A65-170
10	"	180	2	Line code repeater.	Fig. 2	A65-175
—	1F	.6	2	Track	Fig. 2	A65-704
2	2FB	7	2	Track	Fig. 2	A65-705
—	2FB	38	2	Track	Fig. 2	A65-706
	2FB	.16	2	Track	Fig. 2	A65-707

CODE TRANSMITTERS

Type K, Direct-Current

This transmitter has an oscillating armature carried on a vertical shaft. Contacts are metal-to-metal (silver-platinum) and are actuated by cams on the vertical shaft. When the driving coil is deenergized, all contacts used to control the external circuits are open. When energized, the contacts close and open at the code rate.

NOMINAL CODE RATE	CONTACTS	NOMINAL RESISTANCE OHMS	NOMINAL SYSTEM VOLTAGE	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
75	2F-2B	5.5	2	Fig. 4	A65-189
75	"	150	10	"	A65-190
120	"	"	"	"	A65-195
180	"	"	"	"	A65-199

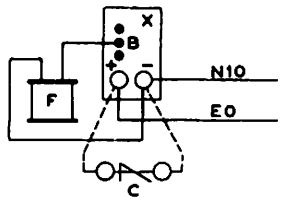
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FLASHER RELAYS

For highway crossing protection - For flashing aspects

Type K Size 4, Direct-Current

This relay is furnished for either of two flashing rates: 40 - 45 flashes per minute, for use in highway crossing protection flashing light circuits, 56 - 64 f.p.m. for use where a flashing signal aspect is desired. Each relay has four dependent front-back, metal-to-metal contacts. Each flasher relay consists of a Type K4 neutral relay and a relay flasher module, a plastic enclosed, solid-state coder, which determines and controls the flashing rate.



These relays operate from battery energy or from a separate full-wave rectifier (with regulation within one volt). Specified rate remains constant through a range of 8-16 volts d-c.

The relay is equipped with an offset terminal block to which the relay flasher module is mounted.

Notes: An arrester, not in excess of 1000 volts breakdown, must be used for surge protection if d-c energy is on line outside of case. See Section 3, for ordering information.

Connector from positive side of relay coil must be connected to terminals on the relay flasher module as follows:

"A" for 4 cells lead battery or equivalent.
"B" for 5 cells lead battery or equivalent.
"C" for 6 or 7 cells lead battery or equivalent.

NOMINAL SYSTEM (VOLTS)	CONTACTS	FLASHES PER MINUTE	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
				RELAY COMPLETE WITH FLASHER
8 to 16	4FB	40 - 45	Fig. 5	A65-213
8 to 16	4FB	56 - 64	"	A65-217

FLASHER RELAY, SIGNAL

Type K Size 2, Direct-Current

This relay is used for controlling the flashing aspects of a wayside signal. It is equipped with two back contacts, one for use in outside circuits. The remaining back contact is required for relay operation.

NOMINAL SYSTEM VOLTAGE	CONTACTS	FLASHES PER MINUTE	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
10	1B	Approx. 60	Fig. 3	A65-215
12	"	"	"	A65-216

LAMP-CONTROL RELAY

Type K Sizes 4 and 6, Direct-Current

This relay has two regular front-back contacts in spaces 2 and 3 and two lamp-control back contacts in spaces 1 and 4 especially designed to control the heavy surge current in lighting highway crossing lamps. These lamp-control contacts are rated at 15 amperes at 12 volts a.c. or d.c.

CONTACTS	NOMINAL RESISTANCE OHMS	NOMINAL SYSTEM VOLTAGE	RELAY SIZE	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
2FB-2B	300	10 – 12	4	Fig. 6	A65-250
4FB-2B	184	5	6	Fig. 11	A65-708

LIGHT-OUT NEUTRAL RELAY

Type K Sizes 2 and 4, A-C/D-C

This relay is used to detect failure of signal lamps. It operates on d.c. or a.c. Relays with low-resistance windings are used for hot filament checks. Relays with both low- and high-resistance windings are used for hot and cold filament checks.

CONTACTS	NOMINAL RESISTANCE OHMS	FOR USE WITH LAMP		MAXIMUM WORKING AMPERES A.C.	RELAY SIZE	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
		VOLTS	WATTS				
2FB		8	13 + 3.5				
"	.051	8	18 + 3.5	.960	2	Fig. 1	A65-714
"	.102	10	5+3.5	.600	2	Fig. 1	A65-260
		12 - 16	21(C.P.)				
		10	10				
		11.3	13.3				
"	.069	10	13+3.5	1.00	"	"	A65-261
"	500 – .069	10	18	1.2	"	"	A65-263
"	400 – .069	11	11	.650	"	"	A65-264
4FB	500 – .080	8	18	1.0	4	Fig. 5	A65-272

NEUTRAL RELAY, REGULAR-RELEASE

Type K Sizes 2, 4 and 6, Direct-Current, Line and Track

STANDARD RELAYS

CONTACTS	NOMINAL RESISTANCE OHMS	MAXIMUM PICKUP AND WORKING AMPERES	NOTES	RELAY SIZE	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
2FB	2	.0892		2	Fig. 1	A65-300
"	4	.067		"	"	A65-301
"	500	.0089		"	"	A65-305
4FB	2	.0992		4	Fig. 5	A65-310
"	4	.068		"	"	A65-311
"	500	.0084		"	"	A65-315
"	28 –.04	.0892	compound relay	"	"	A65-709
6FB	2	.125		6	Fig. 11	A65-320
"	4	.0861		"	"	A65-321
"	500	.0106		"	"	A65-325

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SPECIFIC APPLICATION RELAYS

CONTACTS	NOMINAL RESISTANCE OHMS	MAXIMUM PICKUP AND WORKING AMPERES	NOTES	RELAY SIZE	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
2FB	280	.0189	(HD) contacts	2	Fig. 1	A65-345
4FB	50	.0258	Pulse bridging.	4	Fig. 5	A65-351
"	100	.0164		"	"	A65-353
"	500	.0124	(HD) contacts .125" front contact opening.	"	"	A65-355
"	"	"	(EHD) contacts .125" front contact opening.	"	"	A65-356
"	6	.110	Overlay track circuit.	"	"	A65-359
6FB	500	.0128	(HD) contacts .125" front contact opening.	6	Fig. 11	A65-365
"	55	.0336	Coded track receiver.	6	"	A65-703

SLOW-ACTING RELAYS

Time of release is the time required to open front contacts after energy is removed from the relay. Time of pickup is the time required to make front contacts after energy is applied to the relay. Operating values shown are based on 70 degrees F. (21°C.).

NEUTRAL RELAY, SLOW-PICKUP
Type K Sizes 4 and 6, Direct-Current, Line
STANDARD RELAYS

CONTACTS	NOMINAL RESISTANCE OHMS	MAXIMUM PICKUP AND WORKING AMPERES	MINIMUM TIME OF PICKUP @70° F	RELAY SIZE	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
4FB	880	.0105	1½ seconds at 11.5 volts	4	Fig. 5	A65-376
6FB	880	.0105	" " 11.5 "	6	Fig. 11	A65-386

NEUTRAL RELAY, SLOW-PICKUP AND SLOW-RELEASE
Type K Sizes 4 and 6, Direct-Current

CONTACTS	NOMINAL RESISTANCE OHMS	MAXIMUM PICKUP AND WORKING	MINIMUM TIME OF PICKUP AND RELEASE	RELAY SIZE	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
4FB	350	8.9 volts	2.3 sec. pickup and 1.1 sec. release at 10 volts.	4	Fig. 5	A65-405
6FB	350	.021 Amperes	1.5 sec. pickup at 11.5 volts and 1.2 sec. release at 9.0 volts	6	Fig. 11	A65-409

NEUTRAL RELAY, SLOW-RELEASE

Type K Sizes 4 and 6, Direct-Current, Line

STANDARD RELAYS

CONTACTS	NOMINAL RESISTANCE OHMS	MAXIMUM PICKUP AND WORKING AMPERES	TIME OF RELEASE	RELAY SIZE	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
4FB	400	.010	1.0 seconds at .0225 A	4	Fig. 5	A65-420
6FB	400	.0119	1.0 seconds at .0225 A	6	Fig. 11	A65-425

SPECIFIC APPLICATION RELAYS

CONTACTS	NOMINAL RESISTANCE OHMS	MAXIMUM PICKUP AND WORKING AMPERES	MINIMUM TIME OF RELEASE	RELAY SIZE	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
4FB	250	.013	4.0 seconds at .040 A.	4	Fig. 5	A65-435
"	500	.0081	2.0 seconds at .020 A.	4	"	A65-437
"	"	.0115	.9 seconds at .0166 A.	4	"	A65-439
4FB (HD-F)	"	.0098	.090 front contact openings.	4	"	A65-710
6FB	38	.030	Partial slow release.	6	Fig. 11	A65-711

POLARIZED RELAY

Type K Size 6, Direct-Current

This relay has two armatures, one polar and one neutral. The polar armature operates either to the normal or reverse position, depending upon the polarity of the applied energy, and remains in the last-operated position. The neutral armature drops momentarily during pole-changing.

CONTACTS		NOMINAL RESISTANCE OHMS	MAXIMUM WORKING AMPERES	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
NEUTRAL	POLAR				
4FB	2NR	500	.0108 (neutral armature)	Fig. 12	A65-461

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POWER-TRANSFER RELAY

Type K Sizes 2, 4 and 6

This relay is essentially a d-c neutral line relay operating on rectified a.c. If a-c energy fails, the relay armature drops and automatically transfers the circuits onto local battery. The ratio of release voltage to pickup voltage is about 75 percent to provide transfer before signal aspects are impaired. Contacts are (HD) metal-to-metal—capacity 15 amperes at 15 volts.

CONTACTS	NOMINAL RESISTANCE EACH SIDE OHMS	RATED VOLTAGE A-C	RELAY SIZE	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
2FB	132 – 132	10	2	Fig. 1	A65-480
4FB	50 – 50	"	4	Fig. 5	A65-485
6FB	"	"	6	Fig. 11	A65-490

SWITCH-CONTROL NEUTRAL RELAY

Type K Size 4, Direct-Current

This relay is used to control energy to high- or low-voltage switch machines. These relays have .125" front contact openings.

CONTACTS	NOMINAL RESISTANCE OHMS	SWITCH MACHINE OPERATING VOLTAGE	MAXIMUM PICKUP AND WORKING AMPERES	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
4FB(HD)	500	Low	.0124	Fig. 5	A65-355
" (EHD)	"	High	"	"	A65-356
4FB (2F-HD)	500	Low	"	Fig. 5	A65-712

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SWITCH-OVERLOAD NEUTRAL RELAY

Type K Size 2, Direct-Current

This relay is used to cut off energy from a switch control relay when the switch machine motor is overloaded because of an obstruction, and to provide for automatic resetting when polarity of the control circuit is reversed. The relay picks up on the overload current and remains stuck up until control circuit is reversed. The relay is made slow in picking up to prevent pickup on the heavy surges through the switch machine motor when starting. Contacts are metal-to-metal, close-before-open (CBO).

CONTACTS	NOMINAL RESISTANCE OHMS	SWITCH MACHINE OPERATING VOLTAGE	OVERLOAD RATING AMPERES	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
2CBO	.066-125	Low	18	Fig. 1	A65-570
"	"	High	12	"	A65-571

TIMING RELAY, MOTOR-OPERATED

Type KB, Direct-Current

This relay has an external time adjustment which can be sealed to prevent unauthorized adjustment. The relay is shipped adjusted to the maximum time, unsealed. All contacts are metal-to-metal.

NOMINAL SYSTEM VOLTAGE	CONTACTS		TIME RANGE		TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
	CHECK	TIME	MIN.	MAX.		
10	2	2	4 seconds	64 seconds	Fig. 8	A65-609
"	"	"	1 minute	8 minutes	"	A65-610
12	"	"	4 seconds	64 seconds	"	A65-612
"	"	"	1 minute	8 minutes	"	A65-613
10	"	"	4 seconds	64 seconds	"	A65-717
"	"	"	1 minute	8 minutes	"	A65-716
12	"	"	4 seconds	64 seconds	"	A65-719
"	"	"	1 minute	8 minutes	"	A65-718

TIMING RELAY, THERMAL

Type T–Class A

This relay has one normally open, metal-to-metal time contact. It has no check contact. Timing is preset and sealed at factory. Indicated time is for heating only.

NOMINAL SYSTEM VOLTAGE	TIME IN SECONDS	NOMINAL RESISTANCE OF HEATER—OHMS	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
10	5–6	11.3	Fig. 10	A65-635
"	9-11	"	"	A65-636

TIMING RELAY, THERMAL

Type T–Classes G and J

This relay has one normally closed check contact and a normally open time contact which are metal-to-metal. It has an external adjustment, which can be sealed to prevent unauthorized adjustment. The relay is shipped adjusted to the maximum time. Time ranges indicated are for a complete cycle of heating and cooling.

NOMINAL SYSTEM VOLTAGE	TIME RANGE, SECONDS		NOMINAL RESISTANCE OF HEATER—OHMS	TERMINAL DESIGNATION (See Page 9)	CATALOG NUMBER
	MIN.	MAX.			
10	18	30	11.3	Fig. 9	A65-643
"	25	45	"	"	A65-644
"	45	130	"	"	A65-646
8	18	30	7.6	"	A65-713
12	45	130	18.6	9	A65-648
12	18	30	18.6	9	A65-649

Memoranda

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TYPE K RELAYS

CAT.NO.	QTY	DRAWING NO.	ED NO.	PG.
A65-110		53000-265GR2	ED60-1718	10
A65-112		53000-276GR2	ED(DWG.NO)	10
A65-118		53000-285GR50	ED60-1755	11
A65-120		53000-317GR18	ED60-1720	11
A65-125		53000-307GR2	ED(DWG.NO)	
A65-127		53000-307GR15	ED60-1719	11
A65-128		53000-303GR9	ED60-1765	6
		(SEE A92)		
A65-158		53000-317GR13	ED(DWG.NO)	11
A65-170		56600-47GR10	ED(DWG.NO)	12
A65-175		56600-49GR1	ED(DWG.NO)	12
A65-189		57090-125GR3	ED(DWG.NO)	12
A65-190		57090-125GR1	ED(DWG.NO)	12
A65-195		57090-126GR1	ED(DWG.NO)	12
A65-199		57090-127GR1	ED(DWG.NO)	12
A65-213		53000-285GR74	ED60-1707	13
A65-215		53000-274GR3	ED(DWG.NO)	
A65-216		53000-274GR4	ED(DWG.NO)	
A65-217		53000-285GR75	ED(DWG.NO)	13
A65-250		53000-255GR2	ED60-1754	14
A65-260		53000-124GR6	ED60-1711	14
A65-261		53000-124GR4	ED(DWG.NO)	14
A65-263		53000-285GR13	ED(DWG.NO)	14
A65-264		53000-285GR57	ED(DWG.NO)	14
A65-272		53000-285GR56	ED60-1799	14
A65-300		53000-122GR2	ED(DWG.NO)	14
A65-301		53000-122GR4	ED60-1757	14
A65-305		53000-122GR18	ED60-1725	14
A65-310		53000-84GR2	ED60-1791	14
A65-311		53000-84GR3	ED60-1756	14
A65-315		53000-84GR15	ED60-1747	14
A65-320		53000-96GR2	ED(DWG.NO)	14
A65-321		53000-96GR3	ED(DWG.NO)	14
A65-325		53000-96GR14	ED60-1748	15
A65-345		53000-285GR76	ED(DWG.NO)	
A65-351		53000-185GR8	ED60-1746	15
A65-353		53000-84GR7	ED60-1701	15
A65-355		53000-142GR15	ED60-1706	15
A65-356		53000-165GR15	ED(DWG.NO)	15
A65-359		53000-285GR69	ED60-1723	15
A65-365		53000-133GR14	ED60-1704	15
A65-376		53000-113GR6	ED(DWG.NO)	15
A65-386		53000-114GR6	ED60-1761	15
A65-405		53000-85GR78	ED60-1730	15
A65-409		53000-185GR67	ED(DWG.NO)	15
A65-415		53000-122GR36	ED(DWG.NO)	
A65-420		53000-84GR50	ED60-1721	16
A65-425		53000-96GR46	ED60-1722	16
A65-435		53000-141GR10	ED60-1705	16
A65-437		53000-141GR4	ED(DWG.NO)	16
A65-439		53000-84GR40	ED(DWG.NO)	16
A65-461		53002-123GR16	ED60-1789	16
A65-480		53000-123GR4	ED60-1703	17
A65-485		53000-137GR3	ED60-1708	17
A65-490		53000-144GR3	ED60-1709	17
A65-570		53000-275GR3	ED60-1764	18
A65-571		53000-275GR2	ED(DWG.NO)	18
A65-609		57262-859GR3	ED(DWG.NO)	18
A65-610		57262-859GR2	ED(DWG.NO)	18
A65-612		57262-860GR3	ED(DWG.NO)	18
A65-613		57262-860GR2	ED(DWG.NO)	18
A65-635		53610-3GR2	ED(DWG.NO)	19
A65-636		53610-3GR5	ED(DWG.NO)	19
A65-643		53610-28GR20	ED(DWG.NO)	19
A65-644		53610-28GR23	ED(DWG.NO)	19
A65-646		53610-19GR2	ED(DWG.NO)	19
A65-648		53610-19GR16	ED(DWG.NO)	19
A65-649		53610-28GR21	ED(DWG.NO)	19
A65-700		53000-309GR16	ED(DWG.NO)	11
A65-701		53000-318GR11	ED(DWG.NO)	11
A65-702		53000-314GR10	ED(DWG.NO)	11
A65-703		53000-285GR48	ED60-1763	
A65-704		56600-47GR11	ED(DWG.NO)	12
A65-705		56600-49GR2	ED(DWG.NO)	12
A65-706		56600-49GR7	ED(DWG.NO)	12
A65-707		56600-93GR10	ED(DWG.NO)	12
A65-708		53000-273GR2	ED60-1767	14
A65-709		53000-85GR29	ED(DWG.NO)	15
A65-710		53000-129GR15	ED(DWG.NO)	16
A65-711		53000-96GR79	ED(DWG.NO)	16
A65-712		53000-163GR15	ED(DWG.NO)	17
A65-713		53610-28GR24	ED(DWG.NO)	19
A65-714		53000-124GR2	ED(DWG.NO)	14
A65-715		53000-326GR1	ED(DWG.NO)	
A65-716		57262-861GR2	ED(DWG.NO)	18
A65-717		57262-861GR3	ED(DWG.NO)	18
A65-718		57262-862GR2	ED(DWG.NO)	18
A65-719		57262-862GR3	ED(DWG.NO)	18
A65-720		50800-100GR1	ED(DWG.NO)	
		30268-18GR1		
A65-721		53000-307GR7	ED(DWG.NO)	

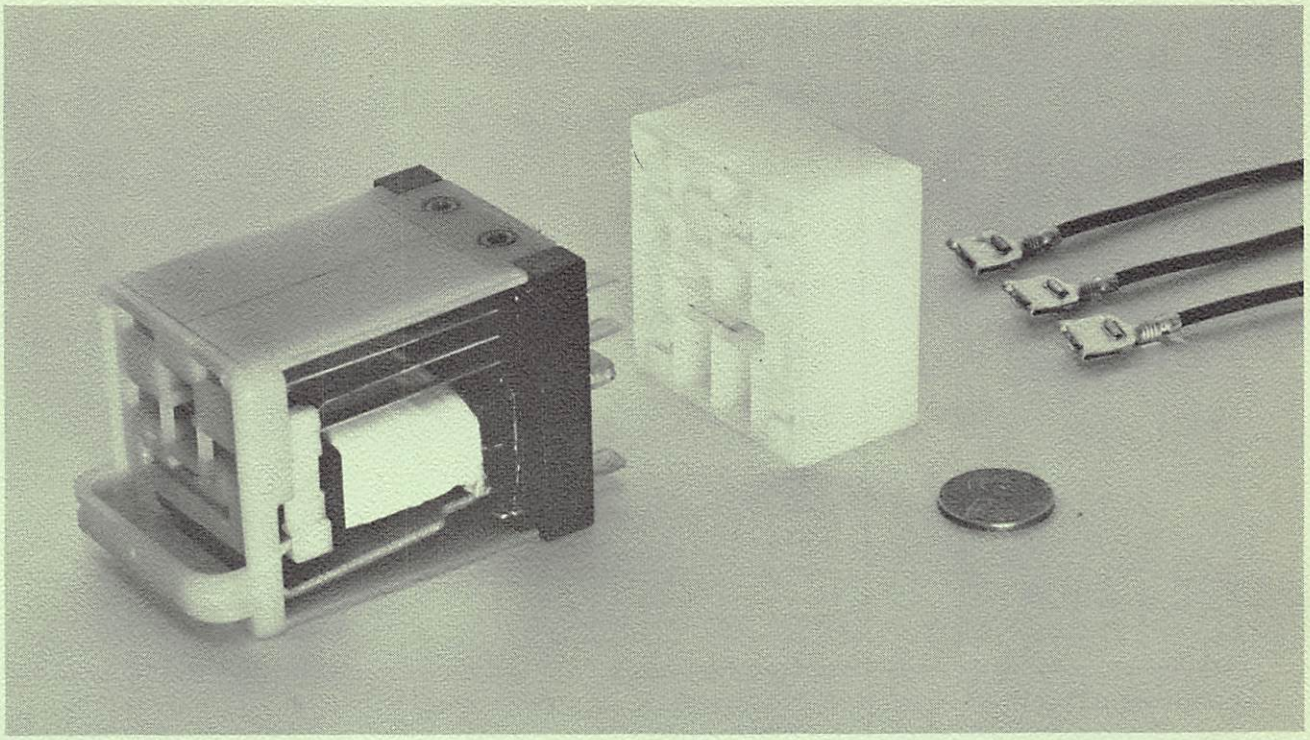
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NUMERICAL INDEX

TYPE K RELAYS

DRAWING NO.	CAT. NO.	DRAWING NO.	CAT. NO.	DRAWING NO.	CAT. NO.
53000-84GR2	A65-310	53000-285GR69	A65-359		
53000-84GR3	A65-311	53000-285GR74	A65-213		
53000-84GR7	A65-353	53000-285GR75	A65-217		
53000-84GR15	A65-315	53000-285GR76	A65-345		
53000-84GR40	A65-439	53000-307GR2	A65-125		
53000-84GR50	A65-420	53000-307GR7	A65-721		
53000-85GR29	A65-709	53000-307GR15	A65-127		
53000-85GR78	A65-405	53000-308GR9	A65-128		
53000-96GR2	A65-320	53000-309GR16	A65-700		
53000-96GR3	A65-321	53000-314GR10	A65-702		
53000-96GR14	A65-325	53000-317GR13	A65-158		
53000-96GR46	A65-425	53000-317GR18	A65-120		
53000-96GR79	A65-711	53000-318GR11	A65-701		
53000-113GR6	A65-376	53000-326GR1	A65-715		
53000-114GR6	A65-386	53002-123GR16	A65-461		
53000-122GR2	A65-300	53610-3GR2	A65-635		
53000-122GR4	A65-301	53610-3GR5	A65-636		
53000-122GR18	A65-305	53610-19GR2	A65-646		
53000-122GR36	A65-415	53610-19GR16	A65-648		
53000-123GR4	A65-480	53610-28GR20	A65-643		
53000-124GR2	A65-714	53610-28GR21	A65-649		
53000-124GR4	A65-261	53610-28GR23	A65-644		
53000-124GR6	A65-260	53610-28GR24	A65-713		
53000-129GR15	A65-710	56600-47GR10	A65-170		
53000-133GR14	A65-365	56600-47GR11	A65-704		
53000-137GR3	A65-485	56600-49GR1	A65-175		
53000-141GR4	A65-437	56600-49GR2	A65-705		
53000-141GR10	A65-435	56600-49GR7	A65-706		
53000-142GR15	A65-355	56600-93GR10	A65-707		
53000-144GR3	A65-490	57090-125GR1	A65-190		
53000-163GR15	A65-712	57090-125GR3	A65-189		
53000-165GR15	A65-356	57090-126GR1	A65-195		
53000-185GR8	A65-351	57090-127GR1	A65-199		
53000-185GR67	A65-409	57262-859GR2	A65-610		
53000-255GR2	A65-250	57262-859GR3	A65-609		
53000-265GR2	A65-110	57262-860GR2	A65-613		
53000-273GR2	A65-708	57262-860GR3	A65-612		
53000-274GR3	A65-215	57262-861GR2	A65-716		
53000-274GR4	A65-216	57262-861GR3	A65-717		
53000-275GR2	A65-571	57262-862GR2	A65-718		
53000-275GR3	A65-570	57262-862GR3	A65-719		
53000-276GR2	A65-112				
53000-285GR13	A65-263				
53000-285GR48	A65-703				
53000-285GR50	A65-118				
53000-285GR56	A65-272				
53000-285GR57	A65-264				

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Type JT (heavy duty) relay, cut away to show rugged internal structure.

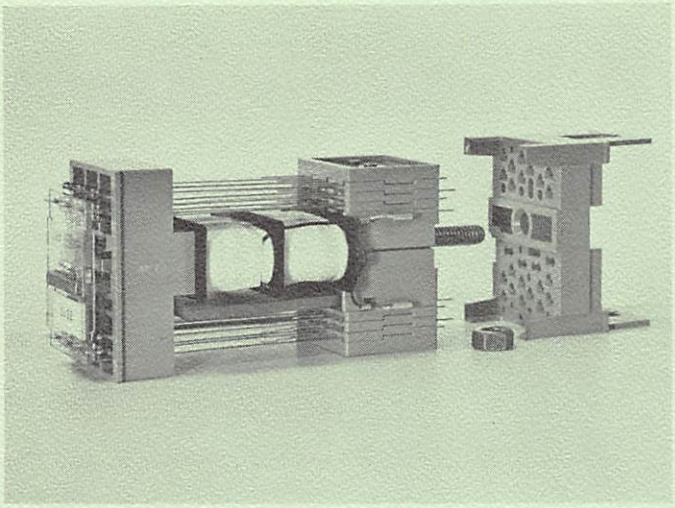
The J Line of Plug-In Relays

- *Type J - neutral*
- *Type JM - magnetic stick*
- *Type JT - neutral, HD*

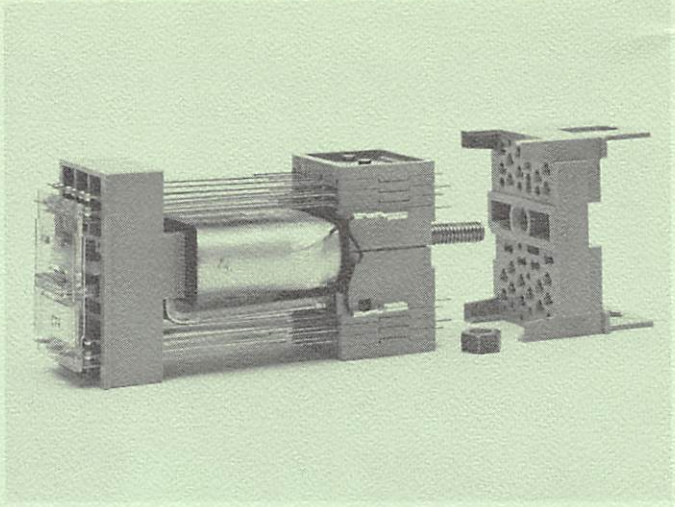
Small, compact, reliable • No adjustment required

GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL
ROCHESTER NEW YORK 14602

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Type J neutral relay.



Type JM magnetic stick relay.

TYPE J RELAY

The Type J plug-in neutral relay is designed for use in control and indication systems, logic networks, communication systems, and in other applications where long life and reliability are required. It requires no maintenance and only minimal mounting space.

The Type J relay uses two 180-ohm coils, which operate on 20 to 24 volts d-c. Usually, one coil is used to operate the relay. The other coil - via the circuitry - provides special operating characteristics, such as various release times, pulse-responsive action, stick action, etc. Arc suppression for the coils is built into the relay, thus eliminating the need for external suppression units.

There are six dependent front-back contacts, which never need adjustment. They maintain a constant pressure throughout the life of the relay, resulting in uniform operating characteristics.

To differentiate between the various Type J relays, the contact pushers are color coded, as listed on page 4.

TYPE JM RELAY

The Type JM is a plug-in magnetic stick (magnetic latching) relay. The dimensions, physical appearance, and applications are the same as those of the Type J relay except that the JM has a single 82-ohm coil. Arc suppression for the coil is built into the relay, thus eliminating the need for external suppression units.

There are six dependent front-back contacts, which never need adjustment. They maintain a constant pressure throughout the life of the relay, resulting in uniform operating characteristics.

Once picked up, the Type JM relay remains picked up with energy removed. Applying reverse energy of a nominal 5 to 6 volts d-c releases the armature. The relay is designed to operate from a 24-volt battery, split nine cells for pickup and three cells for release knockdown. It has no permanent magnet and is not polarity conscious – requiring merely that the pickup and knockdown be opposed.

To differentiate between the various Type JM relays, the contact pushers are color coded, as listed on page 4.

TYPE JT RELAY

(Pictured on front cover)

The Type JT is a general purpose, heavy-duty, neutral, plug-in relay for handling loads such as fractional hp motors, starters, solenoids, lamp loads, and automatic equipment controls.

The Type JT relay is available with a choice of coil resistances as listed on page 4. There are two front-back contacts of either silver or silver cadmium oxide. The contacts are nominally rated

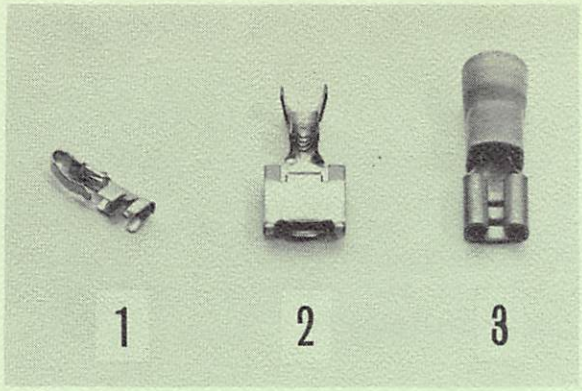
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for four amperes at 40 volts d-c with a resistive load, and five amperes (silver) or 10 amperes (silver-CdO) at 115 volts a-c. Silver cadmium oxide contacts are capable of switching a 1000-watt a-c tungsten lamp load.

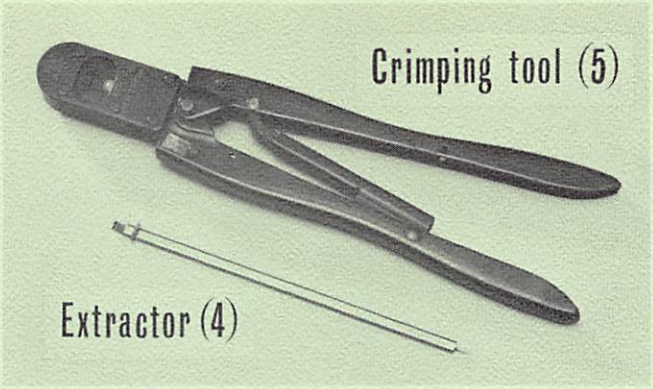
The contacts and magnetic structure never require adjustment. Stainless steel contact springs – not susceptible to loss of trapped pressure because of heat transfer from the contacts – are stable up to 350 degrees F. The contact buttons are accessible by removing the front cover plate. Contact pressure and travel are not affected when the contacts are cleaned and burnished.

SUMMARY OF SPECIFICATIONS

	TYPE J NEUTRAL	TYPE JM MAGNETIC LATCHING	TYPE JT NEUTRAL
DIMENSIONS			
Height	2-1/4"	2-1/4"	1-13/16"
Width	2"	2"	1-13/16"
Depth, relay only	4-3/8"	4-3/8"	2-3/4"
Depth, relay and plugboard	5"	5"	3-3/4"
CONTACTS			
Number	6FB	6FB	2FB
Form	C	C	C
Capacity, amps:			10 at 115v. a-c
Resistive load at 24v. d-c	1	1	–
Resistive load at 40v. d-c	–	–	4
Material	Silver or gold alloy	Silver	Silver or Silver-Cad. Oxide
Pressure, grams	30	30	30
COILS			
Number	2	1	1
Resistance, ohms	180 each	82	See pg. 4
Arc suppression	Yes	Yes	No
NOMINAL OPERATING VOLTAGE			
Forward (pickup)	24	24	See pg. 4
Reverse (knockdown)	–	6	–
NOMINAL OPERATING TIMES			
Pickup	25 ms	25	20 ms
Dropaway	15 ms	–	10 ms
DIELECTRIC STRENGTH			
Volts at 60 Hz	1500	1500	1500
TEMPERATURE RANGE			
Ambient F°	-60° to + 160°	-40° to + 160°	-40° to + 160°
PLUGBOARD MOUNTING	One 1/4" screw	One 1/4" screw	Two 6-32 screws
WEIGHT			
Relay (ounces)	15	15	7
Plugboard (ounces)	1.1	1.1	1.0



Terminals.



Crimping tool and extractor.

ORDERING INFORMATION

Please order by name, shown in BOLD TYPE, and catalog number.

NAME	CONTACTS	PUSHER COLOR	RES. PER COIL	D-C VOLTS	OPERATE CURRENT (MA.)	CATALOG NUMBER
RELAY, TYPE J	Silver	Clear	180	24	100	A69-100
RELAY, TYPE J, tropicalized	Silver	Red	180	24	100	A69-103
RELAY, TYPE J	Gold	Blue	180	24	100	A69-105
RELAY, TYPE J, with diode noise suppression . .	Silver	Lt. Grn.	180	24	100	A69-107
RELAY, TYPE J, with diode noise suppression . .	Gold	Lt. Blue	180	24	100	A69-109
RELAY, TYPE J, tropicalized with diode noise suppression	Silver	Dk. Grn.	180	24	100	A69-111
RELAY, TYPE JM	Silver	Amber	82	24	195	A69-120
RELAY, TYPE JM, tropicalized	Silver	Green	82	24	195	A69-123
RELAY, TYPE JT	Silver-CdO		40	10-12	186	A69-145
RELAY, TYPE JT	Silver-CdO		125	18	125	A69-135
RELAY, TYPE JT	Silver-CdO		156	24	112	A69-133
RELAY, TYPE JT	Silver-CdO		202	30-33	107	A69-139
RELAY, TYPE JT	Silver-CdO		385	36	75	A69-137
RELAY, TYPE JT	Silver-CdO		960	60	45	A69-141
RELAY, TYPE JT	Silver		40	10-12	186	A69-143
RELAY, TYPE JT	Silver		202	24	82	A69-130
RELAY, TYPE JT, with diode noise suppression . .	Silver		202	24	82	A69-147
RELAY, TYPE JT, with diode noise suppression . .	Silver		450	28	50	A69-151

REF.		
	PLUGBOARD, for Types J and JM relays	P69-101
	PLUGBOARD, for Type JT relay	P69-102
1	TERMINAL, leaf, for two No. 18 wires, for Types J and JM relays	P69-114
1A	As above, except for one or two No. 22 wires, or one No. 18 wire	P69-116
2	TERMINAL, for one No. 14 or 18 wire, for Type JT relay, with plugboard	P69-119
3	TERMINAL, for two No.12 or 14 wires, for Type JT relay, without plugboard	P69-118
4	EXTRACTOR, for terminals Refs. 1 and 1A	P69-121
5	TOOL, for Refs. 1 and 1A, for use with one No.18-20-22 or two No.22 wires	P69-106
5A	As above, except for use with one or two No. 20 wires	P69-108
5B	As above, except for use with two No. 18 wires	P69-110
5D	As above, except for use with terminal Ref. 2	P69-107
5E	As above, except for use with terminal Ref. 3	A3-183

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TYPES J, JM & JT RELAYS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A69-100			J RELAY	4
	31500 GR1		RELAY	
	424-11		NUT	
A69-103			J RELAY	4
	31500 GR2		RELAY	
	424-11		NUT	
A69-105			J RELAY W/NUT	4
	31500 GR3		J RELAY	
	424-11		NUT	
A69-107			J RELAY	4
	31500 GR4		RELAY	
	424-11		NUT	
A69-109			J RELAY W/ NUT	
	31500 GR5		J RELAY	
	424-11		NUT	
A69-111			J RELAY W/ NUT	
	31500 GR6		J RELAY	
	424-11		NUT	
A69-120			JM RELAY	4
	31570 GR1		RELAY	
	424-11		NUT	
A69-123			JM RELAY	4
	31570 GR2		RELAY	
	424-11		NUT	
A69-130	31580 GR1		JT RELAY	4
A69-133	31580 GR11		JT RELAY	4
A69-135	31580 GR12		JT RELAY	4
A69-137	31580 GR13		JT RELAY	4
A69-139	31580 GR14		JT RELAY	4
A69-141	31580 GR15		JT RELAY	4
A69-143	31580 GR7		JT RELAY	4
A69-145	31580 GR16		JT RELAY	4
A69-147	31580 GR9		JT RELAY	4
A69-150	31580 GR10		JT RELAY	
A69-151	31580 GR17		J T RELAY	

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TYPES J, JM & JT RELAYS

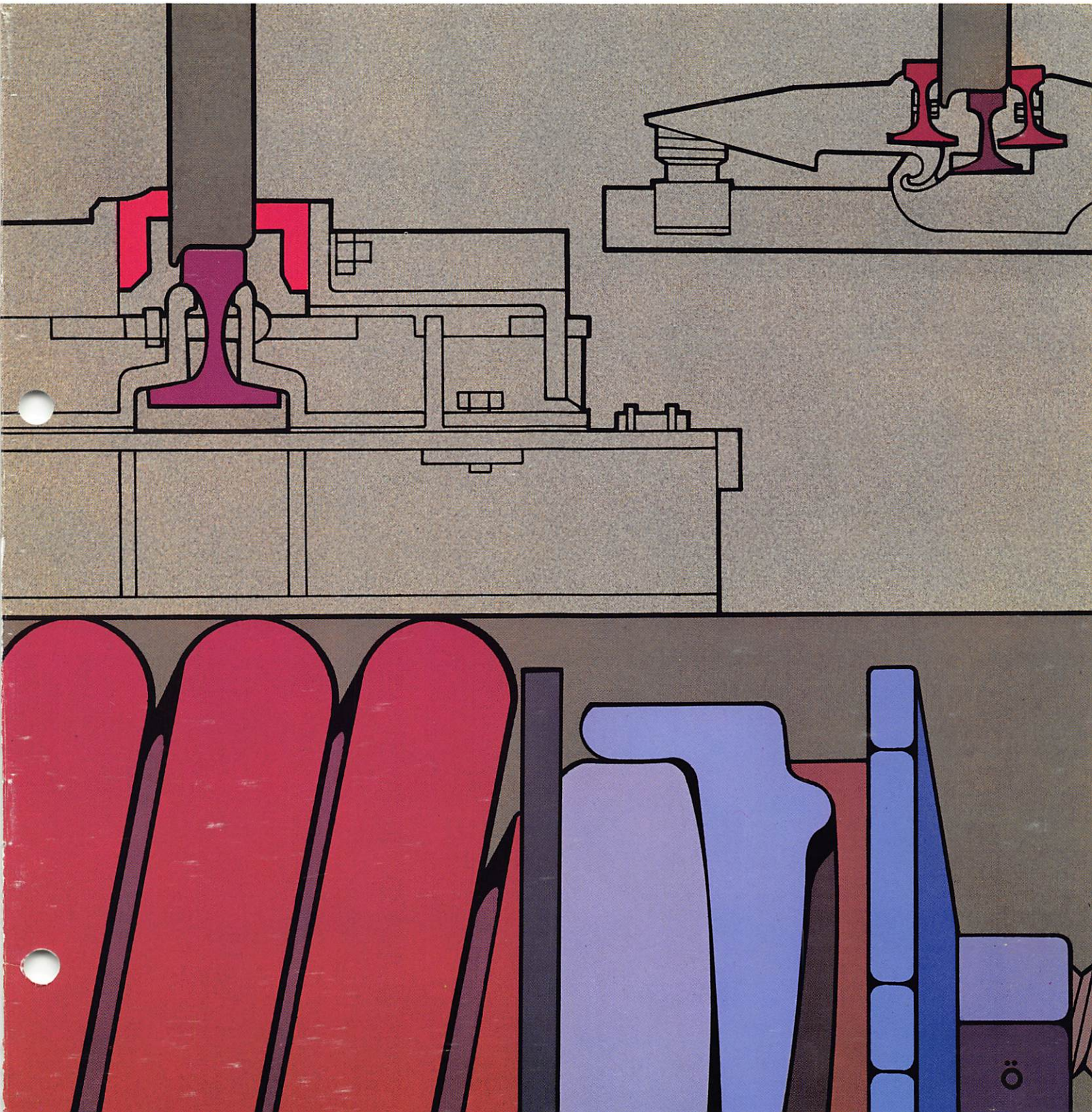
CAT.NO.	DRAWING NO.	QTY	NAME	PG.
P69-101	01099		COUPLER	
P69-102	01099-2		COUPLER	
P69-103	01099-4		COUPLER	
P69-106	24745-26		TOOL	
P69-107	24745-33		TOOL	
P69-108	24745-44		TOOL CRIMPING	
P69-110	24745-45		TOOL	
P69-114	55871-51		TERMINAL	
P69-116	55871-52		TERMINAL	
P69-118	59825-112		TERMINAL	
P69-119	59825-196		TERMINAL	
P69-121	59688-9		EXTRACTOR	

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CAR RETARDERS

FOR ELECTRIC OR HYDRAULIC OPERATION;
AUTOMATIC OR MANUAL CONTROL

GRS CATALOG **71-1**



INTRODUCTION

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GRS car retarders meet all the demands of today's car classification yards, and many industrial applications as well. From huge sophisticated, computer-aided, microprocessor-controlled yards handling up to 3,000 cars a day, to small yards handling less than 600 cars a day, GRS car retarders provide simple, reliable car control that ensures smooth, efficient, trouble-free operation.

The Type E series car retarders are primarily used as hump and group retarders in large car classification yards. The Type F series car retarders are used as hump and group retarders in small yards, and for spotting, skating, and tangent point control in all sizes of yards, as well as for simple speed reduction in industrial applications.

The Type E series retarders are equipped with economical and low-maintenance hydraulic mechanisms called Hydra-Trak.® They are also available with traditional electromechanical mechanisms. The hydraulically operated Type F series retarders are equipped with an essentially maintenance-free pump unit and heavy-duty, fast-response rams.

GRS car retarders are available with both automatic and manual control. When automatically controlled, the Type E retarder is positioned by the yard's automatic retarder-control system; when manually controlled, the retarder is operated to a position corresponding to the velocity and weight of the car about to enter the retarder. The Type F retarder is weight-responsive and automatically adjusts its retardation in proportion to the car's weight.

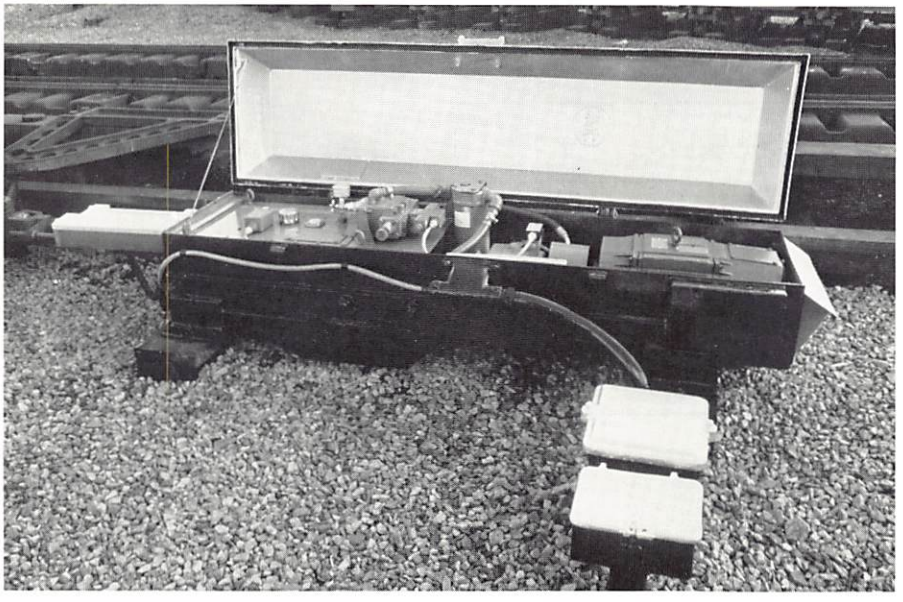
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The hydraulically or electrically operated Type E series car retarders provide effective car speed control over a wide range of car characteristics and retarder applications. The Type E160XHD retarder, with its heavy "beefed up" construction, is especially suited as a hump retarder and group retarder in high-capacity classification yards, where cars up to 160 tons with 38-inch wheels are regularly handled. The Type E1 retarder, although similar to the Type E160XHD, is designed for lighter applications.

Braking is provided by cast-steel or iron-alloy replaceable retarder shoes mounted on each side of the rails. Optional retarder shoes are available for the Type E1 retarder if more retardation is necessary, but the higher retardation capabilities of the Type E160XHD are not needed. The velocity head ratings for all Type E retarders are shown in the table on page 4.

Maintenance consists only of periodic adjustments for shoe wear, occasional replacement of worn shoes, tightening of bolts, and lubrication.

Features

- **Hydraulically Operated**—there are no gears, no brake, no daily adjustment, and no burnout worries with the Hydra-Trak hydraulic mechanism. It is available as a complete assembly or as a retrofit kit for existing electromechanical mechanisms.
- **Electrically Operated**—electric power is easily controlled, practically immune to cold-weather failure, and readily available.

Both Hydraulic and Electric Retarders Provide These Added Features:

- **Economy**—energy is required to change retarder position only; actual braking pressure is provided by powerful springs.
- **Added Safety**—by restoring a retarder to the closed position as soon as each car is released, retardation is always available. In fact, a car can be held in the retarder even with complete power failure.
- **Easy Maintenance**—one adjustment takes care of shoe wear for the entire retarder. Bolts and lubrication points are readily accessible.
- **Versatile**—cars with 28- to 38-inch diameter wheels and weighing up to 160 tons can be handled with precision. Type E car retarders can provide control, from spotting empty cars in barney pit operations to handling large, heavyweight cars in hump retarder and group retarder applications.

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Velocity Head Ratings for Type E Retarders

Total Length of Retarder in Feet	No. of Effective Beams	Number of Mechanisms	100-Ton Cars with 33" Wheels — Velocity Head Per Effective Beam Length, 4-Axle Cars (MPH) Type E1 .390'	Type E1H* .420'	Type E1HS+ .490'	160-Ton Cars with 38" Wheels Type E160XHD .420'
16½	2	1	0.78	0.84	0.98	0.84
22	3	1	1.17	1.26	1.47	1.26
27½	4	1	1.56	1.68	1.96	1.68
33	5	1	1.95	2.10	2.45	2.10
38½	6	1	2.34	2.52	2.94	2.52
44	7	1	2.73	2.94	3.43	2.94
49½	8	1	3.12	3.36	3.92	3.36
55	9	2	3.51	3.78	4.41	3.78
60½	10	2	3.90	4.20	4.90	4.20
66	11	2	4.29	4.62	5.39	4.62
71½	12	2	4.68	5.04	5.88	5.04
77	13	2	5.07	5.46	6.37	5.46
82½	14	2	5.46	5.88	6.86	5.88
88	15	2	5.85	6.30	7.35	6.30
93½	16	2	6.24	6.72	7.84	6.72
99	17	3	6.63	7.14	8.33	7.14
104½	18	3	7.02	7.56	8.82	7.56
110	19	3	7.41	7.98	9.31	7.98
115½	20	3	7.80	8.40	9.80	8.40
121	21	3	8.19	8.82	10.29	8.82
126½	22	3	8.58	9.24	10.78	9.24
132	23	3	8.97	9.66	11.27	9.66
137½	24	3	9.36	10.08	11.76	10.08
143	25	4	9.75	10.50	12.25	10.50
148½	26	4	10.14	10.92	12.74	10.92
154	27	4	10.53	11.34	13.23	11.34
159½	28	4	10.92	11.76	13.72	11.76
165	29	4	11.31	12.18	14.21	12.18
170½	30	4	11.70	12.60	14.70	12.60
176	31	4	12.09	13.02	15.19	13.02
181½	32	4	12.48	13.44	15.68	13.44
187	33	5	12.87	13.86	16.17	13.86
192½	34	5	13.26	14.28	16.66	14.28
198	35	5	13.65	14.70	17.15	14.70
203½	36	5	14.04	15.12	17.64	15.12
209	37	5	14.43	15.54	18.13	15.54
214½	38	5	14.82	15.96	18.62	15.96
220	39	5	15.21	16.38	19.11	16.38
225½	40	5	15.60	16.80	19.60	16.80
231	41	6	15.99	17.22	20.09	17.22
236½	42	6	16.38	17.64	20.58	17.64
242	43	6	16.77	18.06	21.07	18.06
247½	44	6	17.16	18.48	21.56	18.48
253	45	6	17.55	18.90	22.05	18.90
258½	46	6	17.94	19.34	22.54	19.34
264	47	6	18.33	19.74	23.03	19.74
269½	48	6	18.72	20.16	23.52	20.16
275	49	7	19.11	20.58	24.01	20.58
280½	50	7	19.50	21.00	24.50	21.00
286	51	7	19.89	21.42	24.99	21.42
291½	52	7	20.28	21.84	25.48	21.84
297	53	7	20.67	22.26	25.97	22.26

*Optional high outer shoes. +Optional high outer shoes, special alloy inner shoes.

Description

The Type E retarder mechanism positions articulated beams supporting replaceable retarder shoes.

The electromechanical mechanism contains a 15-hp dc motor and associated gear train which rotate a drive gear. The reversible motor rotates the drive gear counterclockwise to move the shoes toward each other, and clockwise to move the shoes apart.

The hydraulic mechanism contains an ac or dc 15-hp motor, pump unit, and control valves which drive a reversible hydraulic ram to position the retarder shoes. This mechanism is essentially maintenance-free.

The configurations of the Types E1 and E160XHD retarders are similar, but adjustments and parts differ from one type to another. The Type E160XHD has a sturdier retarding structure (shoe beams, chairs, linkages, levers, etc.) which provides greater pressure needed for regular handling of cars up to 160 tons.

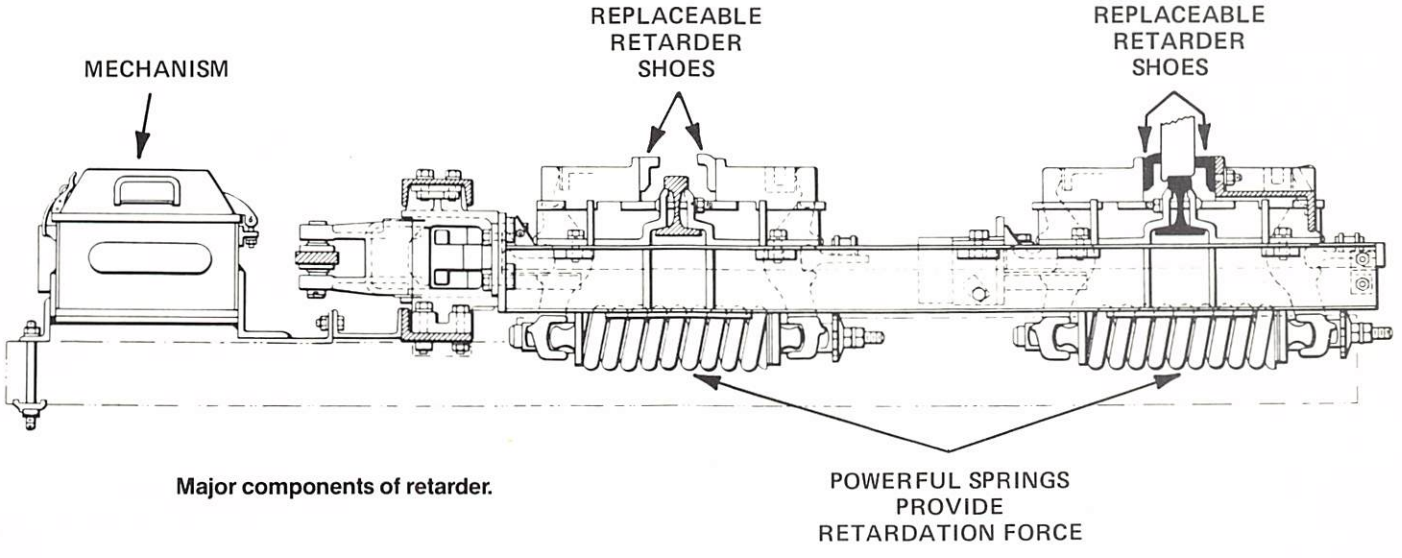
Braking in Type E retarders is provided by cast-steel or iron-alloy replaceable retarder shoes mounted on each side of the rails. The vertical position and composition of these shoes vary, depending on retarder type and selection of optional retarder shoes. A special ductile-iron inside shoe—the GRS LN-80—is recommended for use in conjunction with traditional GRS steel outside shoes to greatly reduce wheel screech. Ductile-iron inside shoes and cast-steel outer shoes are used where noise is a problem; cast-steel inner and outer shoes are used where noise is not a problem.

The shoes for the basic Type E1 retarder provide a velocity head rating of 0.390 foot per effective beam length for 100-ton, four-axle cars with 33-inch wheels; with optional high outer shoes (Type E1H), the velocity head rating is increased to 0.420 foot. The increase results from moving the point of shoe and wheel contact farther towards the center of the wheel. An additional increase to 0.490-foot velocity head rating can be achieved with the use of optional special steel-alloy retarder shoes (Type E1HS).

The Type E160XHD car retarder combines the effects of the high position of the retarder shoe-wheel contact surface with an increase in the actual "squeezing" force exerted on the wheel by the retarder. An increase to 0.420 foot of velocity head removed is obtained per effective beam length for a 160-ton, four-axle car with 38-inch wheels.

All Type E retarders are available in 5½-foot increments. These increments are assembled in line to produce a continuous retarding surface with the most economical use of track space.

Energy for an electrically operated retarder is supplied through a three-wire circuit—265 volts dc for power, 132 volts dc for control. Hydraulic retarder mechanisms require 240/480 volts ac or 265 volts dc for power and 24 volts dc for control.



Major components of retarder.

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Operation

A reversible motor and associated gears and levers (or hydraulic ram), Figure 1, position the inner and outer shoes so that the space between them is less than the thickness of a car wheel. A wheel entering the retarder forces the shoes apart against the compression of powerful springs; Figures 2 and 3 show the sequence of operation. The resulting friction between the wheel and the retarder shoes retards the car.

The amount of retardation depends upon the position of the retarder shoes with no wheel between them; the closer together, the more spring compression when the shoes are forced apart and the greater the braking force exerted by the retarder. Operating energy is used only to change retarder shoe position. Actual braking force is provided by the springs.

A weight detector, capable of measuring three weight classifications, is positioned before the retarder. For Type E1 retarders, the weight detector classifies cuts as: less than 35 tons, 35 to 65 tons, or over 65 tons. The weight detector, mounted before a Type E160XHD retarder, classifies cut weights as: 35 to 65 tons, 65 to 100 tons, or over 100 tons. Cuts present in the system (as detected by a presence detector also mounted before the retarder) but not of sufficient weight to be detected by the weight detector are automatically classified as under 35 tons.

During automatic operation, the retarder shoes are positioned according to the weight classification of the car about to enter the retarder. Four retardation positions, plus open (no retardation) are available for both the Types E1 and E160XHD retarders during automatic operation.

During manual operation, the retarder shoes are positioned by the operator to provide the degree of retardation desired: the Type E160XHD has three retardation positions, plus open, available; the Type E1, two positions, plus open. In the maximum retardation position, during both manual and automatic operation, the Type E1 retarder shoes are 3¾ inches apart and the Type E160XHD shoes are 3½ inches apart.

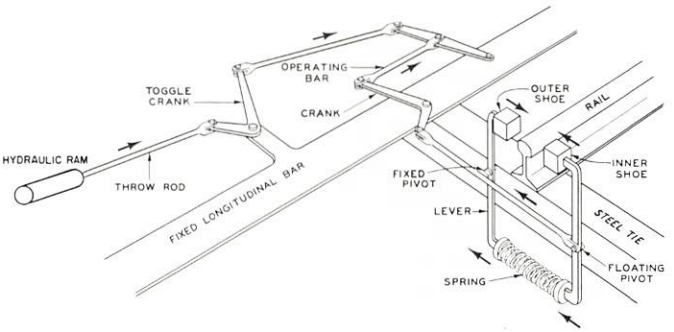


Figure 1. Simplified diagram of linkage to position retarder shoes. Shown for one rail.

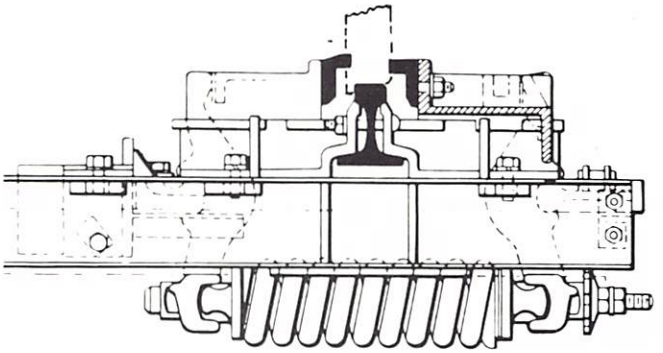


Figure 2. Before the car's wheels enter the retarder, the retarder shoes are positioned such that the distance between them is less than the thickness of the car's wheels.

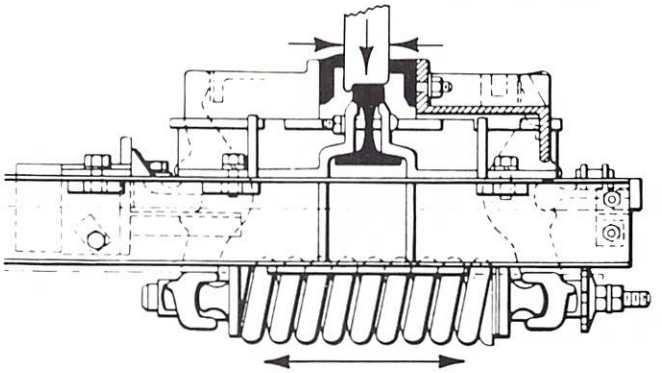


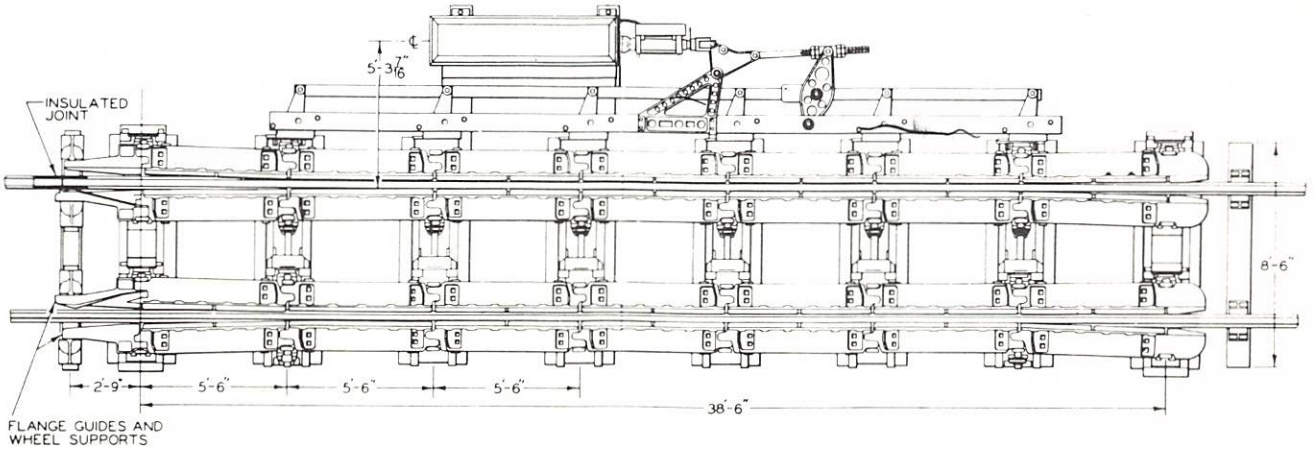
Figure 3. Once in the retarder, the car's wheels force the retarder shoes apart against the resistance of the powerful springs. Friction between the retarder shoes and the car's wheels inhibits the movement of the wheel. Arrows show lines of force.

Installation

The total amount of retardation is usually divided between the hump and group retarders. The length of the hump retarder and each group retarder is determined by the throughput and by economic studies.

Type E retarders are available in varying lengths according to the amount of retardation required. Minimum retarder length is 16½ feet, with two effective beam lengths and one operating mechanism. Retarder length can be increased in 5½-foot increments, with the number of operating mechanisms being determined by traffic conditions; heavier traffic requires fewer effective beams per operating mechanism (see Velocity Head Ratings).

GRS furnishes all castings, hardware, and special retarder shoes for assembling retarders as specified. If desired, GRS will assemble retarders at the factory or on site, or assist you in assembling and installing retarders. Mounting hardware, running rails, guard rails, ties, etc., can be provided, if desired.



Typical Type E retarder layout

Application

Type E1 car retarder is especially suited for spotting empty cars in barney pit and dumper operations or where cars up to 100 tons with four axles are typically handled.

Optional retarder shoes convert the Type E1 retarder to Type E1H or Type E1HS retarders. The Type E1H retarder has an 8% higher velocity head rating than the Type E1 retarder, enabling 108-ton cuts to be handled in the same length as the Type E1 retarder handles 100-ton cuts. The Type E1HS retarder has a 26% higher velocity head rating than the Type E1 retarder and handles 126-ton cuts in the same length as the Type E1 retarder handles 100-ton cuts.

In special applications, 160-ton cars with 38-inch wheels can be controlled with the Types E1, E1H, and E1HS car retarders, depending on desired operation and available space. Typically, Types E1H and E1HS car retarders are used where existing Type E1 retarders require upgrading to handle specific loads. However, for general-revenue traffic, upgrading to a Type E160XHD retarder is usually the most economical approach.

The Type E160XHD car retarder, especially designed for use as a hump retarder and a group retarder in today's modern, high-capacity classification yards, can control cars weighing up to 160 tons with 38-inch wheels with high precision.

Upgrading Existing Yards

Types E1 and E160 electric retarders presently in service can be converted to high-performance Type E160XHD retarders with either electric or hydraulic operation. The Type E160XHD linkage and retarder components increase mechanical advantage, thus reducing demands on the retarder mechanism by 10%. Rods and springs are heat-treated for increased durability, and improved design of

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shoe beam and chair cross sections increase strength.

GRS has available kits for field modification of the operating mechanisms and retarder components, or the mechanisms can be returned to GRS for factory retrofit.

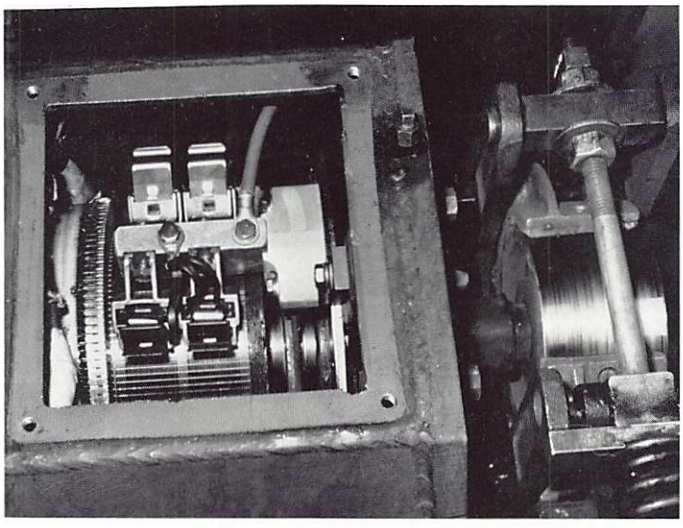
To convert existing electrically operated Types E1 or E160 retarders to the extra-performance Type E160XHD, the following modification kits are available:

Field Modification—Mechanism Only. This kit is available as a fast, easy, on-location retrofit to existing retarders. It includes a case extension to accommodate a larger motor, and the new extra-performance motor.

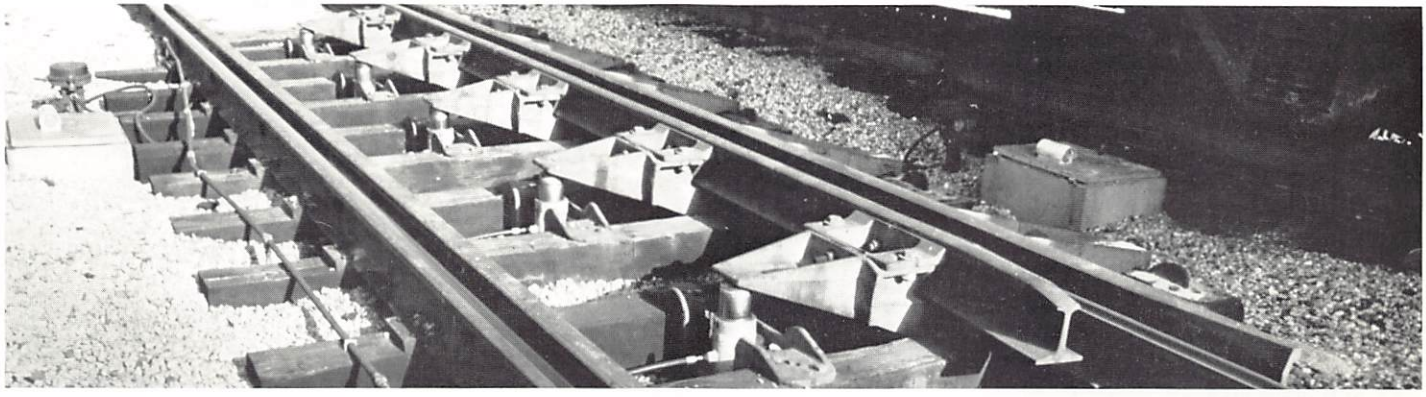
Field Modification—Linkage Only. The new linkage kit includes all required parts and complete installation instructions.

To convert electrically operated Type E retarders to hydraulically operated Hydra-Trak retarders, a field retrofit kit is available that makes trackside changeout fast and easy—typically, a crew of four can complete the changeout in about eight hours. This kit is available for either dc or ac operation and includes the ram, controller, and all necessary hardware. The retarder needs no changes and no rewiring is necessary. The controller mounts in a standard 14″ x 18″ space.

For more information on the new heavy-duty, electrically operated Type E160XHD retarder, see GRS Folder 274. For more information on Hydra-Trak hydraulic car-retarder mechanisms, see GRS Folder 279.



TYPES F4 AND F5 CAR RETARDERS



GRS Types F4 and F5 are weight-responsive, single-rail car retarders operated by a compact Hydra-Trak hydraulic mechanism. They are furnished with all the necessary components to fully equip or convert new or existing hydraulic retarders.

The Type F4 single-action retarder (driven in the close direction) and the Type F5 double-action retarder (driven in both the close and open directions) can be used as hump and group retarders in low-volume classification yards. The Type F4 single-action retarder is ideal for spotting cars and skating in any size yard. The retardation pressure gradually releases, so cuts can be pulled through the open retarder without wheel screech.

The Type F5 double-action retarder with the drive open feature assures positive opening. It is used in applications where fast response time is required, such as hump, group, or tangent-point retarder control.

Types F4 and F5 retarders employ a lever principle to apply braking force to the car wheels in proportion to car weight. All cars having the same wheel diameter and characteristics receive the same amount of braking force.

The braking surface of the Types F4 and F5 retarders is a single, continuous shoe-rail. Maintenance consists only of checking the hydraulic fluid level monthly, adjusting for shoe-rail wear, replacing worn shoe rails, and occasionally tightening bolts. Parts are easily accessible.

Features

- **Hydraulically Operated**—self-contained, compact pump unit requires electric service only, thus eliminating the need for long hydraulic feed lines. No modifications are required for installation.
- **Weight Responsive**—inherently adjusts retardation in proportion to car weight. Provides uniform speed reduction for all cars having the same wheel diameter and characteristics.
- **Easy Maintenance**—needs only monthly checking of the hydraulic fluid level; simple adjustments for shoe-rail wear.
- **Versatile**—can be used as a hump and group retarder in low-volume classification yards, skating in any size yard, and for spotting cars. The Type F5, with drive-open capability, can be used for speed control in tangent-point installations. Both Types F4 and F5 retarders offer a choice of manual or automatic control.

Description

Types F4 and F5 retarders consist of articulated inner and outer transverse levers. A lever principle applies braking force to the car wheels in proportion to the car's weight. On the Type F4 retarder, the inner levers are power-operated in the closed direction by hydraulic rams that close the braking surface against the car wheels. Hydraulic rams in the F5 retarder similarly power-operate the rams in the closed direction and also provide for power operation in the open direction.

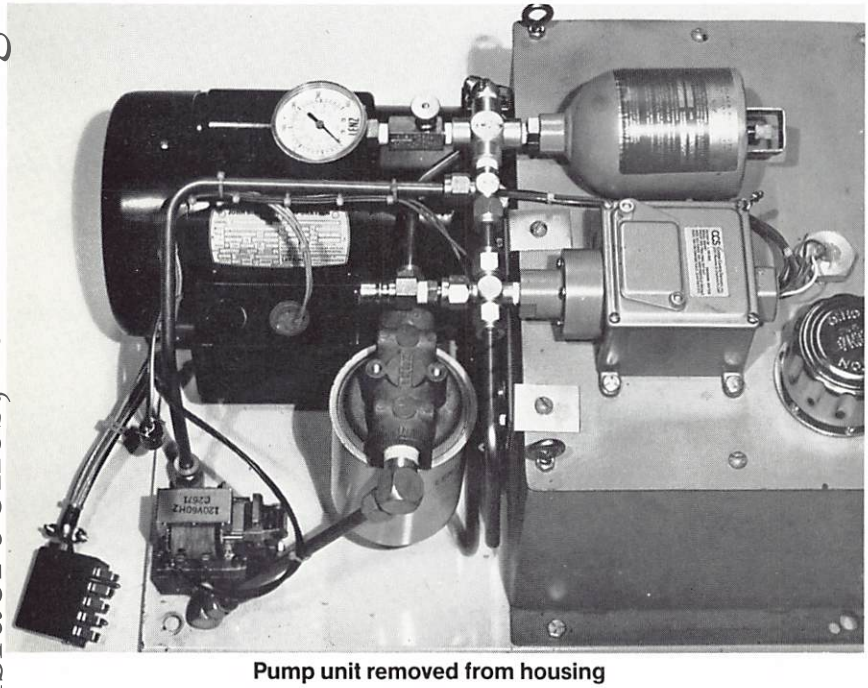
The Hydra-Trak hydraulic mechanism is furnished complete with a pump unit, rams, hydraulic hoses, manifold, adapters, and bleed valves necessary to connect and place it in service. Each pump unit (20" wide, 24" long, 14" high) drives up to 14 rams.

The rugged pump unit can be buried in the ballast near the retarder without obstructing walkways. The field control and motor starter relays can be mounted in any convenient instrument housing. The external indicator light on

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the pump unit shows when the controlled retarder is open, minimizing "pulling" of the wrong track.

Types F4 and F5 car retarders are rated at 0.067-foot velocity head per foot of active retarder length. This rating is based upon four-axle cars of 25 to 150 tons gross weight with 33-inch wheels. Cars with larger wheel diameters have lower velocity head ratings.



Pump unit removed from housing

Velocity Head Ratings for Type F Retarders

Types F4 and F5 Retarder Ratings (MPH)							
		33" Wheels		36" Wheels		38" Wheels	
Total Retarder Length	No. of Lever Units	Velocity Head Removed*	Maximum Entering Speed+	Velocity Head Removed*	Maximum Entering Speed+	Velocity Head Removed*	Maximum Entering Speed+
4'7"	2	.31	3.0	.29	3.0	.28	2.9
9'2"	3	.61	4.3	.59	4.2	.57	4.1
13'9"	4	.92	5.2	.88	5.1	.85	5.0
18'4"	5	1.23	6.1	1.17	5.9	1.14	5.8
22'11"	6	1.54	6.8	1.46	6.6	1.42	6.5
27'6"	7	1.84	7.4	1.76	7.2	1.70	7.1
32'1"	8	2.15	8.0	2.05	7.8	1.99	7.7

* For 4-axle cars with 25 to 150 tons gross weight.
\+ Of car which can be stopped within retarder.
NOTE: For additional retardation, retarder sections are placed in-line with a 7-foot inactive section between them.

Operation

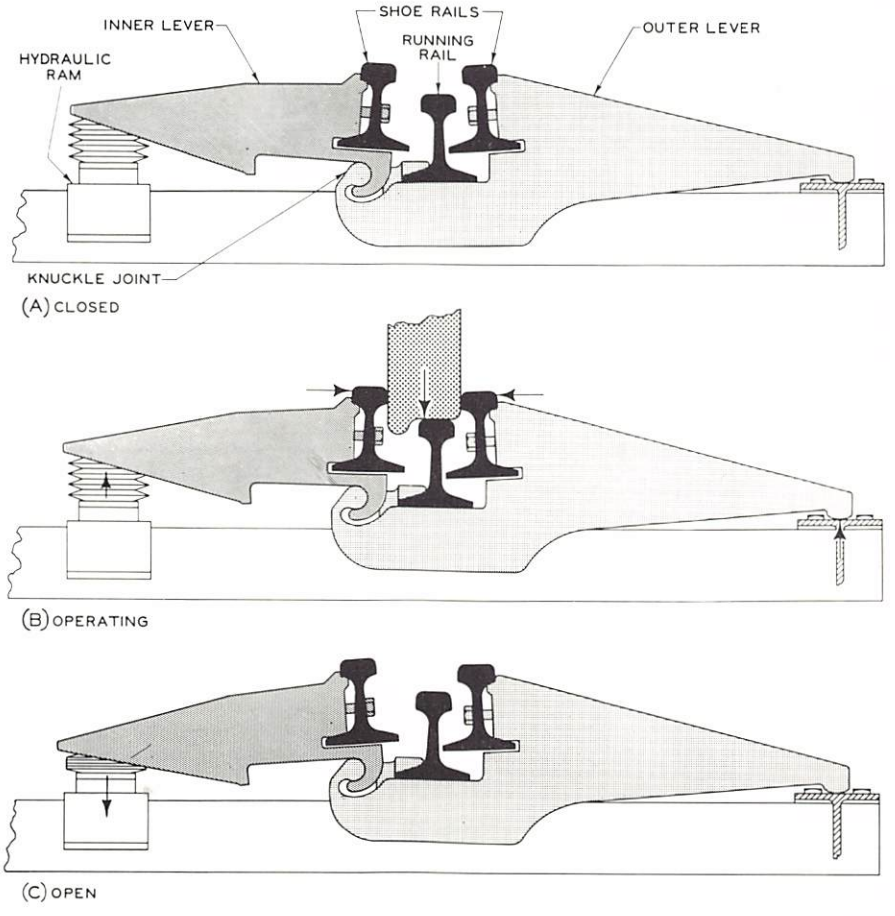
Hydraulic rams move the inside braking surface to the operating position, thus applying braking force to the car wheels. The sequence of operation is shown below.

In the closed position (A), the shoe rails are closer together than the narrowest car wheel. The wheels of a car entering the retarder (B) spread the shoe rails, thereby forcing the inner and outer levers to lift the running rail.

The downward force of the car wheels, exerted upon the running rail, is transmitted through the knuckle joint to the levers and consequently to the shoe rails. Thus, braking force to the car wheels is in proportion to the car's weight.

The rams of the Type F5 retarder are hydraulically opened (C). This allows the inner levers to drop, thus widening the separation between the braking surfaces and permitting the car wheels to run free.

The rams of the Type F4 are not hydraulically opened. In the open position, hydraulic pressure to the rams is released, allowing the inner lever to lower. Thus, the separation between the braking surfaces is widened and the car wheels run free.



Sequence of operation for Types F4 and F5 retarders: closed (A), operating position (B), and open (C). Arrows in (B) indicate lines of force during operation. Arrow in (C) indicates direction of force for power operating the Type F5 retarder in the open direction.

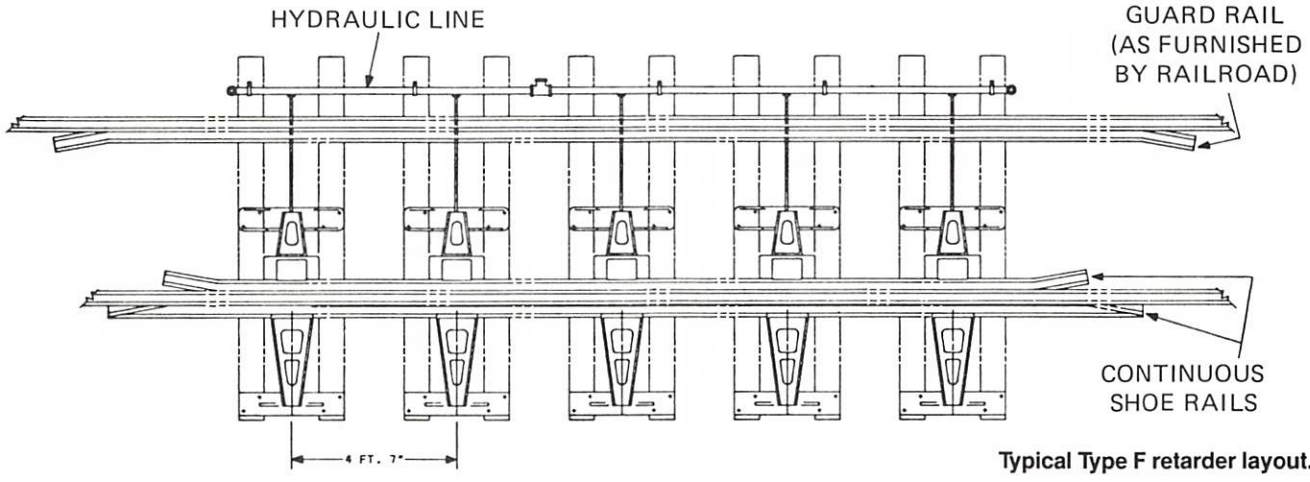
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Installation

Types F4 and F5 car retarders are available in increments of 4'7." The maximum length is 32'1," a total of eight lever units. If more retardation is required, sections are placed in line with seven-foot inactive sections between them. Two 8" x 10" x 10' or 6" x 8" x 10' undapped ties support each lever unit.

Types F4 and F5 retarders can be used with several weight combinations of running and brake rails.

GRS furnishes all castings and hardware for assembling retarders as specified, as well as the Hydra-Trak hydraulic equipment. Running rails, shoe rails, guard rails, mounting hardware, ties, etc., can be provided, if desired.



Typical Type F retarder layout.

Reference Data

Tie Size	No. of Ties Per Lever	Lever Spacing	Lengths Available		Rail Sizes		Types F4 & F5 Retarder Ratings for 4-axle cars of 25 to 150 Tons Gross Weight		
			Min.	Max.*	Running Rail	Shoe Rail	With 33" Wheels	With 36" Wheels	With 38" Wheels
8" x 10" x 10' or 6" x 8" x 10'	2	4'7" centers	4'7"	32'1"	112-lb. RE or 115-lb. RE 113-lb. RE or 119-lb. RE 131-lb. RE or 132-lb. RE 136-lb. RE 133-lb. RE 140-lb. RE	131-lb. RE or 132-lb. RE 136-lb. RE 131-lb. RE or 132-lb. RE 136-lb. RE 131-lb. RE or 132-lb. RE 136-lb. RE	0.067 per ft. of active length.	0.064 per ft. of active length.	0.062 per ft. of active length.

***If greater length is required, sections are placed in-line with a 7-foot inactive section between them.**

Use GRS Parts

GRS parts embody all the skill and design know-how that result from over 50 years of experience in the design and construction of car retarders. Proper maintenance, and the use of genuine GRS parts when replacement becomes necessary, are essential to secure the designed performance and long wear that are built into your GRS retarders.

To order electric or hydraulic retarder mechanisms or retrofit kits, refer to the following listings. To order the equipment for a complete GRS retarder installation, please consult your GRS sales engineer.

Types E1 and E160XHD Car Retarders

Order by name shown in bold type, catalog number and quantity required.

Type E Retarder Mechanisms	
Description	**Catalog Number**
Electric Mechanism Complete, equipped with 240 volt dc motor having series-type brake. Includes throw rod. Use with Types E1, E1H, and E1HS retarders.	P71-710
Electric Mechanism Complete, equipped with 240 volt dc motor having series-type brake and local control switch. Includes throw rod. Use with Type E160XHD retarders.	P71-711
Same as above, except with shunt-type brake.	P71-443
Hydra-Trak Mechanism Complete, with 265-volt dc motor and dc controller	A71-100
Same as above, except with 240/280-volt ac motor and ac controller	A71-101
Pendant Switch Complete, with cord and plug for on-site control during testing and maintenance, ac or dc operation of Hydra-Trak mechanisms	A71-110

Retrofit Kits for Type E Retarders	
Description	**Catalog Number**
Type E160XHD Field Modification—Mechanism Only. Converts existing E160 electric motors to E160 X-tra Heavy Duty motors. Includes extra-performance motor and mechanism case extension to accommodate the motor (see NOTE below)	P71-788
Type E160XHD Field Modification—Linkage Only. Includes all required parts and installation instructions	P71-789
Hydra-Trak Retrofit Kit Complete, with dc motor and dc controller for replacing electromechanical mechanism using same housing	A71-120
Same as above, except for ac operation	A71-121
Conversion Kit Complete, to convert Air and Hydraulic Equipment, Co. HCE-3 mechanism to GRS Hydra-Trak mechanism	A71-122
NOTE: GRS Factory Retrofit—Electric mechanisms may be returned to GRS for a factory retrofit. Includes case extension and extra-performance motor plus cleaning, inspection, and adjustment. A linkage kit will be sent with rebuilt mechanism upon request.	

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Types E1 and E160XHD Car Retarders

Order by name shown in bold type, catalog number and quantity required.

Recommended Spare Parts For Hydraulic Mechanisms	
Description	**Catalog Number**
MOTOR, 15 hp, dc	P71-831
MOTOR, 15 hp, ac	P71-874
PUMP, 15 hp, dc	P71-813
COUPLING, motor to pump	P71-875
RAM, 5" x 11"	P71-826
CLEVIS	P71-820
YOKE BRACKET	P71-832
LIMIT SWITCH ROD	P71-834
KNUCKLE	P71-817
PILOT VALVE	P71-876
GAUGE, temperature and level	P71-802
GAUGE, pressure, 0-3000 psi	P71-807
FILTER ELEMENT	P71-877
AIR FILTER	P71-873
PUMP HOSE	P71-868
RAM HOSE	P71-843
CONNECTOR, 3-pin, male	P71-878
CABLE, with 3-pin female connector	P71-869
CABLE, with 2-pin female connector	P71-870
CONNECTOR, 8-pin, male	P71-879
CABLE, with 8-pin female connector	P71-844
PRINTED CIRCUIT BOARD, dc controller	P71-880
SCR MODULE, for dc controller	P71-881
PRINTED CIRCUIT BOARD, ac controller	P71-882
FUSES, for ac or dc controller	P71-883
CORE ASSEMBLY, for control valve	P71-884

Types F4 and F5 Car Retarders

Order by name shown in bold type, catalog number, and quantity required.

Description	Catalog Number
Hydra-Trak Mechanism Complete For Type F4 Retarder, 110V,* 60 Hz. Includes five-ram manifold with mounting hardware, 5 Type F4 rams, and two-way amber-light indicator. If an indicator is not required, please specify.	A71-130
Same as above, except with seven-ram manifold and 7 Type F4 rams	A71-131
Same as above, except with 14-ram manifold and 14 Type F4 rams	A71-132
Same as above, but specify manifold size and number of rams requested	A71-133
Hydra-Trak Mechanism Complete For Type F5 Retarder, 110V,* 60 Hz. Includes five-ram manifold with mounting hardware, 5 Type F5 rams, and two-way amber-light indicator. If an indicator is not required, please specify.	A71-140
Same as above, except with seven-ram manifold and 7 Type F5 rams	A71-141
Same as above, except with 14-ram manifold and 14 Type F5 rams	A71-142
Same as above, but specify manifold size and number of rams requested	A71-143
Hand Pump for emergency operation of Type F4 Hydra-Trak mechanism	A71-150

*Other operation voltages can be provided if required. Please specify.

Types F4 and F5 Car Retarders

Order by name in bold type, catalog number, and quantity required.

Recommended Spare Parts

No. of Spares Required Per Units in Operation 1-5 Units	6-25 Units	26-Up Units	Description	Catalog Number
0	1	1	TYPE F4 PUMP UNIT, without housing	P71-1000
0	1	1	TYPE F5 PUMP UNIT, without housing	P71-1059
1	1	1	HOUSING for Types F4 & F5	P71-1069
1	1	2	ELECTRIC MOTOR	P71-1007
1	1	2	PUMP	P71-1015
1	2	2	PRESSURE SWITCH ASSEMBLY	P71-1027
1	1	2	ACCUMULATOR	P71-1039
1	2	2	SOLENOID VALVE	P71-1016
1	1	1	PRESSURE GAUGE, 3000 psi	P71-1035
1	1	2	PUMP HOSE, inside housing	P71-1038
2	3	5	HOSE, from manifold to ram	P71-1060
1	3	5	RAM, for F4 retarder	P71-1056
1	3	5	RAM, for F5 retarder	P71-1057
1	2	3	RAM HOSE, from pump to manifold	P71-1063
1	2	3	TUBING REPAIR KIT	P71-1061
5	10	15	RAM SEAL KIT	P71-1062
1	1	1	TEMPERATURE AND LEVEL GAUGE	P71-802
2	5	5	FILTER ELEMENT (change annually)	P71-1058
2	3	5	INDICATOR LAMPS (optional)	P71-1066

GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL

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CAR RETARDERS

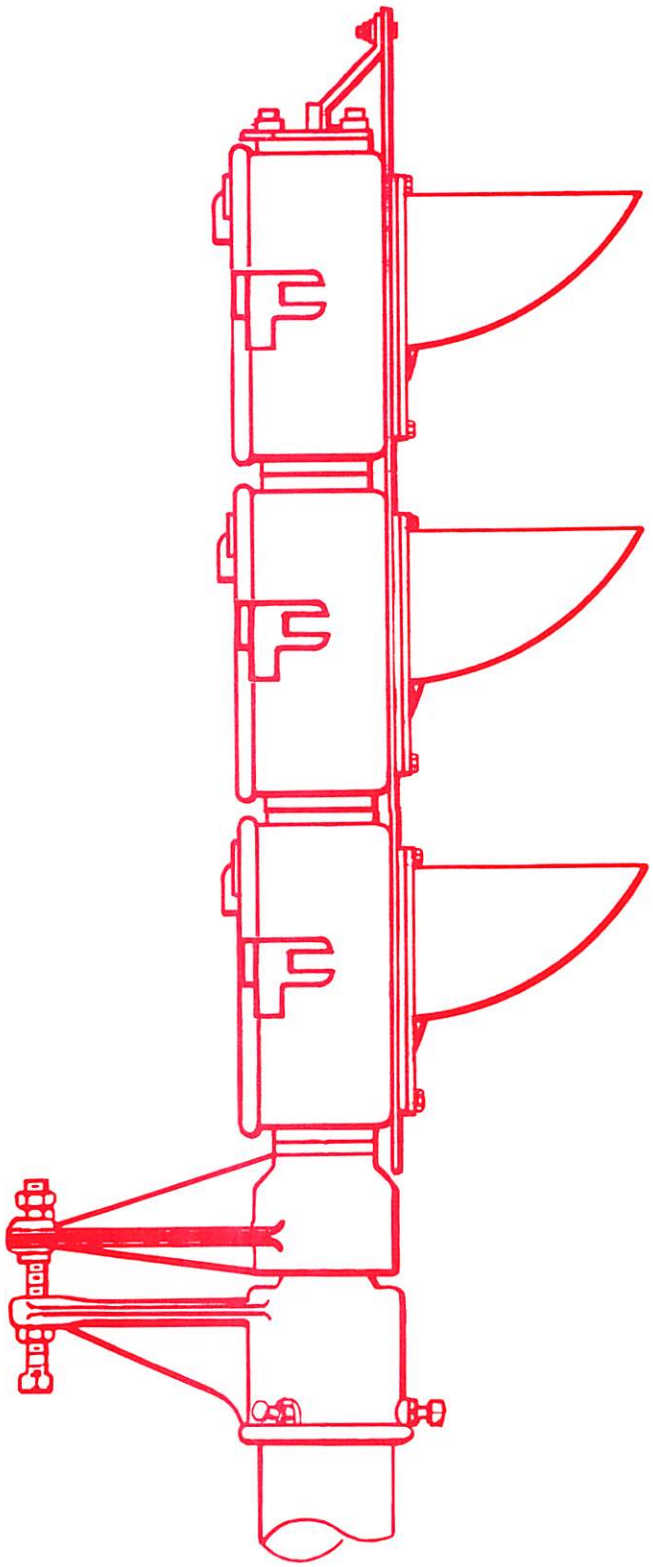
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A71-100			HYDRA-TRAK MECHANISM COMPLETE WITH 265V DC MOTOR AND DC CONTROL-LER (INCLUDES RAM & LIMIT SWITCH) A&H 80000 & 81000	
A71-101			HYDRA-TRAK MECHANISM COMPLETE WITH 240/280 VOLT AC MOTOR AND AC CONTROLLER A&H 90000 & 81000	
A71-120			HYDRA-TRAK RETROFIT KIT COMPLETE WITH D-C MOTOR AND D-C CONTRO - LLER FOR REPLACING ELECTROMEC HANICAL MECHANISM USING SAME HOUSING (INCLUDES RAM & LIMIT SWITCH) A&H 80000	
A71-121			HYDRA-TRAK RETROFIT KIT COMPLETE WITH A-C MOTOR AND A-C CONTRO - LLER FOR REPLACING ELECTROMEC HANICAL MECHANISM USING SAME HOUSING (INCLUDES RAM & LIMIT SWITCH) A&H 90000	

COLOR-LIGHT SIGNALS

GRS CATALOG **73-1**

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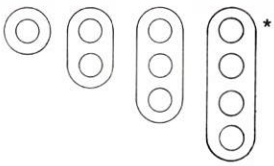
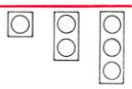
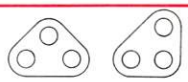
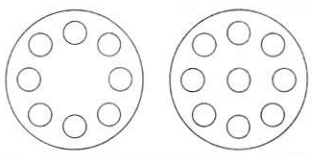
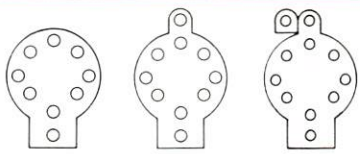
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COLOR-LIGHT AND COLOR-POSITION-LIGHT SIGNALS

Signed by Israel Jones, texasrails.org 7/16/2026

DESIGNATION	DESCRIPTION	SIZE OF OUTER LENS OR ROUNDEL	NUMBER OF ASPECTS
Type D and D1 High	Long range color light, unit construction.	8-3/8"	 *
Type G and G1 High	Long range color-light, triangular assembly	8-3/8"	
Type FA Dwarf	Short range color-light, cast aluminum, unit construction	6-3/8"	
Type MD Dwarf	Short range color-light, cast aluminum, space for relay and transformer	6-3/8"	
Type ME Dwarf	Short range color-light, cast aluminum, for minimum clearance areas	6-3/8"	
Type MF Dwarf	Short range color-light, cast aluminum,	6-3/8"	
Type P Dwarf	Short range color-light, cast aluminum for switch position indication	5-3/8"	 Side 1 Side 2
Type U High	Long range color-position-light, aluminum, circular assembly, 8 or 9 light unit construction	8-3/8"	
Type VA Dwarf	Short range color-position-light, cast aluminum, circular assembly	4"	
Type W High	Long range color-light marker, cast steel, single lens	8-3/8"	
Type AT	Short range color-light, unit construction; for rapid transit, indoors	5"	
Type AW	Short range color-light, unit construction; for rapid transit, outdoors	6-3/8"	

* Four aspect available in Type D only

INTRODUCTION

GRS color-light and color-position-light signals provide various indications by the display of one or more colored aspects. These signals are rugged, compact, simply designed units that meet all operating needs and provide ideal, dependable aspects in all service conditions. The major features are:

1. No moving parts for maximum life and minimal maintenance.
2. Compact construction to fit minimum clearance areas.
3. Factory-focused lamp assemblies with GRS precision filament lamps—no refocusing needed when replaced.
4. Optical arrangements for tangent tracks.
5. Easily added Phankills to reduce beam dilution, Anti-Phans to reduce phantom indications, and roundels for adaptation to curved track.
6. Adjustable lamp resistors.
7. Peep sights or slotted base bolt holes to permit proper alignment.
8. Precision-machined cases to ensure accurate alignment of multiple-unit assemblies.
9. Glass, plastic or polycarbonate lenses.

Optical Arrangements

All signals, except Type P switch signals, are furnished with optical arrangements for tangent tracks.

Color-light signals are almost universally equipped with a doublet lens combination—an outer lens and an inner lens. The outer lens is of stepped construction, and is clear, with deflecting prisms in the hotspot for a close-up indication. The outer surface of the lens is convex and smooth, the steps lying in the concave side. The inner lens is also stepped, but is termed "inverted" because the concave surface is smooth, and the steps lie on the convex side. The inner lens is colored as required for the indication to be displayed.

An outer and inner lens mounted together in a doublet lens combination is more efficient optically than a single lens. This efficiency is due to the short focus of the combination so that more light rays are picked up from the lamp filament. The lenses are assembled with the steps facing each other in a closed compartment, thus exposing only the smooth surfaces to the elements.

The doublet lens combination may be replaced as a unit, or either lens may be replaced separately. However, as these lens combinations are factory focused, care must be taken in reassembling, as the efficiency of the signal may be impaired if assembled improperly. If the outer lens is replaced, sealing compound must be applied to the rim of the lens bezel ring before reassembly. For this GRS recommends Sealing Compound 90B0010.

Optional accessories to adapt the light beams to specific conditions include roundel and Phankill assemblies, and Anti-Phan. An outer deflecting or Spredlite roundel installed in front of the lens adapts a doublet lens to curved track. The assembly includes an additional bezel ring to hold the roundel in position.

The Phankill, which reduces beam dilution in dwarf signals, is a circular metal disc shaped like a diverging concavo-convex lens. It has many small triangular passages through which the signal's beam passes easily, but external light must be within 8° of the beam's axis to pass through the tube-like passages. The Phankill is mounted by a bezel ring in front of the outer lens.

The Anti-Phan, which reduces the intensity of phantom indications in high signals, marker lights, and two-directional signals, consists of a circular piece of fine, black-oxidized, brass wire cloth with many tiny openings. External light reflected by the signal must travel through the Anti-Phan mesh going in and coming out, with the mesh diffusing and weakening it. The Anti-Phan is fastened over the corrugated surface of the inner lens by the signal's regular lens bezel ring.

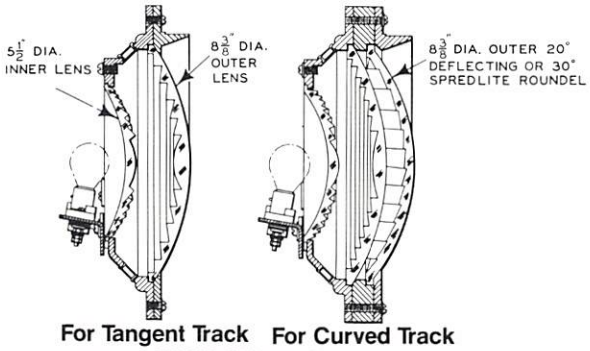
Lamps

GRS precision filament lamps provide consistent, ideal aspects. They are single-contact, candelabra, 2-pin bayonet base lamps that can be replaced in their factory-focused assemblies without refocusing. Signals can be furnished with a two-ohm adjustable lamp resistor (maximum current of 1.75 amperes) in the common return.

Alignment

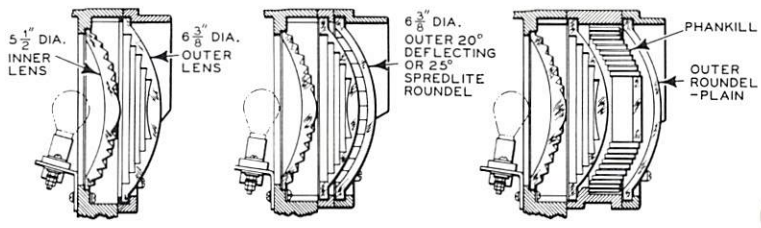
A high signal is aligned by adjusting its support bracket. A peep sight permits proper alignment of the beam with the line of vision of the locomotive engineer.

The base of a dwarf signal is constructed so that, when mounted on a level foundation, the front of the signal is tilted back at the top to direct the light beam up to the engineer's eye level. Slotted bolt holes in the base allow the signals to be pivoted for accurate horizontal alignment.



For Tangent Track For Curved Track

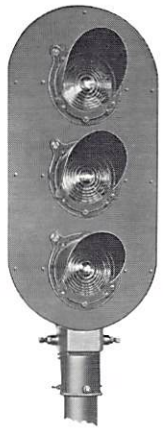
HIGH SIGNALS



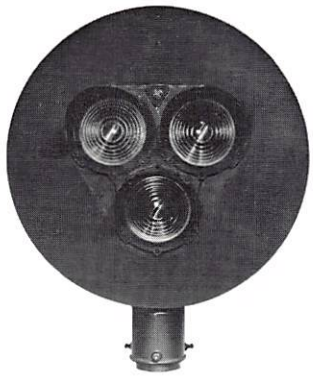
For Tangent Track | With Deflecting or Spredlite Roundel | With Phankill Unit

DWARF SIGNALS

TYPES D, D1, G, AND G1 COLOR-LIGHT HIGH SIGNALS



Type D and D1 three aspect color-light signal.



Type G and G1 three aspect color-light signal.



Lamp Exchanger with prefocused lenses.

Types D, D1, G, and G1 long-range color-light signals consist of one or more light units. The D light units are cast aluminum and the D1 light units are molded of rugged structural foam polycarbonate that makes them lightweight, impact-resistant, and weather-resistant. Multiple aspects are obtained by stacking two, three, or four light units (the four aspect signal is available in aluminum only). Single light unit signals often are used as marker lights, take-siding indicators, etc. Multiple aspects for the Type G1 signals are obtained by assembling two or three light units in a triangular arrangement which differs from the single case of the Type G. Each signal has an integral sighting device. Both types of signals have backgrounds, hoods, and pole mounting brackets.

The doublet lens combination in each unit produces a one-color aspect. The 8-3/8" outer lens has a 4" focus and a 40-degree-from-the-horizontal downward deflecting bullseye (or hotspot) lens for close-up indication. The 5-1/2" inner plastic lens is colored to provide a selection of aspects as shown below.

GRS's Lamp Exchanger is available for existing aluminum or ferrous Type D and polycarbonate Types D1 and G1 signals (see page 14). Types D, D1, and G1 signal units may be ordered with the lamp exchanger factory installed.

The lamp exchanger replaces a failed primary lamp with an identical secondary lamp in less than a second. A burned out primary lamp is sensed by an electronic circuit, causing the secondary lamp to be moved to the exact focal position previously occupied by the primary lamp. Long-life lamps of 10, 18, or 25 watts are available. The lamp exchanger operates compatibly with 8 to 11 volts a-c or d-c power in existing or new signal units and is mounted with two screws (or four screws when a lens ring is supplied). A terminal strip is provided for field connections. The lamp exchanger is compatible with existing light-out circuits. Connections are provided for remote sensing that full indexing has occurred.

TYPES D AND D1 SIGNAL ASPECTS

FOUR ASPECT*	THREE ASPECT	TWO ASPECT	ONE ASPECT
Upper—green	Upper—green or red	Upper—yellow	Red
Upper center—yellow	Center—yellow	Lower—red	
Lower center—red	Lower—red or green		
Lower—lunar white			

TYPES G AND G1 SIGNAL ASPECTS

THREE ASPECT	TWO ASPECT	TWO ASPECT	TWO ASPECT
Upper left—green	Upper right—yellow	Upper left—green	Upper left—green
Upper right—yellow	Lower—red	Lower—red	Lower—yellow
Lower—red			

* Four aspect available in Type D only

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TYPES FA, MD, ME, AND MF COLOR-LIGHT DWARF SIGNALS

Types FA, MD, ME, and MF color-light dwarf signals have doublet lens combinations and optical arrangements for tangent track. Separately ordered roundels and Phankills may be added in front of the lens to adapt these compact signals to curved track. Each signal is housed in a cast aluminum case having an aluminum hood, both painted black.

The doublet lens combination in each signal has a 6-3/8" clear outer plastic lens with a 3-3/4" focus and a 40-degree-from-the-horizontal upward deflecting bullseye in the center for close-up indications. The 5-1/2" inner plastic lens is available in red, yellow, green, lunar white, and clear.

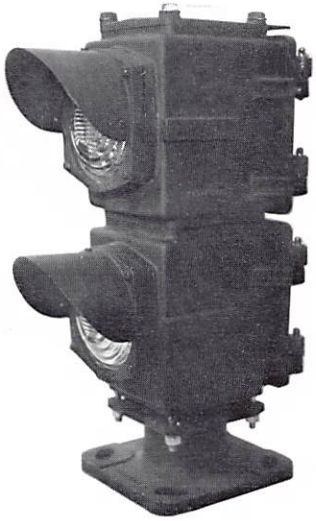
The Type FA signal is of unit construction to permit multiple signals to be bolted together, one atop the other. It usually is used in assemblies of three units to obtain green, yellow, and red aspects. Bolt holes in the base are slotted to permit the signal to be pivoted for accurate alignment. Three pole-mounting sockets are available to mount Type FA signals on 2-1/2", 3", or 4" I.D. pipe. Space is provided in each signal assembly for a Type K1/2 transformer.

The Types MD and ME signals provide two indications, yellow and red, or green and red. One of the bolt holes in the base is slotted to permit the signal to be pivoted for accurate alignment. The Type MD signal case has space for a control relay, transformer, etc; such equipment for the Type ME signal must be housed separately.



Type MF signal.

The Type MF signal has a triangular case, designed for mounting in a limited space. It has three aspects — red, yellow and green. The base provides a 2-1/2 degree upward tilt to the light beams; additional tilt either backward or forward, is provided by adjusting screws in the base. One of the bolt holes in the base is slotted to permit the signal to be pivoted for accurate alignment. A separate housing is required for control relays and a transformer.



Type FA signal.



Type MD signal.



Type ME signal.

TYPE P COLOR-LIGHT SWITCH POSITION SIGNAL

TYPE U COLOR-POSITION-LIGHT HIGH SIGNAL

TYPE VA COLOR-POSITION-LIGHT DWARF SIGNAL

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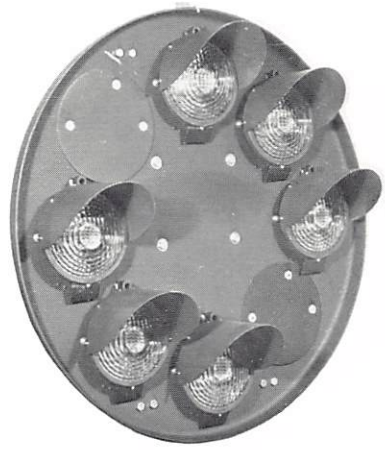
The Type P color-light switch position signal gives two indications in two directions and is designed primarily for use in classification yards at power switch locations. It is housed in a cast aluminum case, painted black.

The doublet lens combination has a 5-3/8" inverted plastic inner lens with a 5-3/8" outer colored glass roundel that provides a 20 degree upward deflection and 18 degree horizontal spread for the most ideal indications. The signal is available with one of three aspect combinations in both directions: red and green, yellow and lunar white, or yellow and green.



The Type U long range color-position-light signal provides indications by the color and positions of the eight light units mounted along the edge of its rigid circular background. It is usually bracket-mounted on a pole or bridge and operates in conjunction with clear or colored marker lights mounted above and/or below it or staggered to either side.

The signal has aluminum light units, background, hoods, and junction box. The 8-3/8" outer plastic lens has a 4" focus and a 40-degree-from-the-horizontal deflecting bullseye. The 5-1/2" inner plastic lens is colored red, yellow, green, or lunar white. The eight light units are arranged in one of 11 combinations to provide the desired indication.



The Type VA color-position-light dwarf signal is a compact eight-indication unit that is available with optional clear indication marker lights. The signal consists of an assembly of three cast aluminum cases — the bottom case houses a maximum of eight signal units, and optional top cases house one or two marker lens units.

The Type VA dwarf signal provides the same indications as the Type U high signal, but its aspects are smaller because it is provided with 4" lenses and 20° upward deflecting roundels. The inner lens is glass; the outer lens and roundel are polycarbonate.



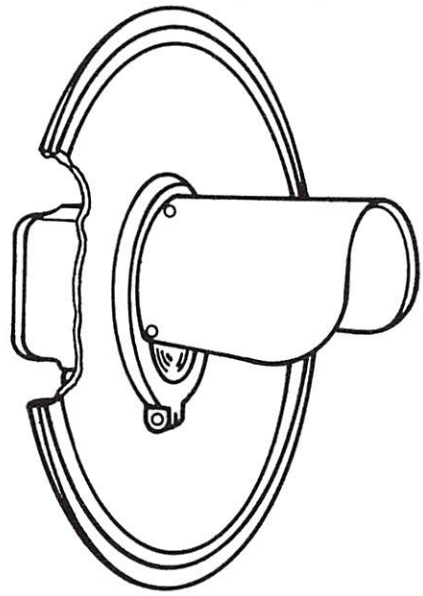
TYPE W MARKER SIGNAL

TYPES AT AND AW COLOR-LIGHT SIGNALS

The Type W marker signal usually is used in a vertical or staggered arrangement with a searchlight signal or position-light signal and can be mounted on the same standard 5" pole. The housing is cast iron with a cast aluminum bezel ring.

The signal is offered with a choice of either a reflector-type or doublet lens optical arrangement, both of which are for tangent track and not adaptable for use with Spredlite or deflecting roundels. The reflector type signal has an 8-3/8" red plastic roundel. The doublet lens signal has a 5-1/2" red inner plastic lens and an 8-3/8" outer plastic lens, with a 40-degree close-up deflector as part of the outer lens.

A universal mounting clamp permits the positioning of the signal either in front of a pole or 9" to the right or left of the pole. A separate housing is required for control relays and a transformer.

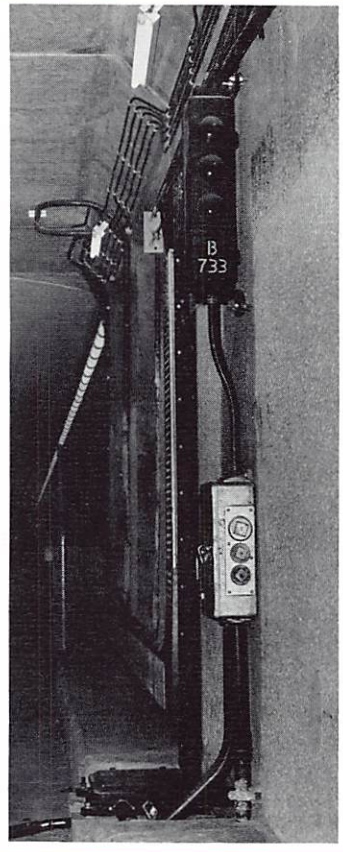


Types AT and AW color-light signals are compact units designed for rapid transit lines where clearances are very limited.

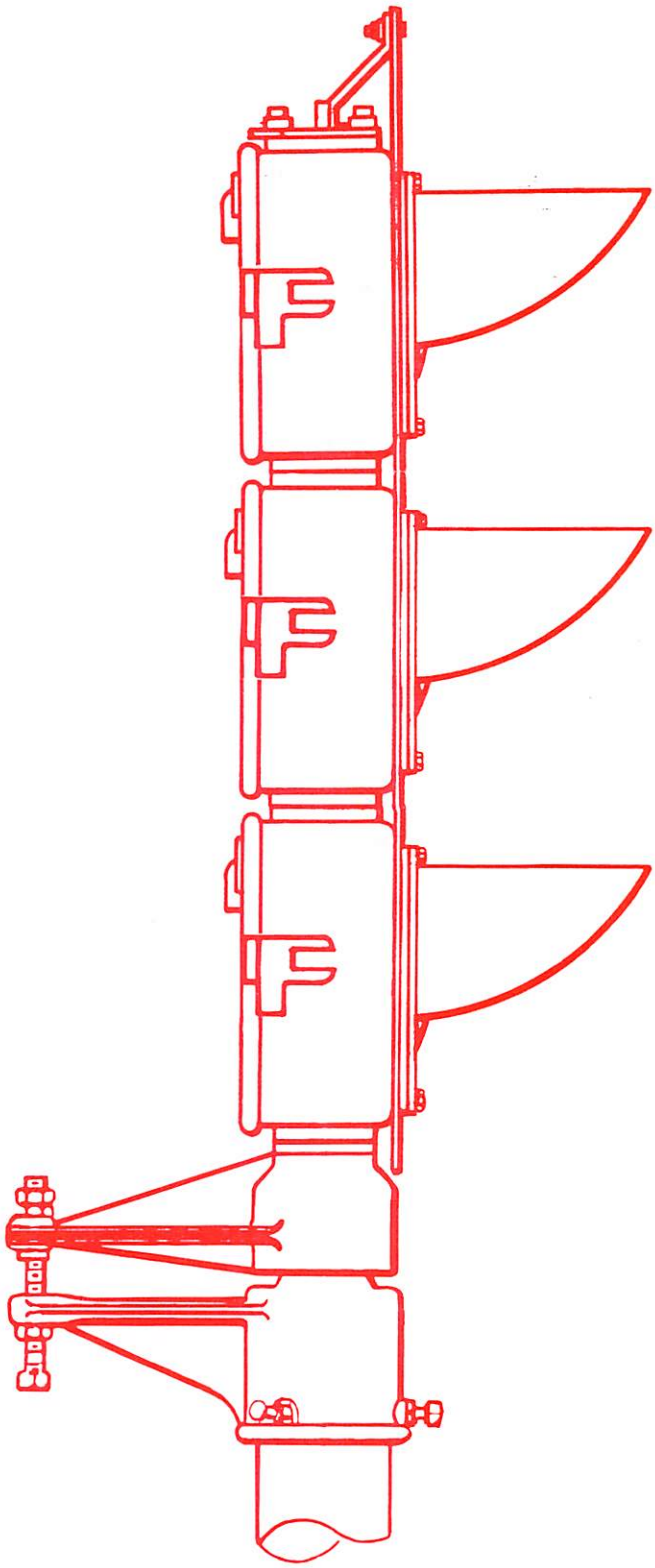
The Type AT signal, for use in underground locations, has a single optical lens since the efficiency of a doublet lens is not required in the darkness. The 5" glass lens has a 3-1/2" focus and is available in red, yellow, green, lunar white, and clear.

The Type AW signal, for use in outdoor locations, uses a doublet lens combination. The 6-3/8" clear outer plastic lens has a 3-3/4" focus and a 40-degree from-the-horizontal deflecting bulls-eye in the center for close up indications. The 5-1/2" inner plastic lens is available in red, yellow, green, lunar white, and clear.

Types AT and AW signals are of unit construction to permit multiple units to be bolted together, one atop the other. Type AT signals are usually provided with brackets for mounting on the subway wall or ceiling. Type AW signals are usually provided with pole mounting sockets.







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ORDERING REFERENCES

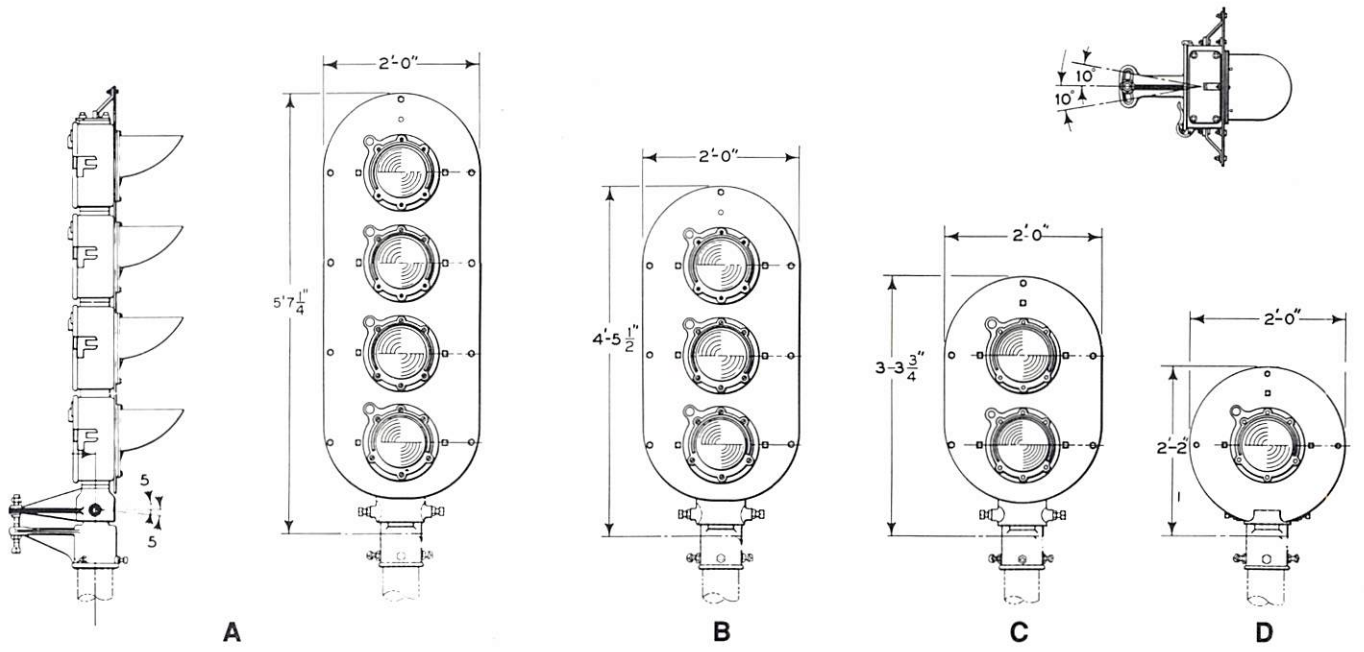
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NOTE:
As Types AW and AT signals are available in numerous arrangements of subassemblies and aspects with many options, please contact your GRS sales engineer for ordering information.

TYPES D AND D1 HIGH SIGNAL HEADS

Each signal listed below INCLUDES light units, adjusting bracket, backgrounds and hood(s) (you must specify your choice of plastic or metal backgrounds and hoods), ventilators, 2 ohm adjustable lamp resistor (lamp bulbs are not included), and four-way AAR terminal block. The signals DO NOT INCLUDE the following; please order separately:

- **Bracket and wire entrance material for front-or side-of-pole mounting; see page 15**
- **Deflecting or Spredlite roundels, and Anti-Phan; see page 14**
- **Lamp Exchanger; see page 14**
- **Pole and ladder assemblies; see pages 12 and 13**



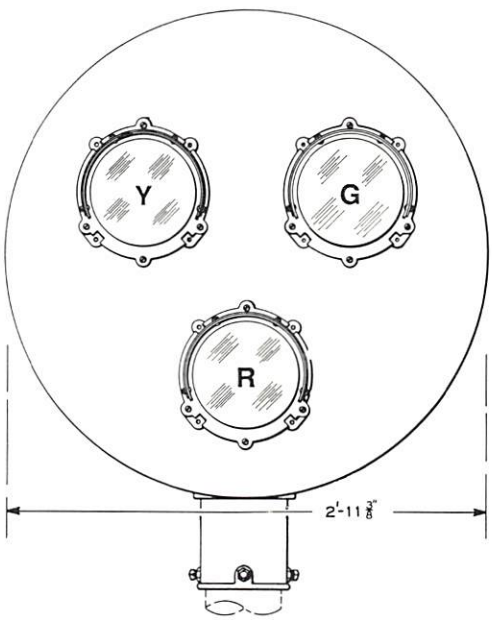
PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE

REFERENCE	NAME	CATALOG NUMBER
A	**TYPE D FOUR-ASPECT SIGNAL, aluminum** green/yellow/red/lunar white	**A73-152**
B	**TYPE D THREE-ASPECT SIGNAL, aluminum** green/yellow/red	**A73-111**
B1	**TYPE D1 THREE-ASPECT SIGNAL, polycarbonate** green/yellow/red	**A73-112**
C	**TYPE D TWO-ASPECT SIGNAL, aluminum** yellow/red	**A73-131**
C1	**TYPE D1 TWO-ASPECT SIGNAL, polycarbonate** yellow/red	**A73-132**
D	**TYPE D ONE-ASPECT SIGNAL, aluminum** red	**A73-151**
D1	**TYPE D1 ONE-ASPECT SIGNAL, polycarbonate** red	**A73-150**

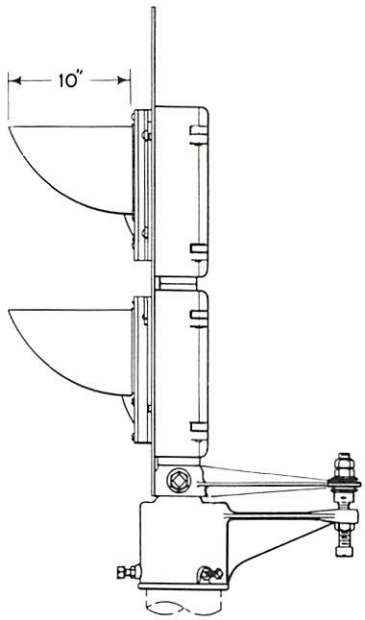
TYPES G AND G1 HIGH SIGNAL HEADS

Each signal listed below INCLUDES light units, adjusting bracket, background and hoods (you must specify your choice of plastic or metal background and hoods), ventilators, and two three-way AAR terminal blocks. Lamp bulbs are not included. The signals also DO NOT INCLUDE the following; please order separately:

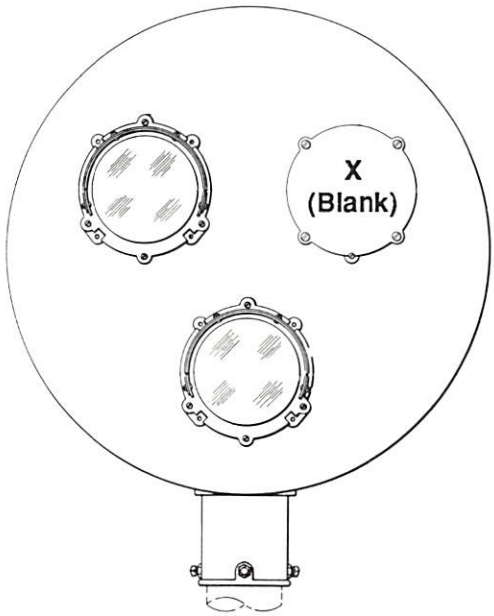
- **Bracket and wire entrance material for front -or side-of-pole mounting; see page 15**
- **Deflecting or Spredlite roundels, and Anti-Phan; see page 14**
- **Lamp Exchanger; see page 14**
- **Pole and ladder assemblies; see page 12 and 13**



A - Front View

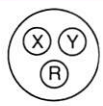
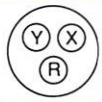
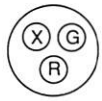


A1 - Side View



B1 - Front View

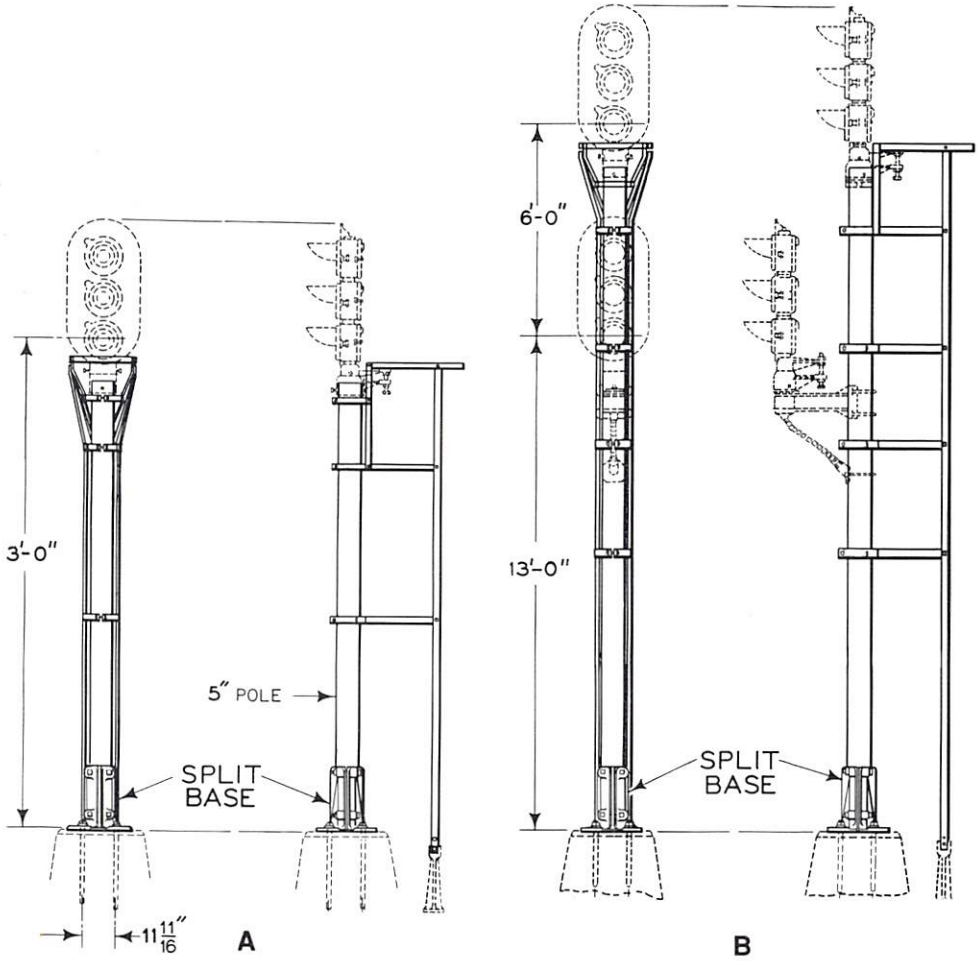
PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE.

REFERENCE	NAME		CATALOG NUMBER
A	TYPE G THREE-ASPECT SIGNAL, aluminum		A73-230
A1	TYPE G1 THREE-ASPECT SIGNAL, polycarbonate		A73-231
B	TYPE G TWO-ASPECT SIGNAL, aluminum		A73-232
B1	TYPE G TWO-ASPECT SIGNAL, aluminum		A73-233
B2	TYPE G1 TWO-ASPECT, polycarbonate		A73-908
B3	TYPE G1 TWO-ASPECT, polycarbonate		A73-909

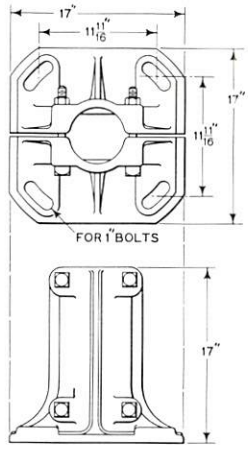
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POLE AND LADDER ASSEMBLIES
For Types D, D1, G and G1 Signals

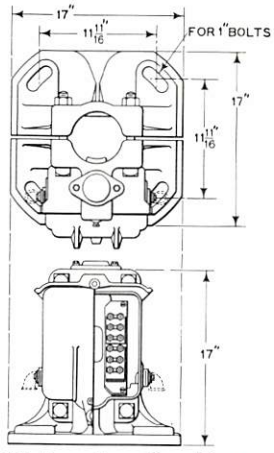
Steel poles have 5" inside diameter. Pole heights are approximate, and they come complete with base, ladder, and platform. To order ladder supports or foundations, see page 13.



Cast Aluminum Bases included With Signal Pole Assemblies



Split Base



Split Junction Box Base

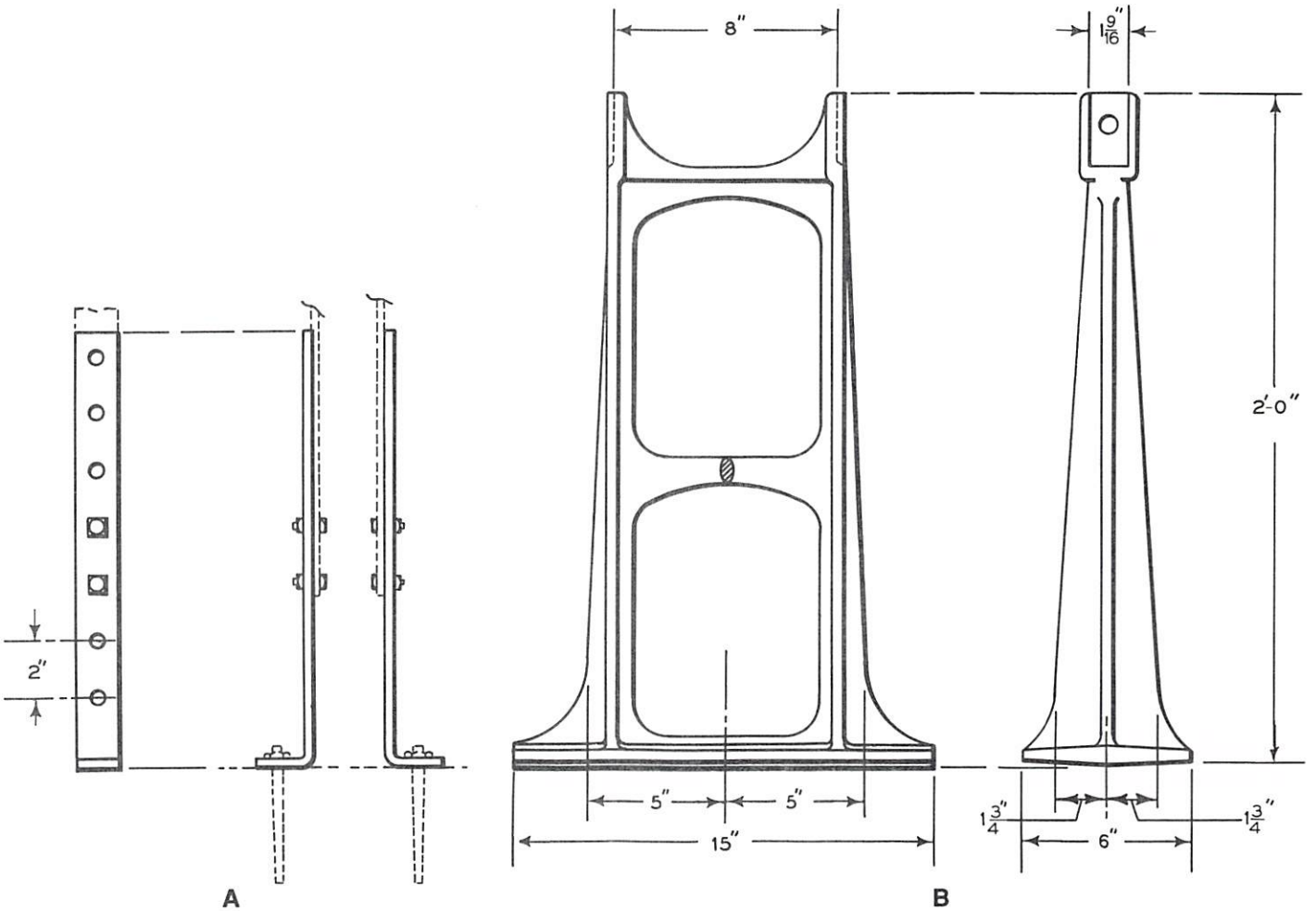
TO ORDER, SPECIFY "POLE ASSEMBLY" AND CATALOG NUMBER.

REFERENCE	DRILLED FOR SIGNAL HEADS	TYPE OF BASE	CATALOG NUMBER
A	None	Split	A73-181
A1	None	Split Junction Box	A73-183
B	One	Split	A73-189
B1	One	Split Junction Box	A73-191

LADDER SUPPORT AND FOUNDATION

For Types D, D1, G and G1 Signals

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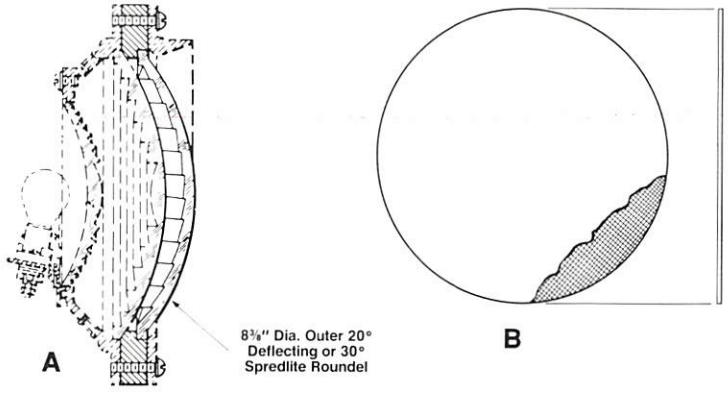


PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE.

REFERENCE	NAME	CATALOG NUMBER
A	**LADDER SUPPORT,** adjustable for use when ladder is to be fastened directly to flat surface; order includes bolts and nuts for attaching to ladder	**A76-325**
B	**FOUNDATION,** for ladder; includes bolts and nuts	**A76-327**

ROUNDEL ASSEMBLIES AND ANTI-PHAN
For Types D, D1, G, and G1 Signals

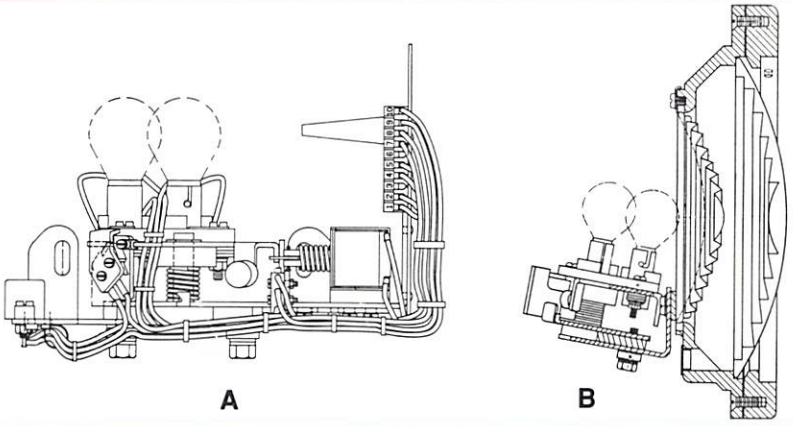
Types D, D1, G, and G1 signal heads, furnished with 8-3/8" lenses for tangent track only, can be adapted easily for specific conditions by the addition of a roundel, which comes ready for installation, except for sealing compound, for which GRS recommends Sealing Compound 90B0010. For other roundels and lenses, see Parts Catalog Sections P73 and P76.



PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE.

REFERENCE	NAME	CATALOG NUMBER
A	**ROUNDEL ASSEMBLY,** 20° deflecting	P73-414
A1	**ROUNDEL ASSEMBLY,** same as Ref. A, except 30° Spredlite	P73-415
B	**ANTI-PHAN**	A73-205

LAMP EXCHANGER
For Types D, D1, and G1 Signals

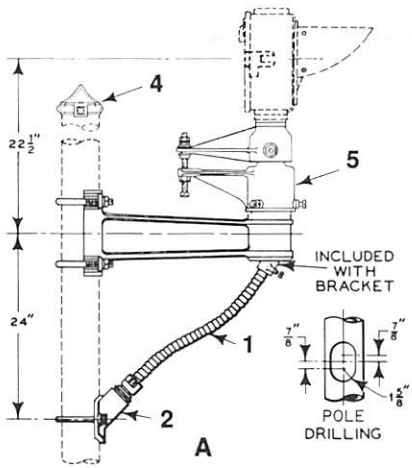


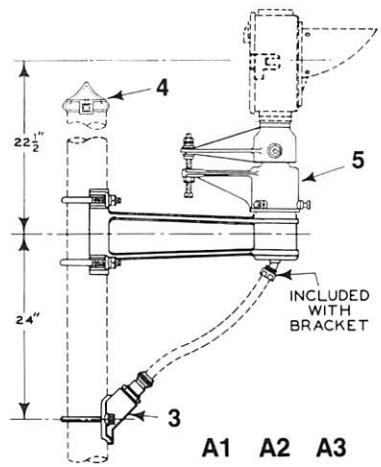
PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE.

REFERENCE	NAME	CATALOG NUMBER
A	**LAMP EXCHANGER,** (lamp bulbs are not included)	A73-902
B	**LENS UNIT COMPLETE**, with lamp exchanger and red lens	A73-903
B1	**LENS UNIT COMPLETE,** same as B, except yellow lens	A73-904
B2	**LENS UNIT COMPLETE,** same as B, except green lens	A73-905
B3	**LENS UNIT COMPLETE,** same as B, except lunar white lens	A73-906

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MOUNTING BRACKETS, CONDUIT AND COUPLINGS
For Types D, D1, G and G1 Signals

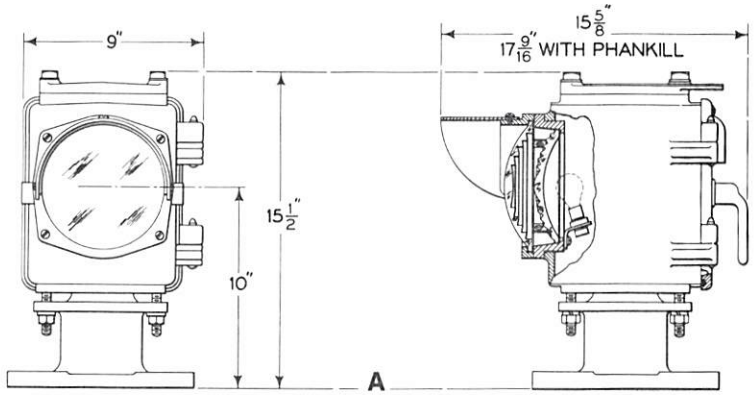




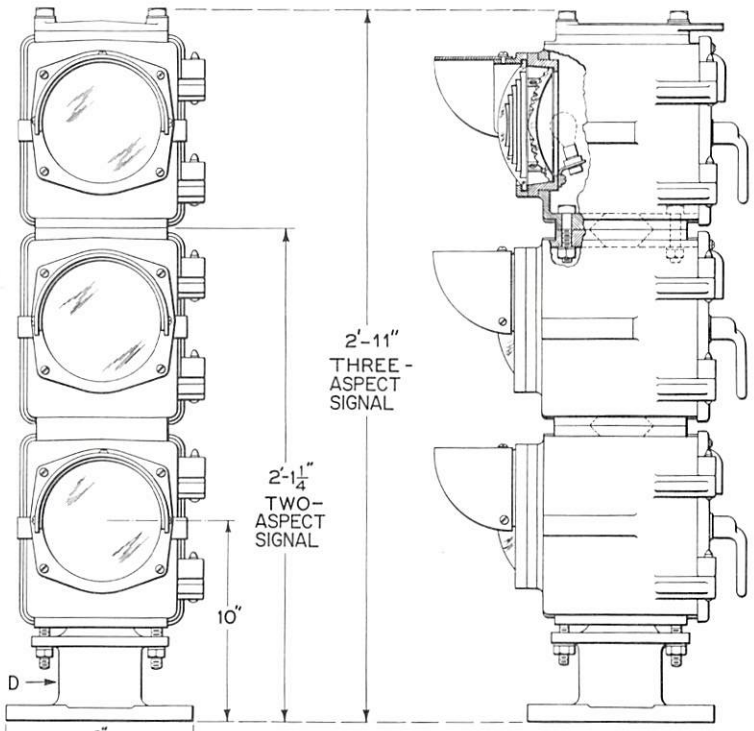
PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE.

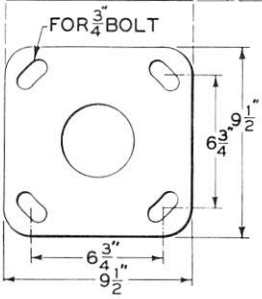
REFERENCE	NAME	CATALOG NUMBER
A	**BRACKET COMPLETE,** for mounting a Type D, D1, G, or G1 signal on side of mast. Includes 45° couplings for 1-1/2" flexible conduit and "U" bolts, nuts, and washers for attaching to 5" pole	**A73-161**
A1	As above, except with coupling for 3/4" to 7/8" dia. cable	**A73-165**
A2	Same as Ref. A1, except for 7/8" to 1.0" dia. cable	**A73-167**
A3	Same as Ref. A1, except for 1.0" to 1-3/16" dia. cable	**A73-169**
1	**CONDUIT**, 1-1/2" flexible, recommended length 2'3", specify length required	**A85-868**
2	**COUPLING,*** complete with "U" bolt and gasket, for 1-1/2" flexible conduit	**A76-568**
3	**COUPLING,*** complete with "U" bolt, reducer, and gasket, for 3/4" to 7/8" dia. cable	**A76-530**
3a	**COUPLING,*** complete with "U" bolt, reducer, and gasket for 7/8" to 1.0" dia. cable	**A76-531**
3b	**COUPLING,*** complete with "U" bolt, reducer, and gasket for 1.0" to 1-3/16" dia.cable	**A76-532**
4	**PINNACLE,** for 5" pole	**A30-521**
5	**ADJUSTING BRACKET**, fits 5" pole or mounting bracket, Refs. A-A3	**P73-270**

*Poles with welded couplings do not require this coupling.

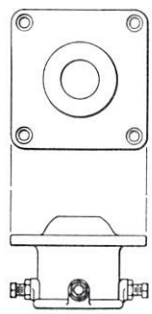


A
ONE - ASPECT SIGNAL

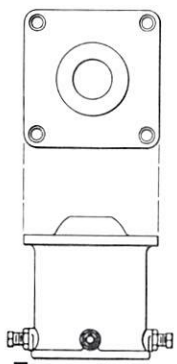




B - TWO-ASPECT SIGNAL
C - THREE-ASPECT SIGNAL



D - FOR 2 1/2" PIPE



E - FOR 3" PIPE
F - FOR 4" PIPE

TYPE FA DWARF SIGNAL

Each Type FA signal listed below INCLUDES a four-way AAR terminal block, ventilators, and 2-ohm adjustable lamp resistor. The Type FA signal DOES NOT INCLUDE the following; please order separately:

- **Pole mounting socket; see below.**
- **Deflecting or Spredlite roundels, and Phankill; see below.**
- **Type K1/2 transformer; see Assemblies Catalog 95-1.**

PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE.

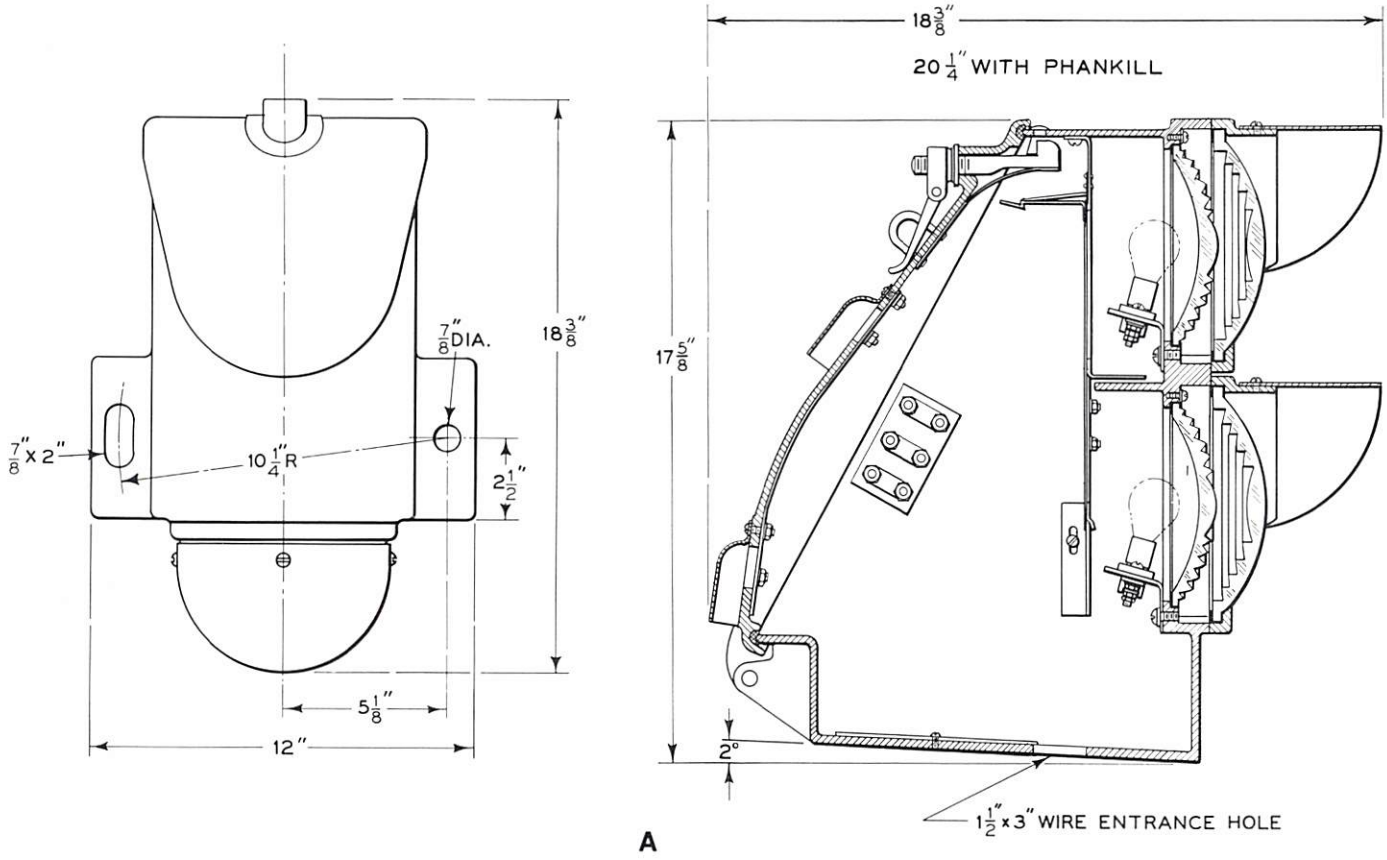
REFERENCE	NAME	CATALOG NUMBER
A	**TYPE FA ONE-ASPECT SIGNAL,** red	**A73-510**
A1	**TYPE FA ONE-ASPECT SIGNAL,** yellow	**A73-512**
B	**TYPE FA TWO-ASPECT SIGNAL,** yellow/red	**A73-530**
B1	**TYPE FA TWO-ASPECT SIGNAL,** green/red	**A73-532**
C	**TYPE FA THREE-ASPECT SIGNAL,** green/yellow/red	**A73-550**
C1	**TYPE FA THREE-ASPECT SIGNAL,** red/yellow/green	**A73-552**
D	**SOCKET, for pole mounting,** fits 2-1/2" I.D. pipe	**A73-590**
E	**SOCKET, for pole mounting,** fits 3" I.D. pipe	**A73-592**
F	**SOCKET, for pole mounting,** fits 4" I.D. pipe	**A73-594**
	ROUNDEL ASSEMBLY, 20° deflecting	**P73-419**
	ROUNDEL ASSEMBLY, same as above except 30° Spredlite	**P73-420**
	PHANKILL ASSEMBLY, with clear lens and roundel, complete with all parts to install	**P73-426**

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TYPE MD DWARF SIGNAL

Each Type MD signal listed below INCLUDES a three-way AAR terminal block, ventilators, and a 2-ohm adjustable lamp resistor. The Type MD signal DOES NOT INCLUDE the following; please order separately:

- **Deflecting or Spredlite roundels, and Phankill; see below.**
- **Type S transformer; see Assemblies Catalog 95-1.**
- **Type K relay; see Assemblies Catalog Section 65.**



A

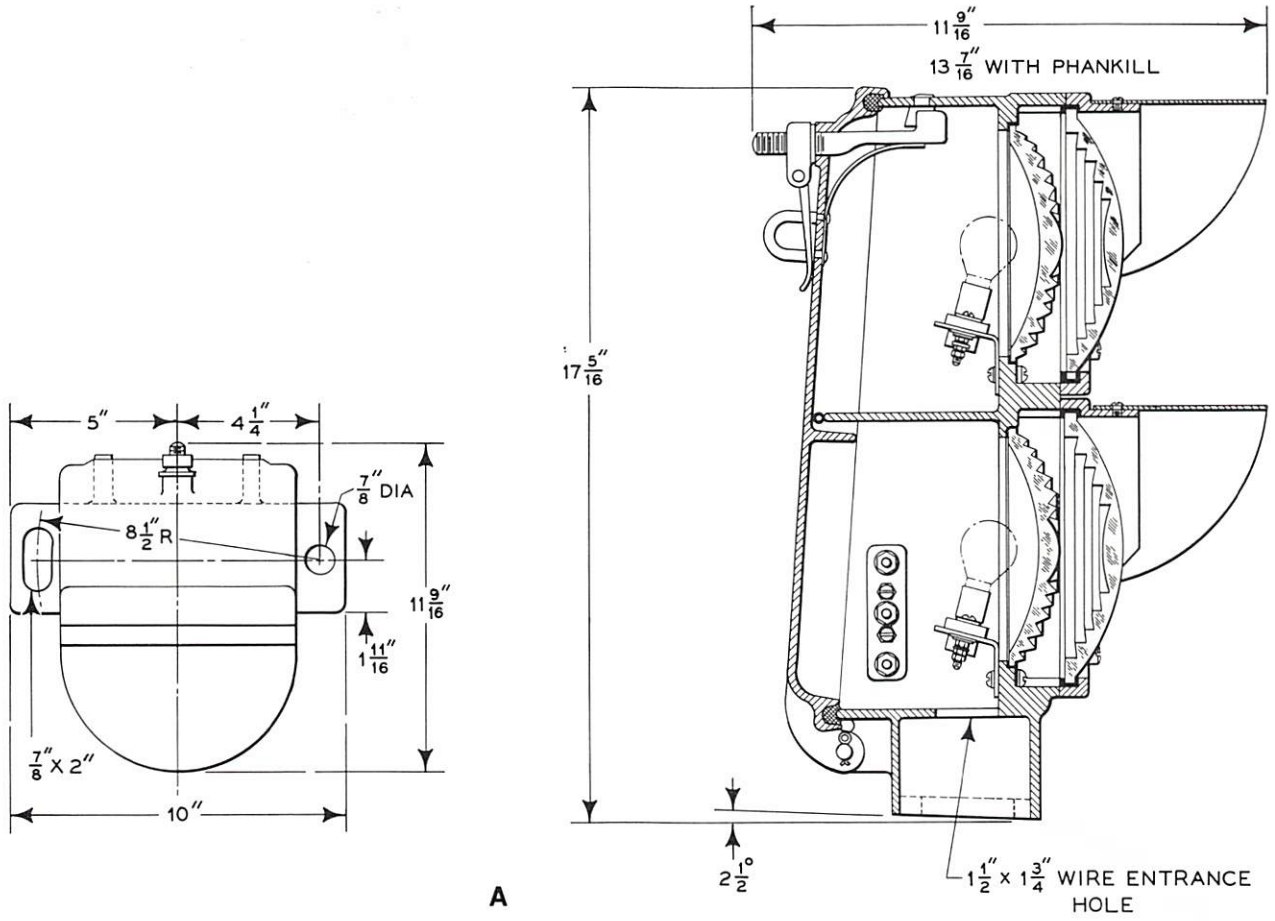
PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE.

REFERENCE	NAME	CATALOG NUMBER
A	**TYPE MD TWO-ASPECT SIGNAL,** yellow/red	**A73-640**
A1	**TYPE MD TWO-ASPECT SIGNAL,** green/red	**A73-642**
	ROUNDEL ASSEMBLY, 20° deflecting	**P73-417**
	ROUNDEL ASSEMBLY, same as above except 25° Spredlite	**P73-418**
	PHANKILL ASSEMBLY, with clear lens and roundel, complete with all parts to install	**P73-425**

TYPE ME DWARF SIGNAL

Each Type ME signal listed below INCLUDES a three-way AAR terminal block and a 2-ohm adjustable lamp resistor. The Type ME signal DOES NOT INCLUDE the following; please order separately:

- **Deflecting or Spredlite roundels, and Phankill; see below.**
- **Type S transformer; see Assemblies Catalog 95-1.**
- **Type K relay; see Assemblies Catalog Section 65**



A

PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE.

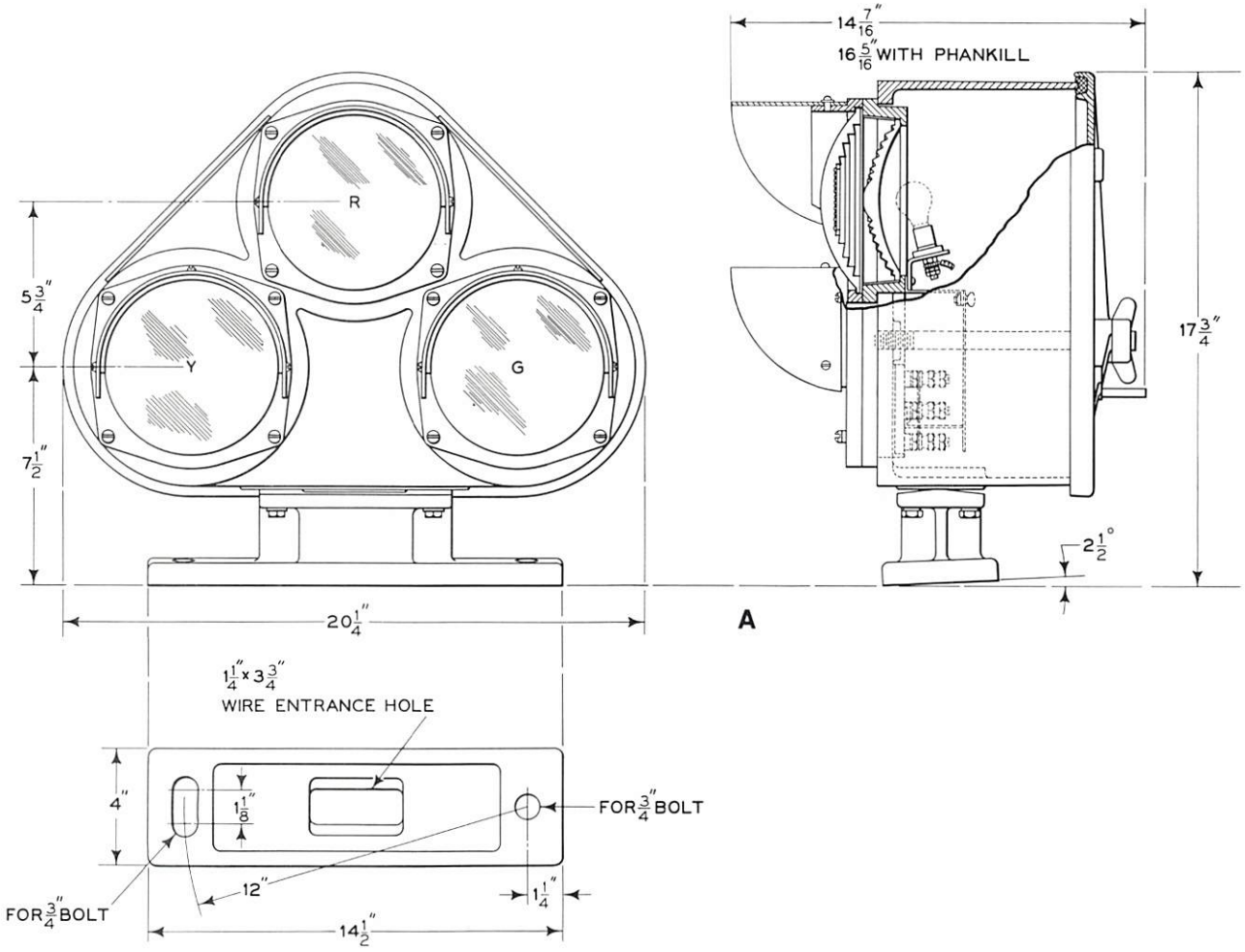
REFERENCE	NAME	CATALOG NUMBER
A	**TYPE ME TWO-ASPECT SIGNAL,** yellow/red	**A73-610**
A1	**TYPE ME TWO-ASPECT SIGNAL,** green/red	**A73-612**
	ROUNDEL ASSEMBLY, 20° deflecting	**P73-417**
	ROUNDEL ASSEMBLY, same as above except 25° Spredlite	**P73-418**
	PHANKILL ASSEMBLY, with clear lens and roundel, complete with all parts to install	**P73-425**

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TYPE MF DWARF SIGNAL

Each Type MF signal listed below INCLUDES a three-way AAR terminal block and a 2-ohm adjustable lamp resistor. The Type ME signal DOES NOT INCLUDE the following; please order separately:

- **Deflecting or Spredlite roundels, and Phankill; see below.**



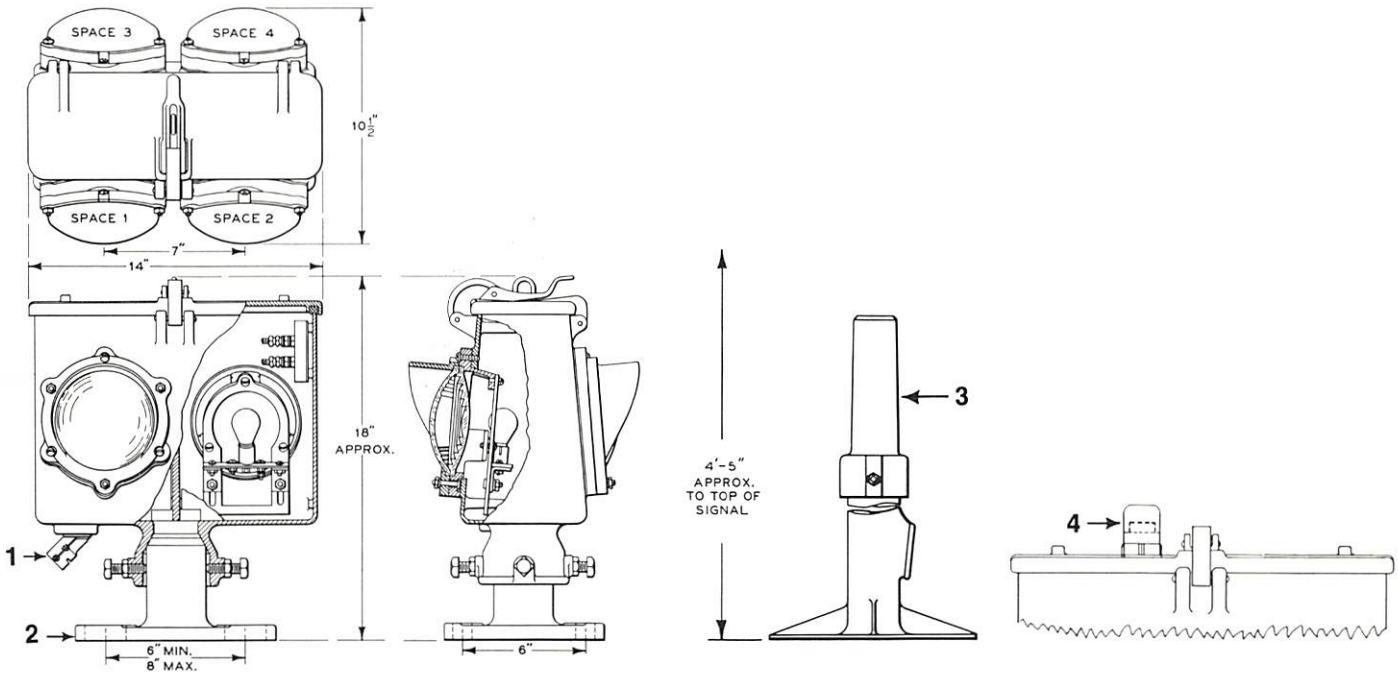
PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE.

REFERENCE	NAME	CATALOG NUMBER
A	**TYPE MF THREE-ASPECT SIGNAL,** red/yellow/green	**A73-670**
	ROUNDEL ASSEMBLY, 20° deflecting	**P73-419**
	ROUNDEL ASSEMBLY, same as above except 25° Spredlite	**P73-420**
	PHANKILL ASSEMBLY, with clear lens and roundel, complete with all parts to install	**P73-426**

TYPE P COLOR-LIGHT SIGNAL

Each Type P signal listed below INCLUDES two-way terminal blocks. Type P signals DO NOT INCLUDE the following; please order separately:

- **Conduit connector; see below.**
- **Standard base or pedestal base; see below.**
- **Pushbutton; see below.**

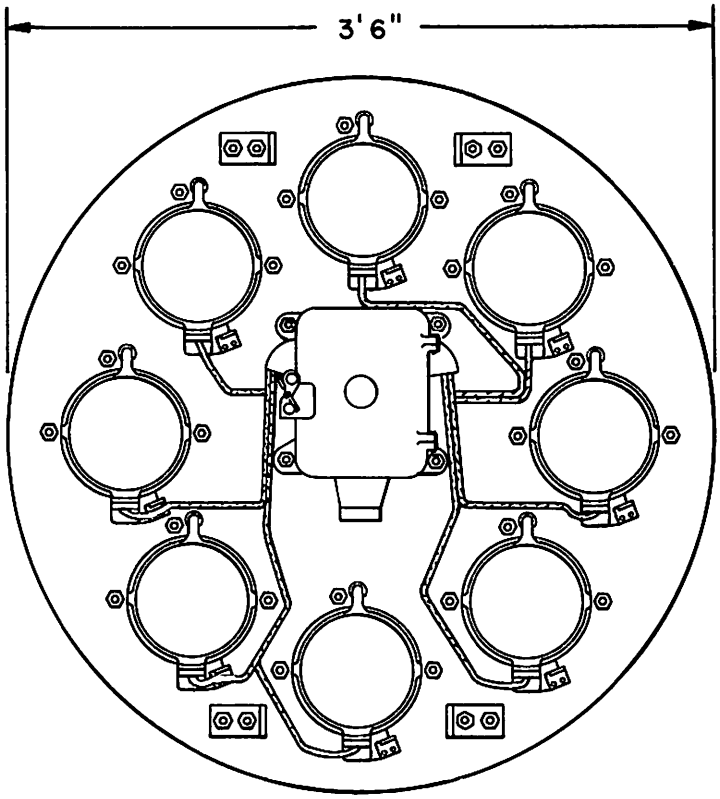


Standard-type base **Pedestal-type base**

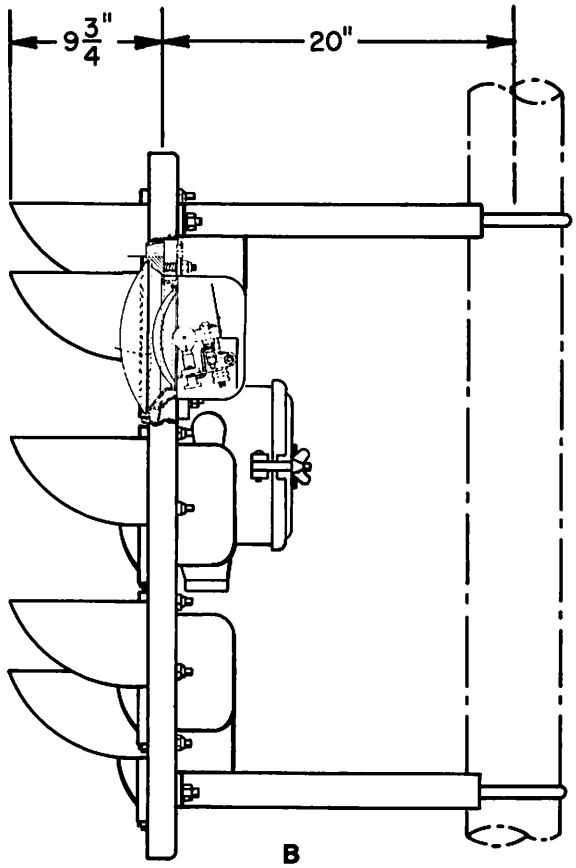
PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE.

REFERENCE	NAME	Aspects Space 1	Space 2	Space 3	Space 4	CATALOG NUMBER
A	**TYPE P SIGNAL,**	Red	Green	Red	Green	**A73-700**
A1	**TYPE P SIGNAL,**	Yellow	L.White	Yellow	L. White	**A73-701**
A2	**TYPE P SIGNAL,**	Yellow	Green	Yellow	Green	**A73-702**
A3	**TYPE P SIGNAL,**	Yellow	Red	Red	Yellow	**A73-703**
1	**CONNECTOR,** for 3/4" flexible conduit, not used with pedestal base					**P73-918**
2	**BASE,** for foundation mounting					**P73-906**
3	**BASE,** pedestal type					**P73-905**
4	**PUSHBUTTON,** for local control					**P73-1005**

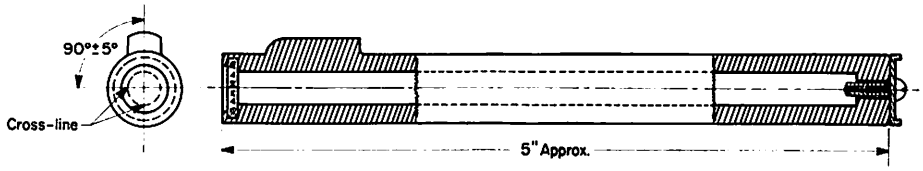
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A

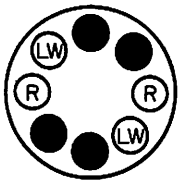


B

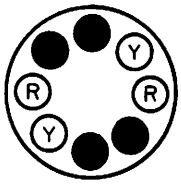


C

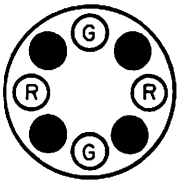
ASPECT 1



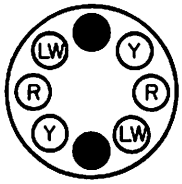
ASPECT 2



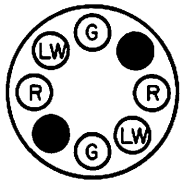
ASPECT 3



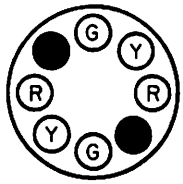
ASPECT 4



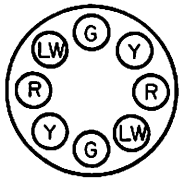
ASPECT 5



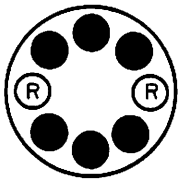
ASPECT 6



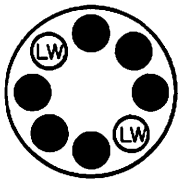
ASPECT 7



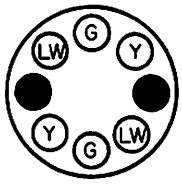
ASPECT 8



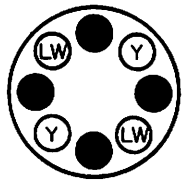
ASPECT 9



ASPECT 10



ASPECT 11



NOTE: DARKENED SPOTS ARE PLUGGED HOLES WITH NO LIGHT UNIT.

TYPE U COLOR-POSITION-LIGHT HIGH SIGNAL

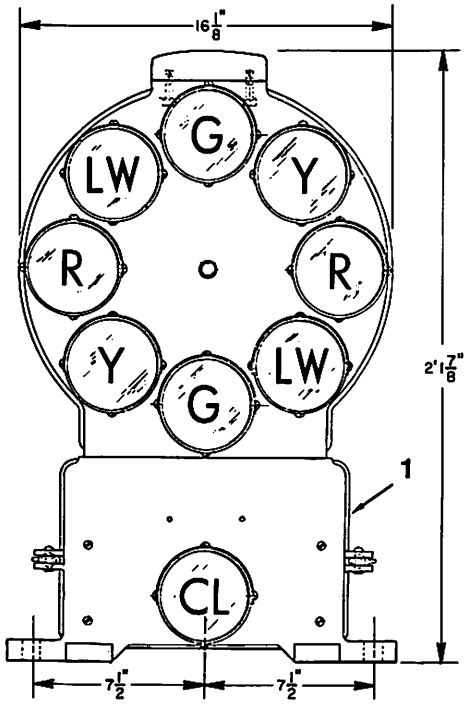
The Type U aluminum color-position-light high signal INCLUDES a choice of aspects as shown on page 22 and listed below. The Type U signal DOES NOT INCLUDE the following; please order separately:

- **Mounting brackets with U bolts; see below.**
- **Sighting device; see below.**
- **Transformers; see Assemblies Catalog 95-1.**

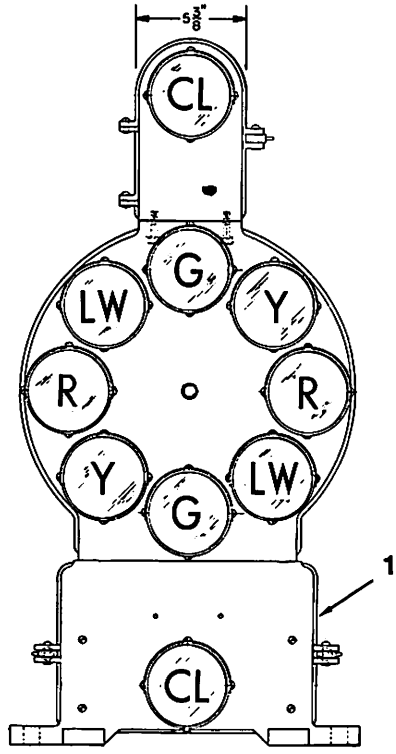
PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE.

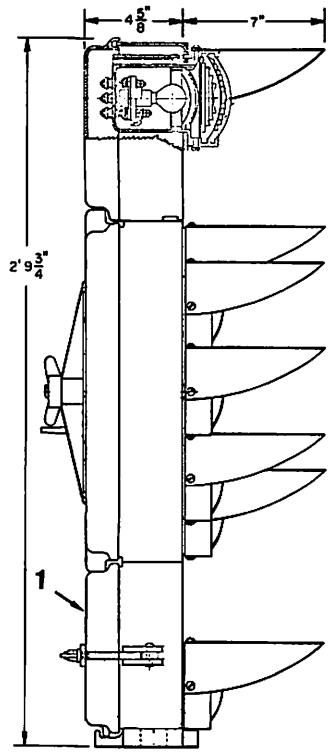
REFERENCE	NAME	CATALOG NUMBER
A	**TYPE U SIGNAL ASPECT 1**	**A73-875**
A	**TYPE U SIGNAL ASPECT 2**	**A73-876**
A	**TYPE U SIGNAL ASPECT 3**	**A73-877**
A	**TYPE U SIGNAL ASPECT 4**	**A73-878**
A	**TYPE U SIGNAL ASPECT 5**	**A73-879**
A	**TYPE U SIGNAL ASPECT 6**	**A73-880**
A	**TYPE U SIGNAL ASPECT 7**	**A73-881**
A	**TYPE U SIGNAL ASPECT 8**	**A73-882**
A	**TYPE U SIGNAL ASPECT 9**	**A73-883**
A	**TYPE U SIGNAL ASPECT 10**	**A73-884**
A	**TYPE U SIGNAL ASPECT 11**	**A73-885**
B	**MOUNTING BRACKET,** set of 2 for 5" pole	**A73-895**
B1	As above, except for 6" pole	**A73-896**
C	**SIGHTING DEVICE**	**A73-897**

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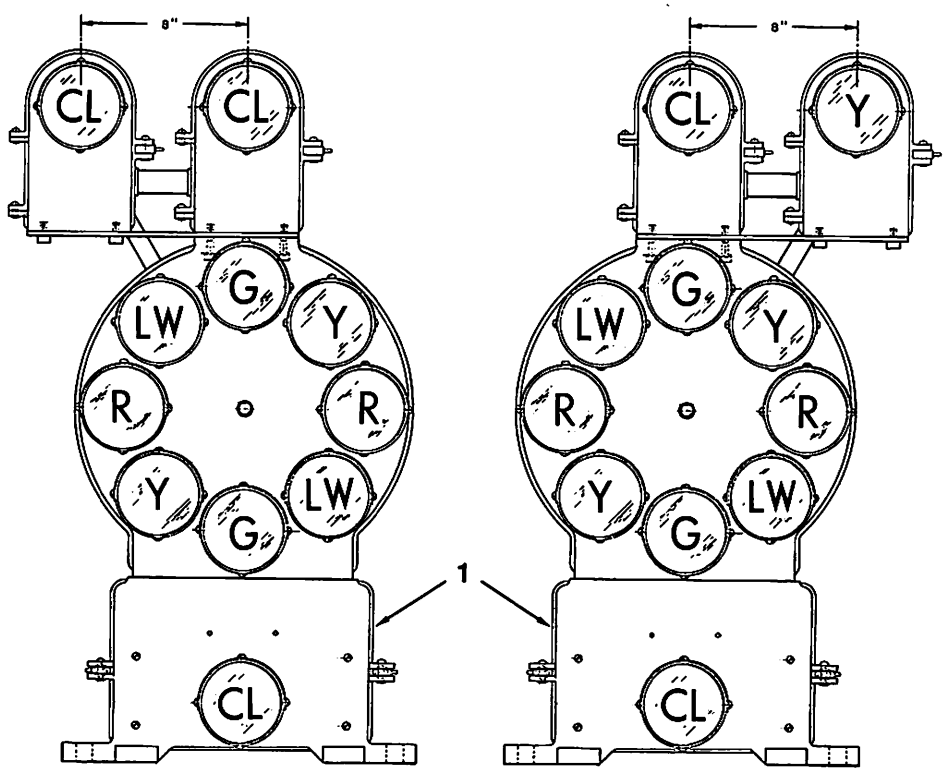

16 1/8"
2'1 7/8"
G
LW
Y
R
R
Y
LW
G
1
CL
7 1/2"
7 1/2"

A


5 3/8"
CL
G
LW
Y
R
R
Y
LW
G
1
CL


4 5/8"
7"
2'9 3/4"
1

B


8"
CL
CL
G
LW
Y
R
R
Y
LW
G
1
CL
8"
CL
Y
G
LW
Y
R
R
Y
LW
G
CL

C D

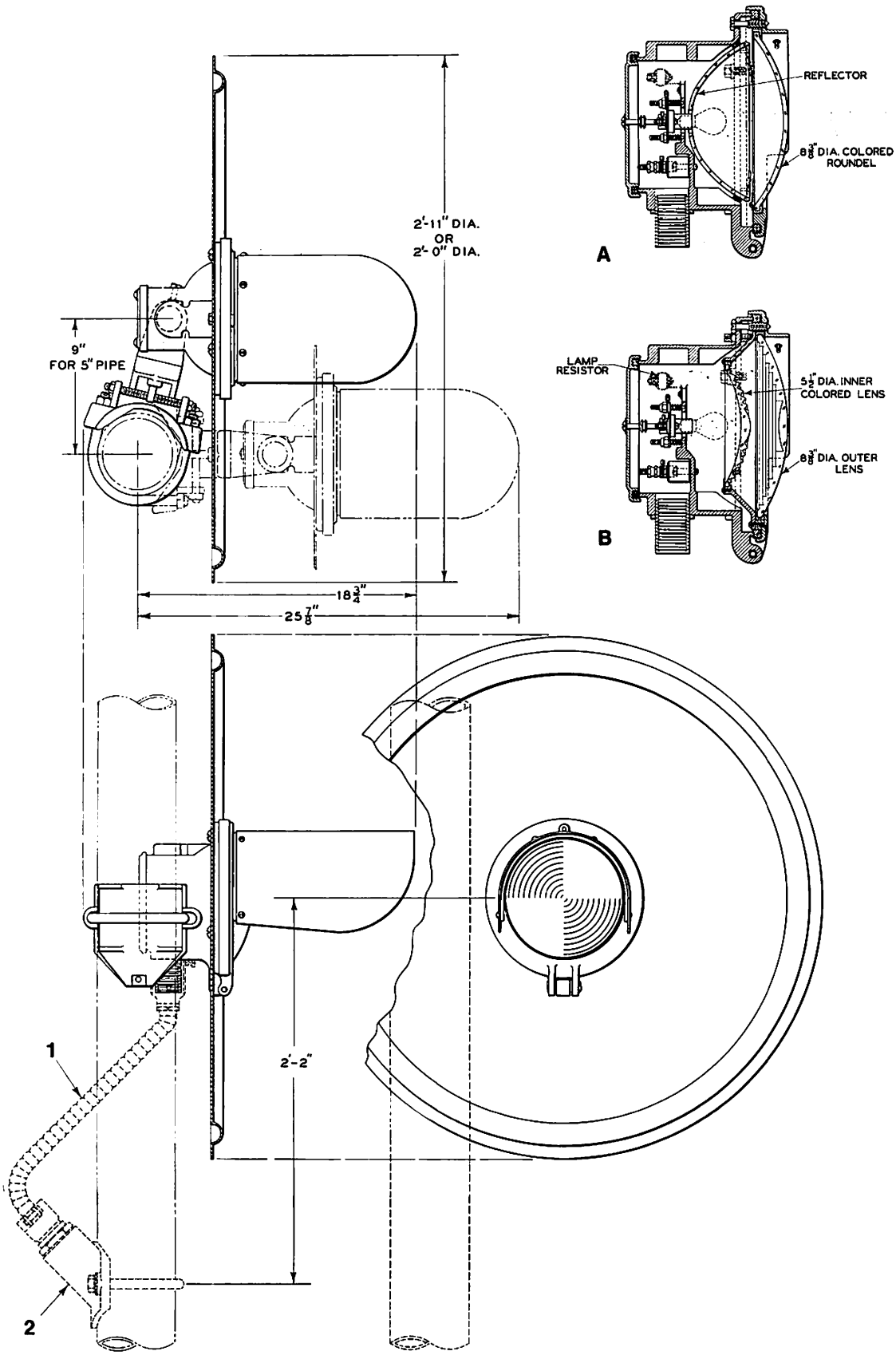
TYPE VA COLOR-POSITION-LIGHT DWARF SIGNAL

The Type VA cast aluminum color-position-light dwarf signal INCLUDES a choice of marker light aspects as listed below. For a different arrangement of the primary eight aspects shown on page 24, specify by the aspect numbers shown on page 22. The signal DOES NOT INCLUDE a deflecting roundel as listed below (please order separately).

PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE.

REFERENCE	NAME	CATALOG NUMBER
A	**TYPE VA SIGNAL,** with bottom clear lens marker	**A73-870**
B	**TYPE VA SIGNAL,** with top and bottom clear lens markers	**A73-871**
C	**TYPE VA SIGNAL,** with two top and one bottom clear lens markers	**A73-872**
D	**TYPE VA SIGNAL,** with top clear and yellow, and bottom clear lens markers	**A73-873**
	ROUNDEL, 20° deflecting, clear	**P73-977**
1	**CASE COMPLETE,** for replacement, with blanking disc covering lens opening	**A73-910**

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2'-11" DIA.
OR
2'-0" DIA.
9"
FOR 5" PIPE
18¾"
25⅞"
2'-2"
1
2
A
REFLECTOR
8⅜" DIA. COLORED
ROUNDEL
B
LAMP
RESISTOR
5½" DIA. INNER
COLORED LENS
8⅜" DIA. OUTER
LENS

TYPE W MARKER SIGNAL

The Type W marker signals listed below INCLUDE a two-way AAR terminal block and a choice of background sizes and optical systems. The signals DO NOT INCLUDE the following; please order separately:

- **Anti-Phan; see page 14.**
- **Conduit and coupling; see below.**

PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE.

REFERENCE	NAME	CATALOG NUMBER With 2-ohm 1.75 amp. lamp resistor	With 5-ohm 1.0 amp. lamp resistor
A	**TYPE W SIGNAL,** with red aspect, 2'-11" dia. background, and reflector and roundel	A73-808	A73-816
A1	**TYPE W SIGNAL,** with frosted aspect, 2'-11" dia. background, and reflector and roundel	A73-809	A73-817
A2	**TYPE W SIGNAL,** with red aspect, 2'-0" dia. background, and reflector and roundel	A73-810	A73-818
A3	**TYPE W SIGNAL,** with frosted aspect, 2'-0" dia. background, and reflector and roundel	A73-811	A73-819
B	**TYPE W SIGNAL,** with red aspect, 2'-11" dia. background, and doublet lens	A73-839	A73-843
B1	**TYPE W SIGNAL,** with red aspect, 2'-0" dia. background, and doublet lens	A73-840	A73-845
1	**CONDUIT COMPLETE,** 3/4" flexible, includes all parts for connecting signal housing to coupling	P73-233	
2	**COUPLING,** complete with U bolt, for 3/4" flexible conduit	A73-860	

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GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL

MAIN OFFICE AND PLANT
PO BOX 20600 ROCHESTER NY 14602-0600 Phone: 716 • 436-2020 Cable: GENRASIG (ROCHESTER NY) Telex: 978317

BOSTON OFFICE
THE 128/ONE EXECUTIVE OFFICE BUILDING 990 WASHINGTON STREET SUITE 106 DEDHAM MA 02026-6790
Phone: 617 • 329-6212

CHICAGO OFFICE
PRUDENTIAL PLAZA SUITE 2120 CHICAGO IL 60601 Phone: 312 • 467-1221

JACKSONVILLE OFFICE
8657 BAYPINE ROAD SUITE 209 JACKSONVILLE FL 32256 Phone: 904 • 739-1900

KANSAS CITY OFFICE
10220 NORTH EXECUTIVE HILLS BOULEVARD SUITE 456 KANSAS CITY MO 64153 Phone: 816 • 891-7211

MONTREAL OFFICE
POINTE-CLAIRE COMMERCE CENTER 6600 TRANSCANADA HIGHWAY SUITE 320 POINTE-CLAIRE QUEBEC H9R 4S2
Phone: 514 • 694-7350

NEW YORK OFFICE
230 PARK AVENUE ROOM 928 NEW YORK NY 10169 Phone: 212 • 697-3681

OMAHA OFFICE
8031 WEST CENTER ROAD SUITE 209 OMAHA NE 68124 Phone: 402 • 399-9333

ROANOKE OFFICE
LIBERTY TRUST BUILDING 101 SOUTH JEFFERSON STREET SUITE 505 ROANOKE VA 24011 Phone: 703 • 343-8628

SAN RAMON OFFICE
CROW CANYON OFFICE PARK 12 CROW CANYON COURT SUITE 210 SAN RAMON CA 94583
Phone: 415 • 831-8775

WASHINGTON OFFICE
MONTGOMERY CENTER 8630 FENTON STREET SUITE 613 SILVER SPRING MD 20910 Phone: 301 • 587-4770

GRS INTERNATIONAL

MAIN OFFICE AND PLANT
PO BOX 20600 ROCHESTER NY U.S.A. 14602-0600 Phone: 716 • 436-2020
Cable: GENRASIG (ROCHESTER NY) Telex: 978317

G.R.S. TRADING CORPORATION
PO BOX 20600 ROCHESTER NY U.S.A. 14602-0600 Phone: 716 • 436-2020
Cable: GENRASIG (ROCHESTER NY) Telex: 978317

GEC-GENERAL SIGNAL LIMITED
BOREHAMWOOD INDUSTRIAL PARK ROWLEY LANE BOREHAMWOOD HERTFORDSHIRE WD6 5PZ ENGLAND
Phone: 44-1-953-9922 Cable: RAILSIGKO BOREHAMWOOD (ENGLAND) Telex: 851-916129 GEC GS

ALGEMENE SEIN INDUSTRIE B.V.
CROESELAAN 28 3521 CB UTRECHT NETHERLANDS Phone: 31-30-94-26-46
Cable: GENRASIG UTRECHT (NETHERLANDS) Telex: 844-47455 GRASI NL

CASCO SIGNAL LIMITED
UNION BUILDING 100 YAN AN DONG ROAD SHANGHAI PEOPLES REPUBLIC OF CHINA Phone: 86-21-26-0579, 86-21-26-5545

REPRESENTATIVES AND LICENSEES THROUGHOUT THE WORLD

CATALOG SECTION A73

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COLOR-LIGHT SIGNALS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A73-111			D SIGNAL 3 IND G-Y-R ALUMINUM	10
	36799-308GR9		D-SIGNAL	
	46668-3GR5		BRACKET	
	49127-85	3	HOOD	
	49163-1GR1		BACKGROUND	
A73-112			D1 SIGNAL 3 IND G-Y-R PLASTIC	10
	36799-314GR1		D1-SIGNAL	
	46668-3GR5		BRACKET	
	49127-93	3	HOOD	
	49162-125		BACKGROUND	
	03615-20	12	SCREW	
	01273-6	12	WASHER	
	01250-12	12	WASHER	
A73-131			D SIGNAL 2 IND Y-R ALUMINUM	10
	36799-211 GR10		D SIGNAL	
	46668-3GR5		BRACKET	
	49127-85	2	HOOD	
	49163-2GR1		BACKGROUND	
A73-132			D1 SIGNAL 2 IND Y-R PLASTIC	10
	36799-213GR1		D1-SIGNAL	
	46668-3GR5		BRACKET	
	49127-93	2	HOOD	
	49162-124		BACKGROUND	
	03615-20	8	SCREW	
	01273-6	8	WASHER	
	01250-12	8	WASHER	
A73-150			D1 SIGNAL 1-IND RED POLYCARBONATE	10
	36799-116GR1		D1-SIGNAL	
	46668-3GR5		BRACKET	
	49127-93		HOOD	
	49162-123		BACKGROUND	
	03615-20	4	SCREW	
	01273-6	4	WASHER	
	01250-12	4	WASHER	
A73-151			D-SIGNAL 1 -IND RED ALUMINUM	
	36799-110GR5		D SIG	
	46668-3GR5		BRACKET	
	49127-85		HOOD	
	49163-3GR1		BACKGROUND	
A73-152			D SIGNAL 4 IND G-Y-R -LW ALUMINUM	10
	36799-403GR7		D-SIGNAL	
	46668-3GR5		BRACKET	
	49127-85	4	HOOD	
	49163-14GR3		BACKGROUND	
A73-161			BRACKET COMPLETE	15
	36731-1		BRACKET	
	5718-290		PLATE	
	56353-33		CONNECTOR	
	35132-32		ELBOW	
	12527-1	4	SCREW	
	01273-6	4	WASHER	
	29953	2	U BOLT	
	0272-9	4	NUT	
	35660	4	WASHER	
	01273-13	4	WASHER	
A73-165			BRACKET	15
	36731-1		BRACKET	
	5718-30		PLATE	
	0359		NUT	
	44515-46		CONNECTOR	
	12527-1	4	SCREW	
	01273-6	4	WASHER	
	29953	2	U BOLT	
	0272-9	4	NUT	
	35660	4	WASHER	
	01273-13	4	WASHER	

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COLOR-LIGHT SIGNALS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A73-167			BRACKET	15
	36731-1		BRACKET	
	5718-39		PLATE	
	27060		NUT	
	44515-63		CONNECTOR	
	12527-1	4	SCREW	
	01273-6	4	WASHER	
	29953	2	U BOLT	
	0272-9	4	NUT	
	35660	4	WASHER	
	01273-13	4	WASHER	
A73-169			BRACKET	15
	36731-1		BRACKET	
	5718-39		PLATE	
	27060		NUT	
	44515-41		CONNECTOR	
	12527-1	4	SCREW	
	01273-6	4	WASHER	
	29953	2	U BOLT	
	0272-9	4	NUT	
	35660	4	WASHER	
	01273-13	4	WASHER	
A73-181			MAST ASSEMBLY COMPLETE	
	31491-199		POLE	
	43951-17GR1		BASE	
	314-146	2	HANDRAILS	
	314-143		HANDRAIL	
	319-219	2	BRACES	
	319-220	2	BRACES	
	319-223	2	BRACES	
	319-224	2	BRACES	
	313-97GR1		PLATFORM	
	077-1	2	BOLTS & NUTS	
	312-125GR2		LADDER	
	312-125GR4		LADDER	
	315-120	2	STAYS	
	317-41GR1	3	CLAMPS	
	09-2	30	BOLTS & NUTS	
A73-183			MAST ASSEMBLY COMPLETE	
	31491-199		POLE	
	43951-16GR6		BASE	
	314-146	2	HANDRAILS	
	314-143		HANDRAIL	
	319-219	2	BRACES	
	319-220	2	BRACES	
	319-223	2	BRACES	
	319-224	2	BRACES	
	313-97GR1		PLATFORM	
	077-1	2	BOLTS & NUTS	
	312-125GR2		LADDER	
	312-125GR4		LADDER	
	312-120	2	STAYS	
	317-41GR1	3	CLAMPS	
	09-2	30	BOLTS & NUTS	
A73-191			MAST ASSEMBLY COMPLETE	
	31491-193		POLE	
	43951-16GR6		BASE	
	314-146	2	HANDRAILS	
	314-143		HANDRAIL	
	319-219	2	BRACES	
	319-220	2	BRACES	
	319-223	2	BRACES	
	319-224	2	BRACES	
	313-97GR1	2	PLATFORMS	
	314-144	2	HANDRAILS	
	077-1	2	BOLTS & NUTS	
	312-125GR4		LADDER	
	312-125GR5		LADDER	
	315-120	2	STAYS	
	317-41GR1	2	CLAMPS	
	09-2	38	BOLTS & NUTS	
A73-205	48885-6		DISC	
A73-210	36762-45GR19		LENS UNIT	
A73-211	36762-45GR18		LENS UNIT	
A73-212	36762-45GR17		LENS UNIT	
A73-215	36762-46GR1		LENS UNIT	
A73-216	36762-46GR2		LENS UNIT	

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COLOR-LIGHT SIGNALS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A73-217	36762-46GR3		LENS UNIT	
A73-220	36762-46GR5		LENS UNIT	
A73-222	36762-46GR6		LENS UNIT	
A73-223	36762-46GR7		LENS UNIT	
A73-225	36762-46GR13		LENS UNIT	
A73-226	36762-46GR14		LENS UNIT	
A73-227	36762-46GR15		LENS UNIT	
A73-230			G SIGNAL 3 IND G-Y-R ALUMINUM	11
	36798-306GR1		G-SIGNAL	
	46668-3GR5		BRACKET	
	49127-85	3	HOODS	
	49163-23GR2		BACKGROUND	
A73-232			G SIGNAL 2 IND R-Y ALUMINUM	11
	36798-205GR1		G-SIGNAL	
	46668-3GR5		BRACKET	
	49127-85	2	HOODS	
	49163-23GR2		BACKGROUND	
A73-233			G SIGNAL 2 IND G-R ALUMINUM	11
	36798-205GR2		G-SIGNAL	
	46668-3GR5		BRACKET	
	49127-85	2	HOODS	
	49163-23GR2		BACKGROUND	
A73-510	36722-268GR3		FA SIGNAL 1 IND RED	17
A73-512	36722-268GR4		FA SIG 1 IND YELLOW	17
A73-530	36722-132 GR11		FA SIGNAL 2 IND Y-R	17
A73-532	36722-132GR7		FA SIGNAL 2 IND G-R	17
A73-550	36722-194GR8		FA SIGNAL 3 IND G-Y-R	17
A73-552	36722-194GR6		FA SIGNAL 3 IND R-Y-G	17
A73-576				17
A73-590			SOCKET	17
	28447-5		SOCKET	
	48576-4	4	SCREW	
	41895-1	4	NUT	
A73-592			SOCKET	17
	28447-6		SOCKET	
	48576-4	4	SCREW	
	41895-1	4	NUT	
A73-594			SOCKET	17
	28447-17		SOCKET	
	48576-4	4	SCREW	
	41895-1	4	NUT	
A73-610	36722-60GR12		ME SIGNAL 2 IND Y-R	19
A73-612	36722-60GR13		ME SIGNAL 2 IND G-R	19
A73-640	36722-52GR51		MD SIGNAL 2 IND Y-R	18
A73-642	36722-52GR45		MD SIGNAL 2 IND G-R	18
A73-670	20725-2GR1		MF SIGNAL 3 IND R-Y-G	20
A73-700			P-SIGNAL R-G-R-G	
	36722-28GR9		P-SIGNAL	
	21211-4		BASE	
	44515-1		CONNECTOR	
A73-701			P-SIGNAL Y-LW-Y-LW	
	36722-28GR10		P-SIGNAL	
	21211-4		BASE	
	44515-1		CONNECTOR	
A73-702			P-SIGNAL Y-G-Y-G	
	36722-28GR11		P-SIGNAL	
	21211-4		BASE	
	44515-1		CONNECTOR	
A73-703			P-SIGNAL Y-R-R-Y	
	36722-28GR19		P-SIGNAL	
	21211-4		BASE	
	44515-1		CONNECTOR	

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COLOR-LIGHT SIGNALS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A73-710			P-SIGNAL R -G-R-G	
	36722-28GR9		P-SIGNAL	
	18006-1		PEDESTAL	
	57452-2GR1		ADAPTOR	
A73-711			P-SIGNAL Y -LW-Y-LW	
	36722-28GR10		P-SIGNAL	
	18006-1		PEDESTAL	
	57452-2GR1		ADAPTOR	
A73-712			P-SIGNAL Y -G-Y-G	
	36722-28GR11		P-SIGNAL	
	18006-1		PEDESTAL	
	57452-2GR1		ADAPTOR	
A73-713			P-SIGNAL Y -R-R-Y	
	36722-28GR19		P-SIGNAL	
	18006-1		PEDESTAL	
	57452-2GR1		ADAPTOR	
A73-808			TYPE W MARKER	27
	53127-5GR11		W LIGHT UNIT	
	49127-19		HOOD	
	49162-26		BACKGROUND	
	47154		NUT	
	53126 GR2		CLAMP	
	16194-17		U-BOLT	
	42333-63	2	NUT	
A73-809			TYPE W MARKER	27
	53127-5GR26		W LIGHT UNIT	
	49127-19		HOOD	
	49162-26		BACKGROUND	
	47154		NUT	
	53126 GR2		CLAMP	
	16194-17		U-BOLT	
	42333-63	2	NUT	
A73-810			TYPE W MARKER	27
	53127-5GR11		W LIGHT UNIT	
	49127-19		HOOD	
	49162-90		BACKGROUND	
	47154		NUT	
	53126 GR2		CLAMP	
	16194-17		U-BOLT	
	42333-63	2	NUT	
A73-811			TYPE W MARKER	27
	53127-5GR26		W LIGHT UNIT	
	49127-19		HOOD	
	49162-90		BACKGROUND	
	47154		NUT	
	53126 GR2		CLAMP	
	16194-17		U-BOLT	
	42333-63	2	NUT	
A73-816			TYPE W MARKER	27
	53127-5GR1		W LIGHT UNIT	
	49127-19		HOOD	
	49162-26		BACKGROUND	
	47154		NUT	
	53126 GR2		CLAMP	
	16194-17		U-BOLT	
	42333-63	2	NUT	
A73-817			TYPE W MARKER	27
	53127-5GR27		W LIGHT UNIT	
	49127-19		HOOD	
	49162-26		BACKGROUND	
	47154		NUT	
	53126 GR2		CLAMP	
	16194-17		U-BOLT	
	42333-63	2	NUT	

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COLOR-LIGHT SIGNALS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A73-818			TYPE W MARKER	27
	53127-5GR1		W LIGHT UNIT	
	49127-19		HOOD	
	49162-90		BACKGROUND	
	47154		NUT	
	53126 GR2		CLAMP	
	16194-17		U-BOLT	
	42333-63	2	NUT	
A73-819			TYPE W MARKER	27
	53127-5GR27		W LIGHT UNIT	
	49127-19		HOOD	
	49162-90		BACKGROUND	
	47154		NUT	
	53126 GR2		CLAMP	
	16194-17		U-BOLT	
	42333-63	2	NUT	
A73-843			TYPE W MARKER	27
	53127-4GR9		W LIGHT UNIT	
	49127-19		HOOD	
	49162-26		BACKGROUND	
	47154		NUT	
	53126 GR2		CLAMP	
	16194-17		U-BOLT	
	42333-63	2	NUT	
A73-845			TYPE W MARKER	27
	53127-4GR9		W LIGHT UNIT	
	49127-19		HOOD	
	49162-90		BACKGROUND	
	47154		NUT	
	53126 GR2		CLAMP	
	16194-17		U-BOLT	
	42333-63	2	NUT	
A73-850			STENCIL	
	53667-17		STENCIL	
	03608-10	4	SCREW	
	48885-3		DISC	
A73-851			STENCIL	
	53667-8		STENCIL	
	03608-10	4	SCREW	
	48885-3		DISC	
A73-860			COUPLING	27
	45689-191		COUPLING	
	13014-158		GASKET	
	41892-20		REDUCER	
	20476-40		U BOLT	
	1048-6	2	NUT	
	01250-21	2	WASHER	
	01273-10	2	WASHER	
A73-870	54360-3GR8		VA SIGNAL	25
A73-871	54360-3GR1		VA SIGNAL	25
A73-872	54360-3GR20		VA SIGNAL	25
A73-873	54360-3GR29		VA SIGNAL	25
A73-875	54350-16GR1		U SIGNAL ASPECT ONE	23
A73-876	54350-16GR2		U SIGNAL ASPECT TWO	23
A73-877	54350-16GR3		U SIGNAL ASPECT THREE	23
A73-878	54350-16GR4		U SIGNAL ASPECT FOUR	23
A73-879	54350-16GR5		U SIGNAL ASPECT FIVE	23
A73-880	54350-16GR6		U SIGNAL ASPECT SIX	23
A73-881	54350-16GR7		U SIGNAL ASPECT SEVEN	23
A73-882	54350-16GR8		U SIGNAL ASPECT EIGHT	23
A73-883	54350-16GR9		U SIGNAL ASPECT NINE	23
A73-884	54350-16GR10		U SIGNAL ASPECT TEN	23
A73-885	54350-16GR11		U SIGNAL ASP ELEVEN	23

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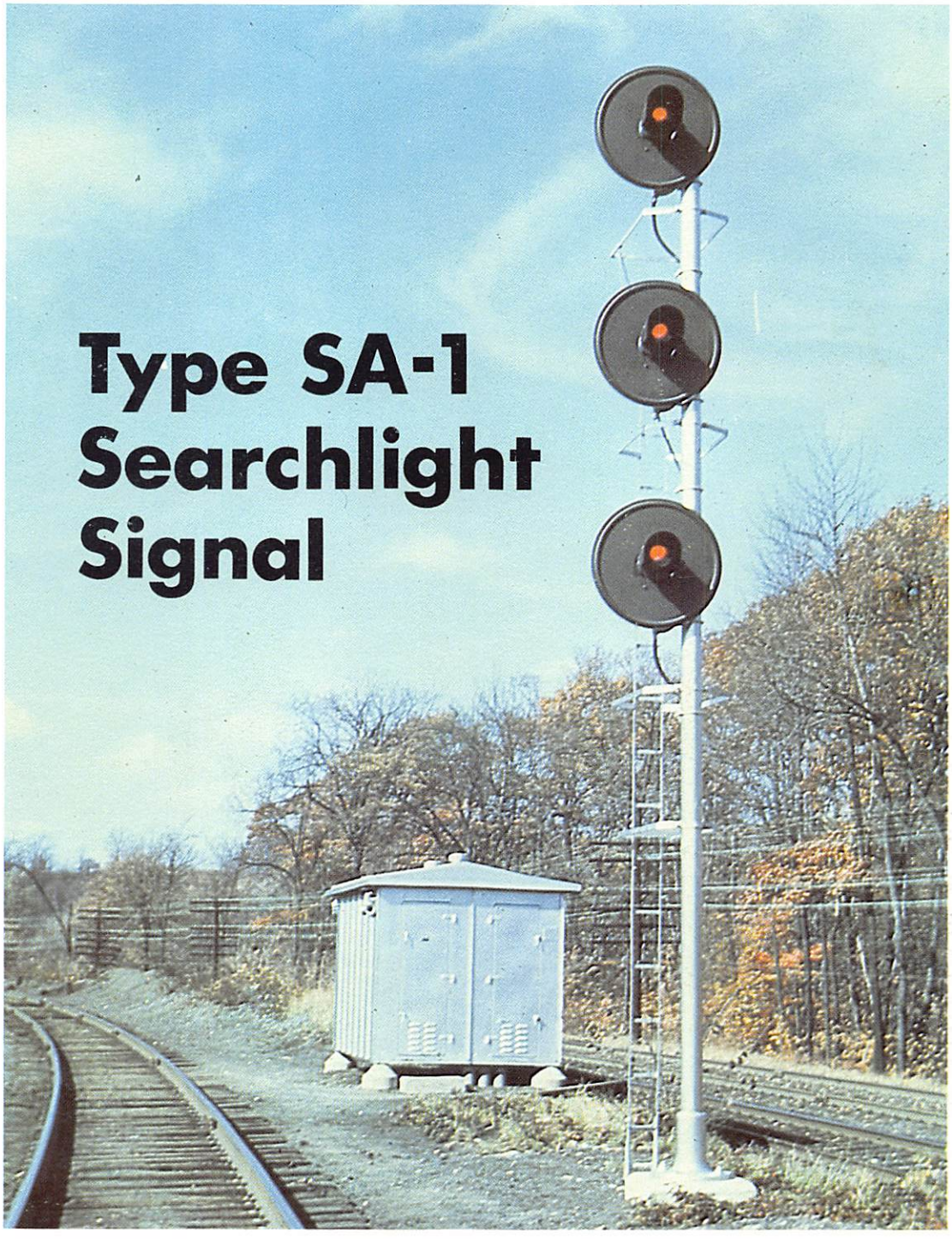
CATALOG SECTION A73

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COLOR-LIGHT SIGNALS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.	CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A73-895			MOUNTING BRACKET FOR 5 INCH POLE	23					
	40539-15	2	BRACKET						
	16194-7	2	U-BOLT						
	645-6	4	NUT						
	01273-11	4	WASHER						
A73-896			MOUNTING BRACKET FOR 6 INCH POLE	23					
	40539-15	2	BRACKET						
	16194	2	U-BOLT						
	645-6	4	NUT						
	01273-11	4	WASHER						
A73-897	51120-3GR1		SIGHTING DEVICE	23					
A73-900	57610 GR1		LAMP EXCHANGER						
A73-901	36762-56GR3		LAMP EXCHANGER KIT						
A73-902	57610-1GR1		LAMP EXCHANGER						
A73-903	36762-57GR1		LENS UNIT						
A73-904	36762-57GR2		LENS UNIT						
A73-905	36762-57GR3		LENS UNIT						
A73-906	36762-57GR4		LENS UNIT						

GRS CATALOG 76-1



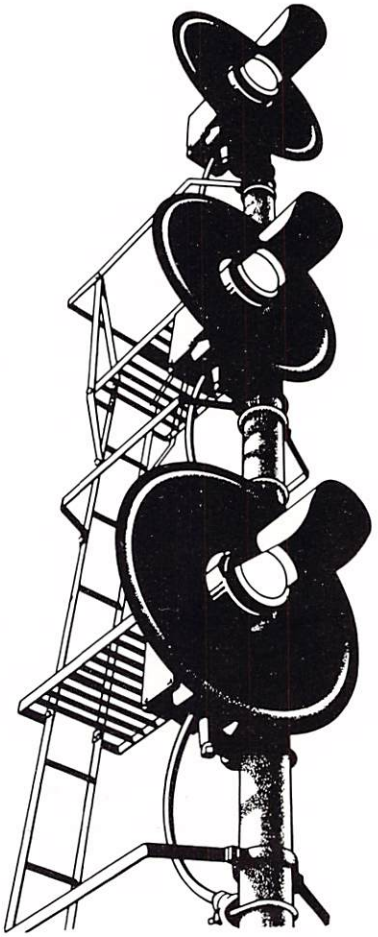
Type SA-1 Searchlight Signal

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GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL
ROCHESTER NEW YORK 14602

FEATURES

- Aspect-Checking Contacts Directly Operated by Counterweights
- Slanted Color Discs Minimize Beam Dilution
- Choice of Compound or Stepped Lens System
- Available with 20-Degree Deflecting Roundel or 30-Degree Spredlite Roundel
- Wide Choice of Assemblies and Wire Entrance Couplings
- Precision Filament Lamp Needs No Refocusing When Changing
- Optional Phankill Unit Reduces Beam Dilution
- Built-In Surge Arrester
- Plug-In, Cartridge-Type, Adjustable Lamp Resistor
- Built-In Sighting Fixture



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A two-unit Type SA-1 dwarf signal, left, is teamed with a three-unit Type SA-1 high signal at this field location.

INTRODUCTION

The GRS Type SA-1 searchlight signal features an efficient electromagnetic structure, maximum back contact pressure, positive contact closure, and precise color disc positioning. It operates from battery or rectified a-c — 8 to 12 volts d-c.

The Type SA-1 signal consists of a compact operating mechanism and a durable cast aluminim housing. The housing can be bracket-mounted to the side or front of the signal mast, provided with a socket for mounting on top of the mast, or provided with a base for mounting on a concrete foundation.

The Type SA-1 signal projects three aspects — red, yellow and green — through a single optical system to provide a powerful beam using minimal energy. The beam has a daylight range (with a compound lens system for tangent track) of one mile, using a 5-watt lamp. The signal automatically displays its most restrictive aspect (red) in case of a power failure or other type of circuit interruption.

The signal housing has an 8-3/8-inch lens, hood, ventilators, background, and mounting bracket, base, or mounting socket. The operating mechanism, Figure 1, slides easily into the housing on a hanger-and-track system, and is locked securely into an accurate position by cams and locking pins.

The signal is available with one of two types of lens systems: (1) a compound lens, with two plano-convex lenses that have smooth surfaces on both sides, or (2) a stepped lens consisting of a single lens with a smooth outer surface and concentric circular steps on the concave inner surface. With the same wattage lamp, the compound lens produces a beam of longer range. Also available are outer roundels to spread or deflect a beam for track curvatures, and a Phankill to reduce beam dilution.

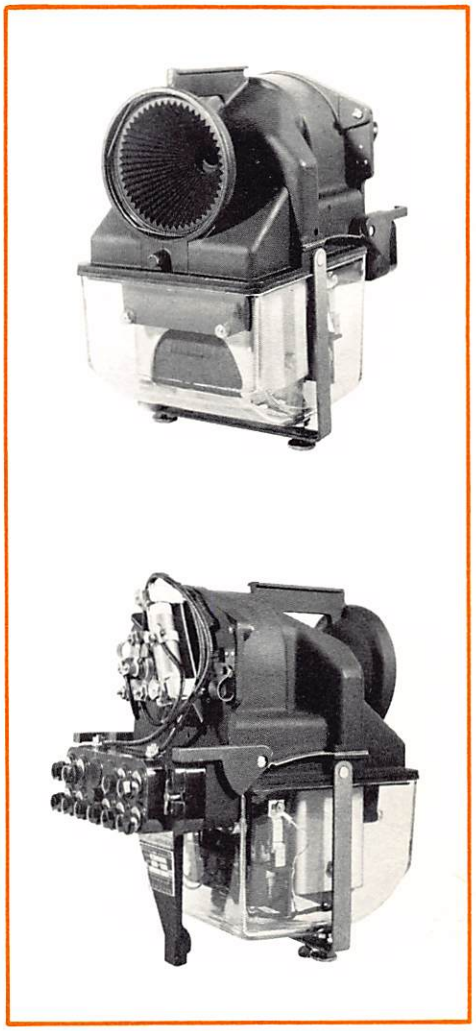


Figure 1. Type SA-1 signal mechanism.

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DESCRIPTION

Figure 2 shows the SA-1 mechanism with the lamp assembly and plug coupler removed. The lamp assembly features a plug-in, adjustable lamp resistor, which makes it easy to match the lamp you plan to use. Resistors are available in three different resistances - one, two, and five ohms. The removable half of the plug coupler contains an air-gap lightning arrester which provides a path from case to control wires for surges in excess of 2000 volts.

The pretested, precision filament, single contact lamp has a bayonet base that locks in place in the lamp reflector. The easily changed lamp requires no refocusing when replaced.

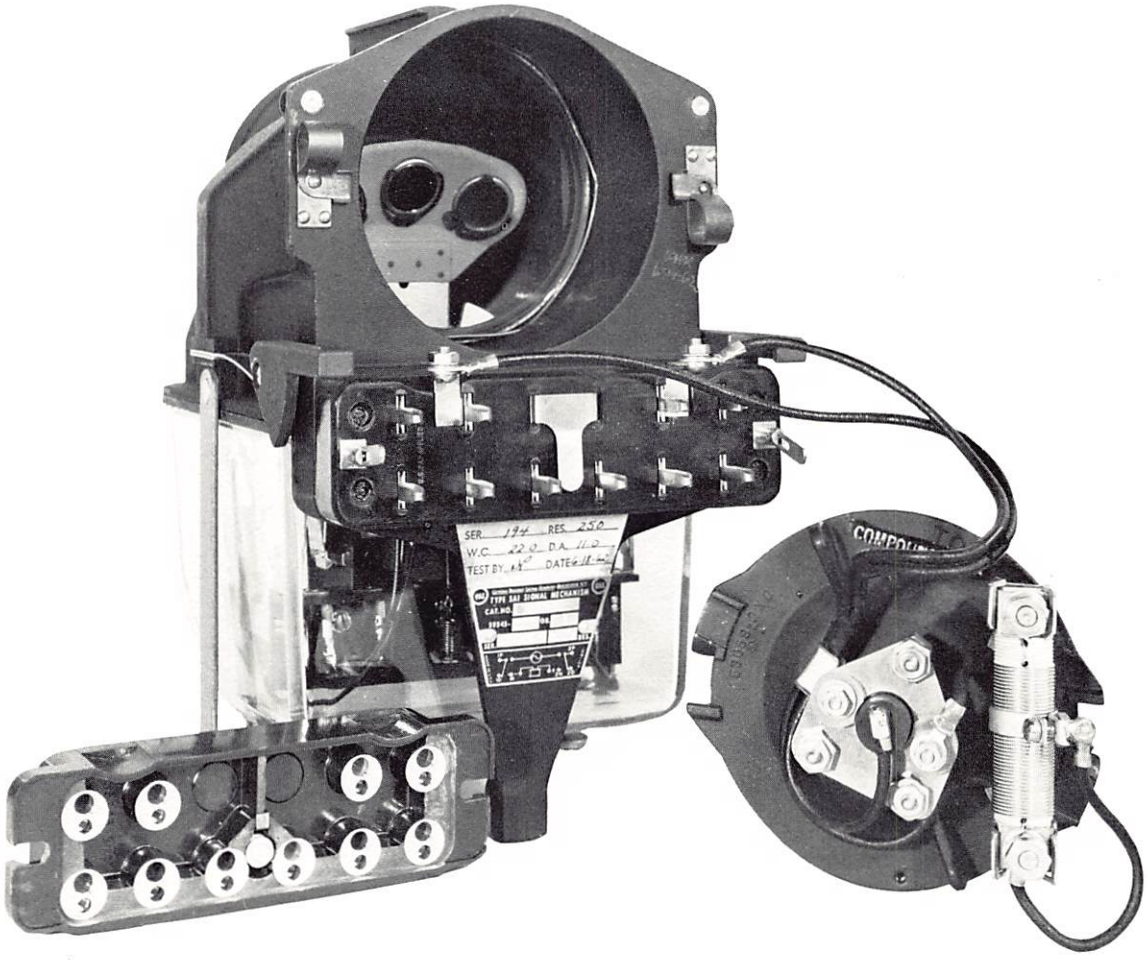


Figure 2. Type SA-1 mechanism with lamp reflector and plug coupler removed.

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The mechanism uses a rotary movement principle to position a spectacle arm which carries three color discs, Figure 3. The spectacle arm is inclined toward the reflector so that each color disc is positioned just out of the maximum heat area of the reflector's focal point. This arrangement protects the color discs against thermal shock, yet provides for full, effective coloring of the light beam. Also, by slanting the color disc, dilution of the color aspect due to mirror effect is prevented, since outside light returning from the front of the signal is reflected upward, rather than back into the color beam.

The polarity of the control circuit determines whether a yellow or a green color disc is positioned in the light beam. When the circuit is deenergized, the red color disc is positioned, by gravity, to color the beam.

The "yellow" and "green" contacts provide maximum back contact pressure to ensure uniform pressure throughout their useful life. A large diameter flywheel, friction mounted on the spectacle shaft, provides "follow-through" inertia so that the contacts close positively, without rebound, in the green and yellow positions. Color flashes are thus eliminated. Suspension counterweights snub the contacts to a clean, solid closure in the red position.

The spectacle shaft assembly has stops of laminated phenolic, a rugged material that provides excellent, long-life service. The shaft is supported by knife edge bearings of a type which, while practically friction free, have demonstrated outstanding ability to withstand wear and vibration.

The design of the electromagnet structure allows substantial clearance between moving and stationary parts. A quarter-inch air gap ensures against interference from foreign material.

Mast-mounted Type SA-1 signals have a sighting device on top of the housing to permit easy, accurate positioning. By sighting through the hairline peep sight and manipulating the horizontal and vertical adjustments, the light beam is directed as desired. Bridge signals on girders and dwarf signals have bases with slotted holes for mounting bolts. These holes allow the signal to be adjusted horizontally, with the vertical alignment done by manipulating the adjustments as with the mast signal.

The SA-1 signals are available with a wide variety of mast and ladder assemblies, and couplings for flexible conduit or cable.

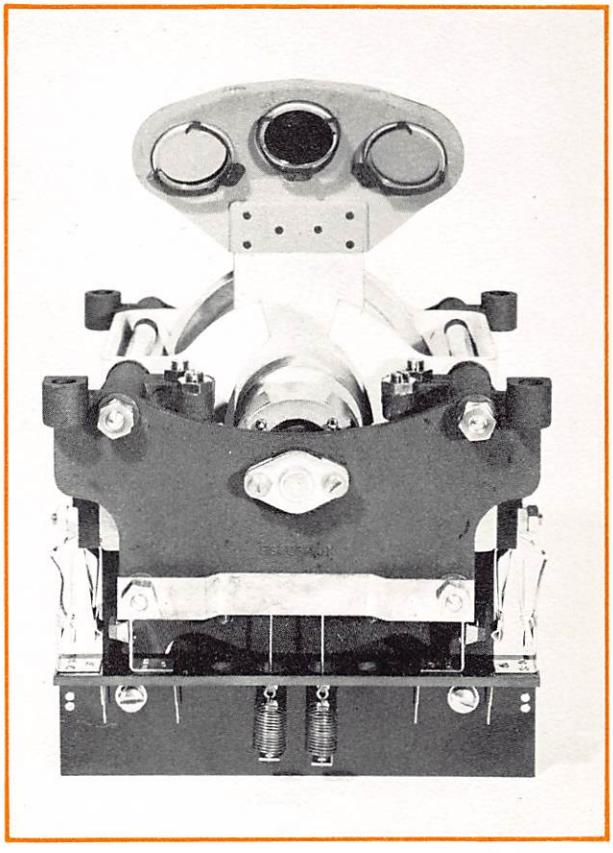


Figure 3. Type SA-1 operating mechanism.

OPERATION

The principles of operation for the Type SA-1 mechanism are illustrated in Figure 4. Polar operation is effected by a permanent magnet, mounted on the spectacle shaft, which polarizes the upper vane north (N) and the lower vane (with counter weight) south (S). The stationary coil, suspended below the spectacle shaft, controls the polarity of pole pieces R and L. With the spectacle shaft assembly isolated from the coil, the possibility of surge currents entering and causing damage to the knife edge bearings is eliminated.

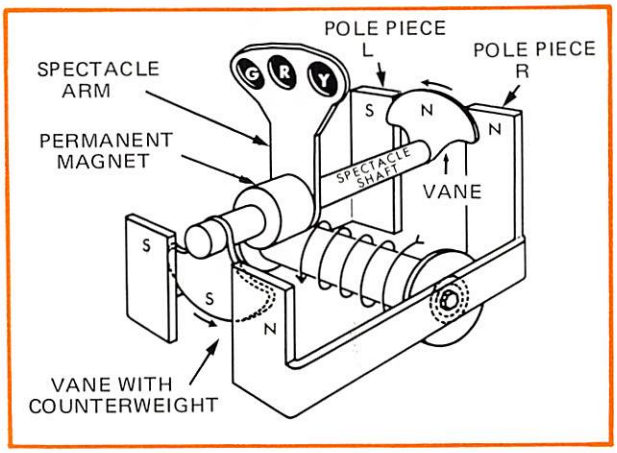


Figure 4. Principles of operation.

With no energy applied to the coil, the spectacle arm is held in the center (red) position by gravity, due to the counterweight. When energy is applied to the coil, with polarity as shown, pole piece R on the electromagnet is polarized north, and pole piece L is polarized south. As unlike poles attract, the south pole of the permanent magnet (lower vane) is attracted to pole piece R, and the north pole (upper vane) is attracted to pole piece L. As a result, the yellow color disc is positioned in the light beam.

When the polarity of the coil is reversed, the magnetic flux in the core is also reversed. Rotation of the armature in the opposite direction then positions the green color disc in the light beam.

A copper slug on the core of the electromagnet dampens the movement of the spectacle arm when energy is removed from the coil. This electromagnetic damping action, together with the nonbounce characteristics of the mechanical movement, positions each color disc precisely and accurately. This positioning is accomplished without overtravel, which could result in a momentary display of an improper aspect.

Contact position in relation to the polarity of the applied voltage is shown in Figure 5. The contacts are operated by two counterweights which, in turn, are operated through link connections to the rotating spectacle arm.

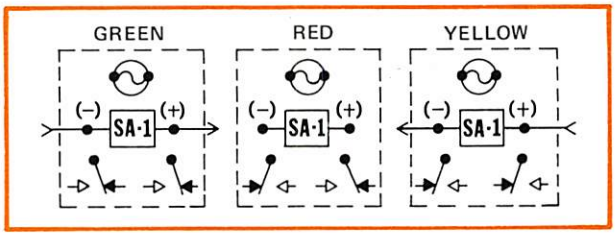


Figure 5. Type SA-1 mechanism contact positions – view facing terminal block.

DIMENSIONS and WEIGHTS

SIGNAL HOUSING DIMENSIONS

Overall length of signal, including hood – compound lens system . . . . . .34 in.

Overall length of signal, including hood – stepped lens system . . . . . 29-3/4 in.

Overall height of signal – either optical system . . . . . 27-7/8 in.

Lens bezel ring, overall diameter . . . . . .10 in.

WEIGHT

Signal housing and signal mechanism – stepped lens arrangement . . . . . .140 lbs. total

Signal housing and signal mechanism – compound lens arrangement . . . .160 lbs. total

Signal mechanism only . . . . . 25 lbs.

INSTALLATION

The coupling plate at the bottom of the signal housing requires one of several types of connectors for bringing in conduit or cable. The proper plate and connector, shipped separately from the housing, should be installed prior to mounting.

For most installations, a high signal is positioned, with respect to the track, so that the lens is as near as possible to the eye-level of the engineman and as close to the track as clearances permit. This means the signal usually is mounted on the left side of the mast as viewed by the approaching engineman. Optional brackets permit mounting on the front or on the top of the mast.

Signal housing 1, Figure 6, may be mounted with bracket 2 already attached, or U-bolts 3 of the bracket may be affixed first and the housing then attached. If flexible conduit is used, care must be taken to locate bracket 2 on the mast so it is positioned properly in relation to conduit hole 4. Coarse aiming of the signal housing by sighting over sighting device 5 during mounting will aid in the final beam alignment.

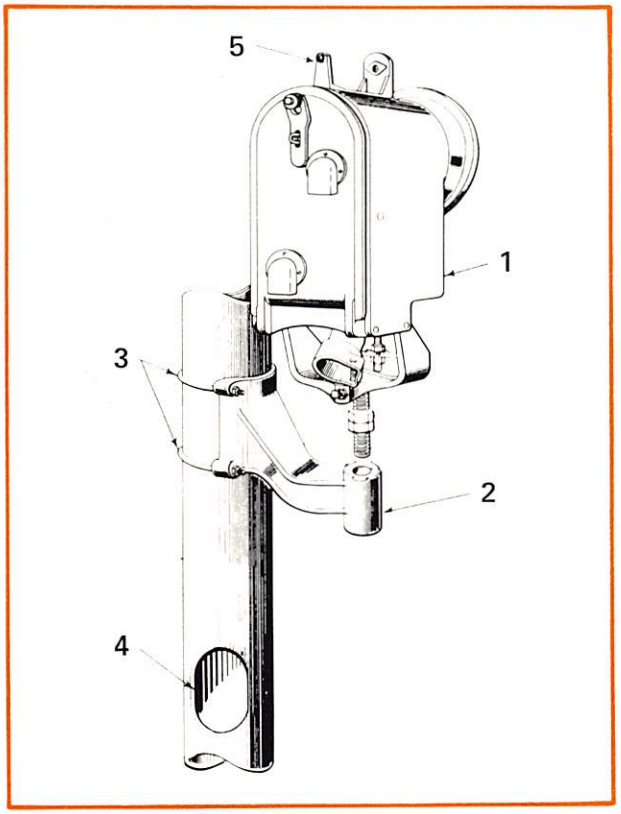


Figure 6. Mounting the Type SA-1 signal on the mast.

The connection diagram for the Type SA-1 signal is shown in Figure 7. The signal, with a coil resistance of 250 ohms, is designed to operate on 10 volts (5 lead cells or equivalent). The minimum current required for proper operation is 24 ma.

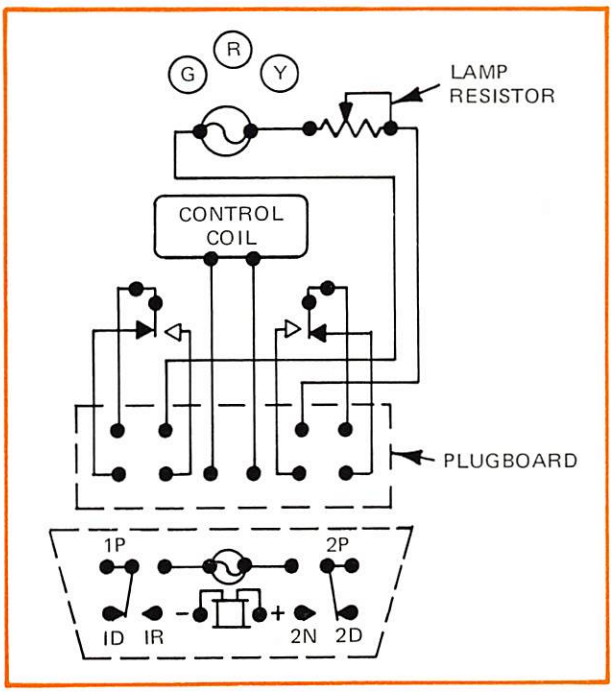


Figure 7. Type SA-1 signal connection diagram - view facing plugboard.

Wires from the plug coupler to the contacts, including the coils wires, are equipped with quick-detachable terminals which require no soldering.

Operating times for the Type SA-1 signal, at 10 volts d-c, are as follows:

Time to close contact from red (deenergized) to yellow (or red to green) . . . . . .0.65 sec.

Time to close red (deenergized) contact from either green or yellow position (time starts when energy is removed) . . . . . .0.58 sec.

Time to close green contact from yellow position (or yellow contact from green position) after energy is pole-changed . . . .0.58 sec.

Time yellow to green contact is open (or green to yellow contact is open) during pole change (time that circuit to yellow-green repeater relay is open) . . . . . 0.165 sec.

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ORDERING INFORMATION

Type SA-1 mast-mounted high signals, listed below, have optical arrangements for tangent track only. They consist of two major assemblies: (1) signal heads complete with choice of mechanism (operating or inoperative), and (2) mast assemblies complete with pinnacle, base, ladder, and platform.

Type SA-1 dwarf signals have a choice of mechanism.

Optional equipment for separate order includes: roundel and Phankill assemblies (page 13), ladder support and foundation (page 16), adjustable lamp resistors (page 16), lamp bulbs (Catalog Section 46), wire entrance couplings and conduit (page 17), and mast mounting brackets (page 18).

For replacement parts not listed herein, see GRS Parts Catalog, Section 76.

TYPE SA-1 HIGH SIGNAL HEADS COMPLETE WITH MECHANISM

A signal head complete INCLUDES the housing with operating or inoperative mechanism, hood, background, 8-3/8" outer lens for tangent track, ventilators, and bracket for side mounting on a 5" mast (for front and top mounting brackets, see page 18).

A signal head DOES NOT INCLUDE the following; please order separately:

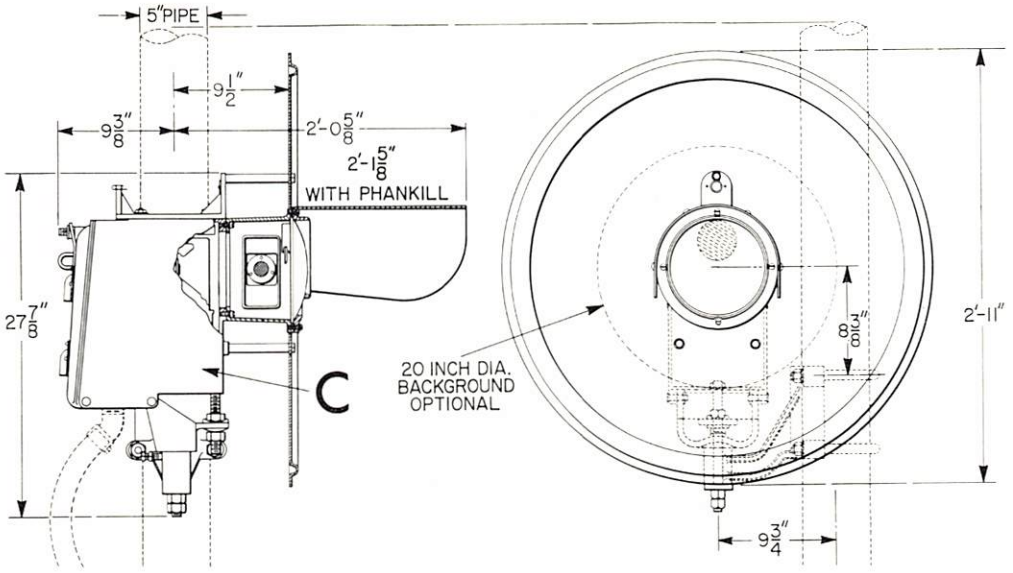
- Wire entrance coupling, see page 17.
- Lamp resistor, see page 16.
- Lamp bulb, see Assemblies Catalog Section 46 (S-11 bulb shape and ± 1/64" precision filament are recommended).
- Roundel and Phankill assemblies, see page 13.

To order, specify "SA-1 High Signal" and catalog number

Ref.	Type of Mechanism	Lens System	Aspect	Type of Wire Connection	Catalog Number	
					With 20" Diameter Background	With 2'-11" Diameter Background
A	Operating	Compound	G/R/Y	Plug coupler	A76-102	A76-114
A1	Inoperative	Compound	Red	A.A.R. terminals	A76-103	A76-115
B	Operating	Stepped	G/R/Y	Plug coupler	A76-106	A76-118
B1	Inoperative	Stepped	Red	A.A.R. terminals	A76-107	A76-119
B2	Operating	Stepped *	G/R/Y	Plug coupler	A76-110	A76-122
B2	Inoperative	Stepped *	Red	A.A.R. terminals	A76-111	A76-123

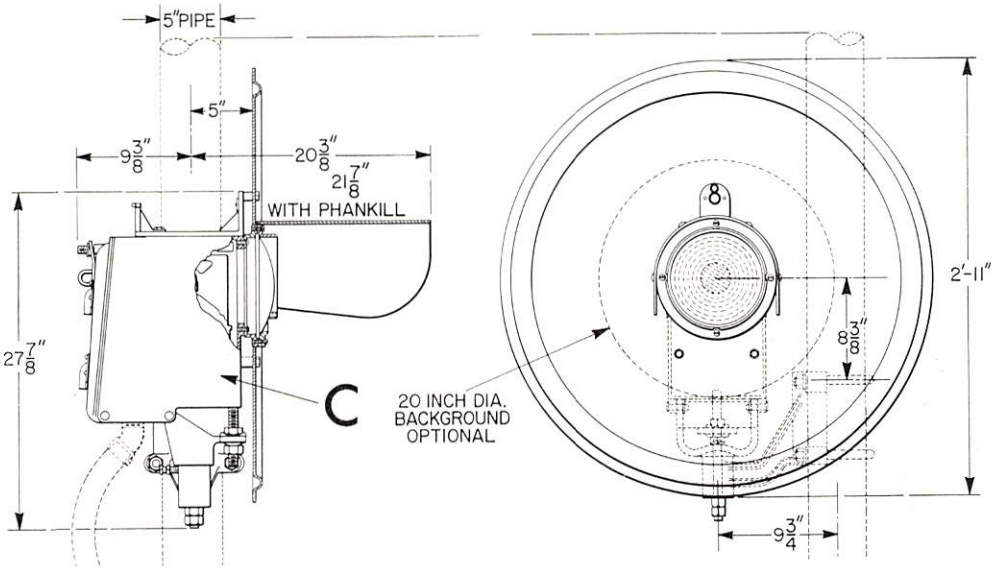
* FOR USE WITH PHANKILL ASSEMBLY, STEPPED LENS FURNISHED WITH CLEAR CENTER.

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A

Type SA-1 searchlight signal head assembly with operating mechanism and 8-3/8 - inch diameter COMPOUND LENS.



B

Type SA-1 searchlight signal head assembly with operating mechanism and 8-3/8 - inch diameter STEPPED LENS

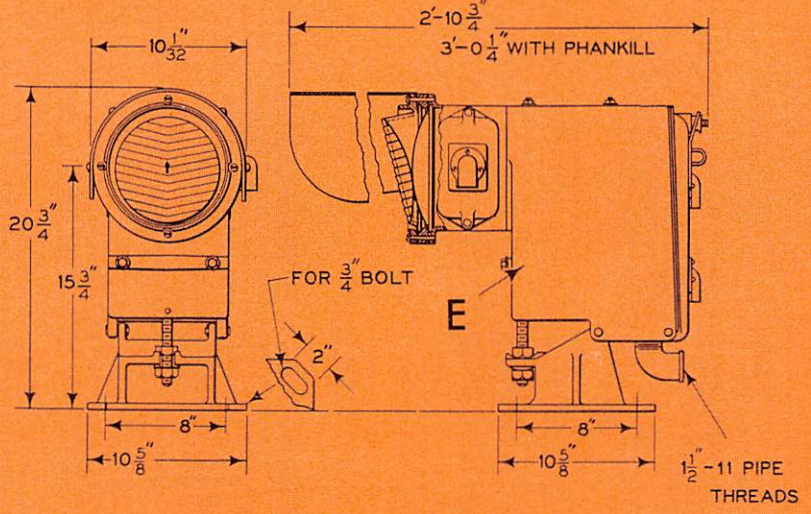
TYPE SA-1 HIGH SIGNAL HOUSING, LESS MECHANISM

A signal housing, less mechanism, INCLUDES a hood, background, 8-3/8" outer lens for tangent track, ventilators, and bracket for side mounting on a 5" mast (for top and front mounting brackets, see page 18). A signal housing DOES NOT INCLUDE a wire entrance coupling (see page 17).

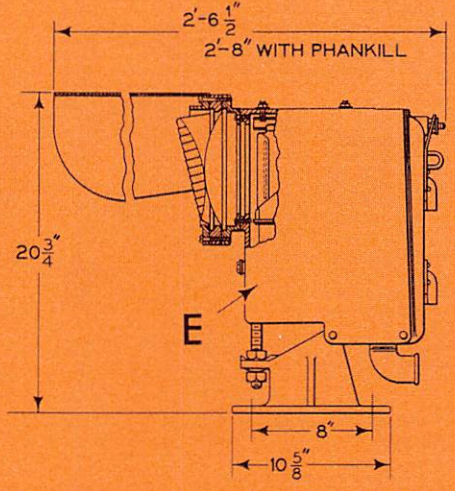
To order, specify "High Signal Housing" and catalog number.

Ref.	Lens System	Catalog Number	
		With 20" Diameter Background	With 2'-11" Diameter Background
C	Compound	A76-130	A76-136
C1	Stepped	A76-132	A76-138
C2	* Stepped	A76-134	A76-140

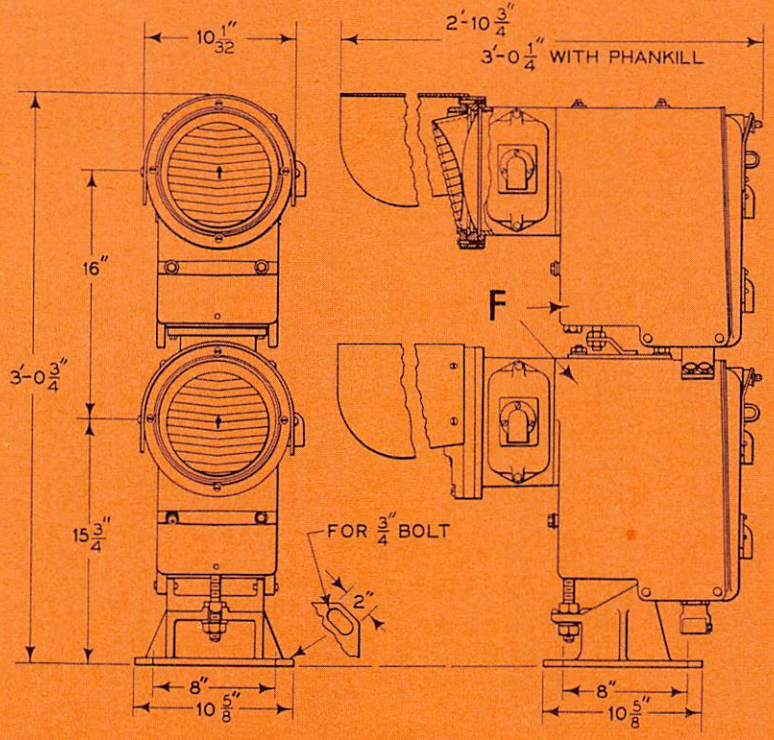
* FOR USE WITH PHANKILL ASSEMBLY, STEPPED LENS FURNISHED WITH CLEAR CENTER.



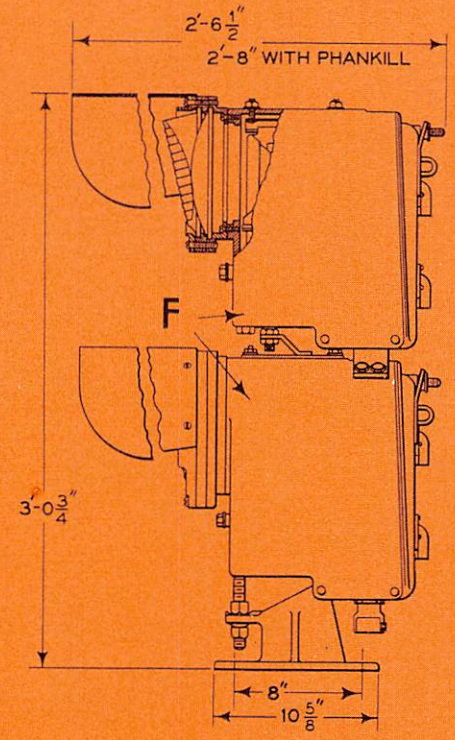
A Type SA-1 searchlight dwarf signal with 8-3/8 inch dia. COMPOUND LENS.



B Type SA-1 searchlight dwarf signal with 8-3/8 inch dia. STEPPED LENS.



C Two unit Type SA-1 searchlight dwarf signal with 8-3/8 inch dia. COMPOUND LENS.



D Two-unit Type SA-1 searchlight dwarf signal with 8-3/8 inch dia. STEPPED LENS.

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TYPE SA-1 DWARF SIGNAL COMPLETE WITH MECHANISM

A dwarf signal complete INCLUDES the housing with operating or inoperative mechanism, hood, background, 8-3/8" V-inclined 10° upward deflecting roundel (for optional roundels, see Parts Catalog Sections 73 and 76), ventilators, and base.

A dwarf signal DOES NOT INCLUDE the following; please order separately:

- Wire entrance coupling, see page 17.
- Lamp resistor, see page 16.
- Lamp bulb, see Assemblies Catalog Section 46 (S-11 bulb shape and ± 1/64" precision filament are recommended).
- Phankill assembly, see page 13.



To order, specify "SA-1 Dwarf Signal" and catalog number.

Ref.	Number Of Units	Type Of Mechanism	Lens System	Aspect	Type or Wire Connection On Mechansim	Catalog Number
A	One	Operating	Compound	G/R/Y	Plug Coupler	A76-201
A1	One	Inoperative	Compound	Red	A.A.R. Terminals	A76-202
B	One	Operating	Stepped	G/R/Y	Plug Coupler	A76-206
B1	One	Inoperative	Stepped	Red	A.A.R. Terminals	A76-207
C	Two	Operating	Compound	G/R/Y	Plug Coupler	A76-211
C1	Two	Inoperative	Compound	Red	A.A.R. Terminals	A76-212
D	Two	Operating	Stepped	G/R/Y	Plug Coupler	A76-216
D1	Two	Inoperative	Stepped	Red	A.A.R. Terminals	A76-717

TYPE SA-1 DWARF SIGNAL HOUSING, LESS MECHANISM

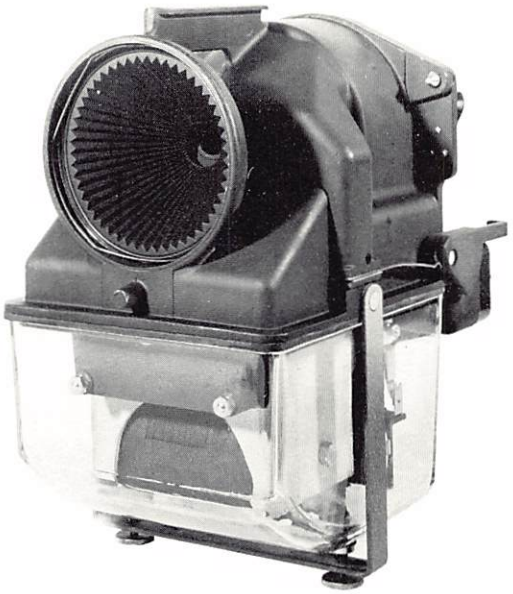
A dwarf signal housing, less mechanism, INCLUDES the hood, background, 8-3/8" V-inclined roundel (for optional roundels, see Parts Catalog Sections 73 and 76), ventilators, and base.

A dwarf signal housing DOES NOT INCLUDE a wire entrance coupling (see page 17).

To order, specify "Dwarf Signal Housing" and catalog number.

Ref.	No. of Units	Lens System	Catalog Number
E	One	Compound	A76-220
E1	One	Stepped	A76-221
F	Two	Compound	A76-225
F1	Two	Stepped	A76-226

TYPE SA-1 SIGNAL OPERATING MECHANISM



The operating mechanism is available with a compound or stepped lens system and has a plug coupler for wire connections.

The operating mechanism DOES NOT INCLUDE the following; please order separately:

- Lamp resistor, see page 16.
- Lamp bulb, see Assemblies Catalog Section 46 (S-11 bulb shape and ± 1/64" precision filament are recommended).

To order, specify "SA-1 Operating Mechanism" and catalog number.

Lens System	Catalog Number
Compound	A76-154
Stepped	A76-157

TYPE SA-1 SIGNAL INOPERATIVE MECHANISM



The inoperative mechanism is for use in two-unit dwarf signals (where only one color is needed) or in high signals that might later be equipped with operating mechanisms. The mechanism is available with a compound or stepped lens system and is provided with standard A.A.R. terminal posts for wire connections.

The inoperative mechanism DOES NOT INCLUDE the following; please order separately:

- Lamp resistor, see page 16.
- Lamp bulb, see Assemblies Catalog Section 46 (S-11 bulb shape and ± 1/64" precision filament are recommended).

To order, specify "SA-1 Inoperative Mechanism" and catalog number.

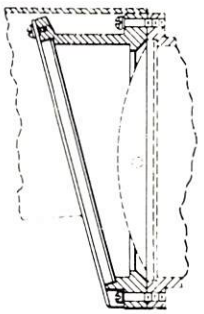
Lens System	Aspect	Catalog Number
Compound	Red	A76-490
Stepped	Red	A76-492

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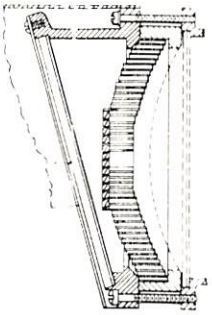
ROUNDEL AND PHANKILL ASSEMBLIES

Signal heads, furnished with 8-3/8" lenses for tangent track only, can be adapted easily for specific conditions by the addition of a roundel or Phankill assembly. The special optical equipment comes ready for installation, except for sealing compound, for which GRS recommends Sealing Compound MS2-332.

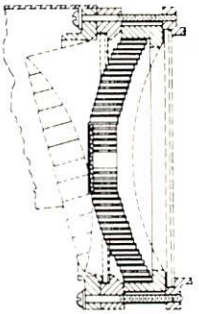
Roundel assemblies fit both stepped and compound lens signals; Phankill assemblies for high signals have a built-in 25 degree close-up roundel. On compound lens high signals, remove the existing close-up roundel before installing the Phankill. A Phankill used with a stepped lens requires a separate order of a signal head with a clear center lens (see page 9), which is specially arranged for use with the Phankill. For other roundels and lenses, see Parts Catalog Sections 73 and 76.



A Roundel assembly for high signals.



B Roundel assembly with Phankill for high signals.



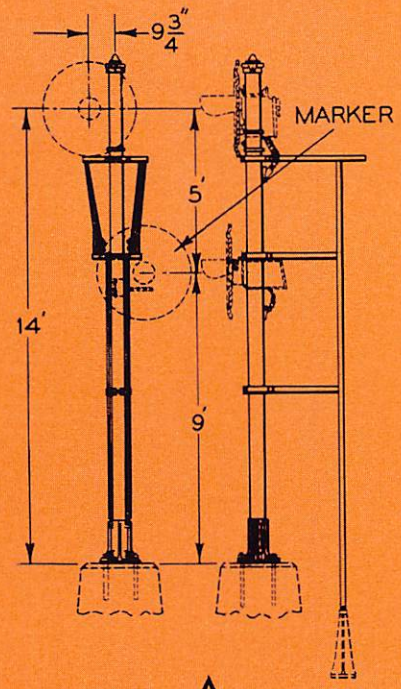
C Phankill assembly for dwarf signals.

To order, specify name shown in bold type and catalog number.

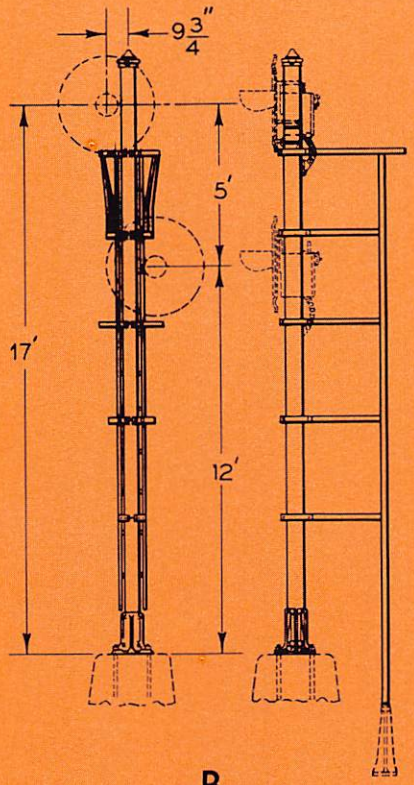
Ref.	Name	Catalog Number
A	**ROUNDEL ASSEMBLY,** inclined 20° deflecting, for compound or stepped-lens high signal	A76-350
A1	**ROUNDEL ASSEMBLY,** same as Ref. A, except 30° Spredlite.	A76-353
B	**PHANKILL ASSEMBLY,** for compound or stepped-lens high signal. The inclined roundel included has no deflecting or Spredlite characteristics	A76-360
B1	**PHANKILL ASSEMBLY,** same as Ref. B, except with 20° deflecting roundel	A76-362
B2	**PHANKILL ASSEMBLY,** same as Ref. B, except with 30° Spredlite roundel	A76-363
C	**PHANKILL ASSEMBLY,** for compound or stepped-lens dwarf signals	A76-370

MAST ASSEMBLIES

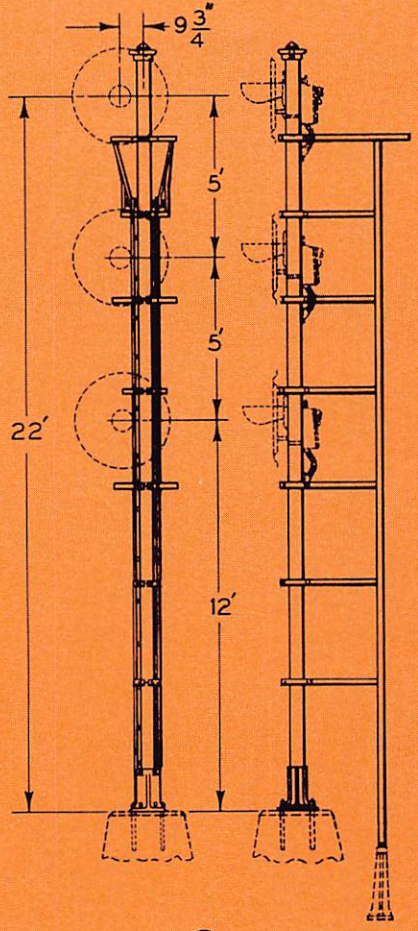
Masts have 5'' inside diameters and are drilled for the number of signal heads listed. Mast heights are approximate, and they come complete with pinnacle, base, ladder and platform, except for Ref. D that has no ladder and platform. To order ladder supports or foundations, see page 16.



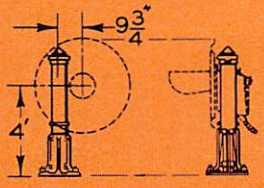
A



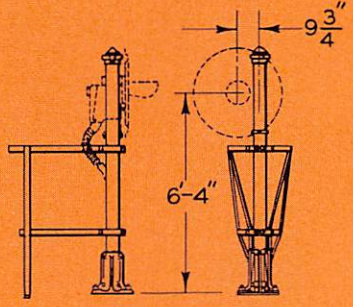
B



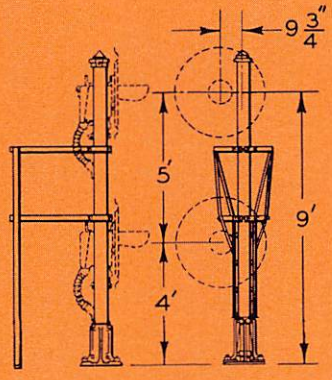
C



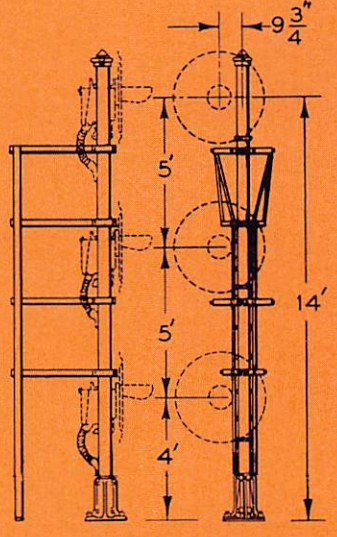
D



E



F

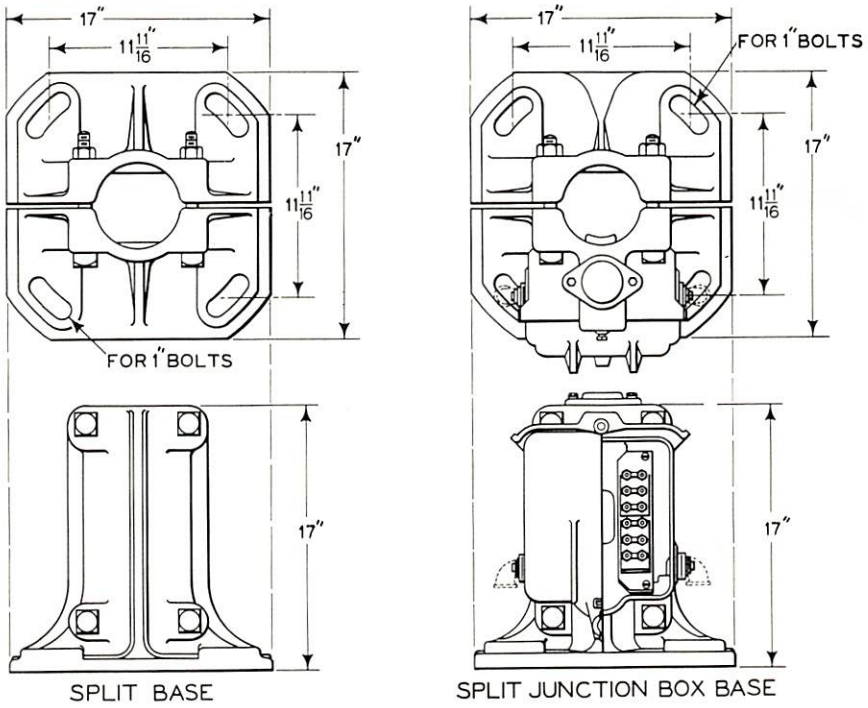


G

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To order, specify "Mast Assembly" and catalog number.

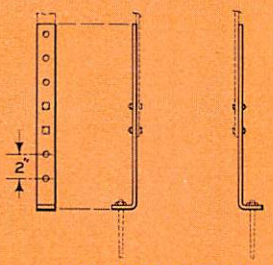
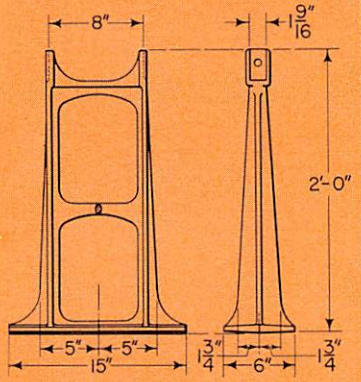
Ref.	Drilled For Signal Heads	Type Of Base (See Below)	Catalog Number
A	Two	Split	A76-302
A1	Two	Split junction box	A76-303
B	Two	Split	A76-308
B1	Two	Split junction box	A76-309
C	Three	Split	A76-312
C1	Three	Split junction box	A76-313
D	One	Split	A76-319
		Split junction box	A76-323
E	One	Split	A76-316
		Split junction box	A76-320
F	Two	Split	A76-317
		Split junction box	A76-321
G	Three	Split	A76-318
		Split junction box	A76-322

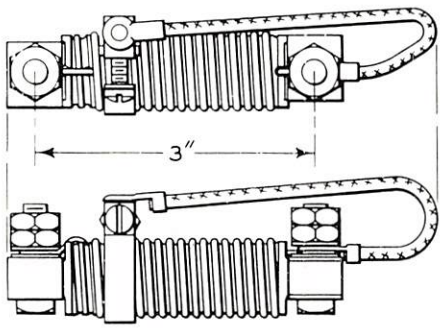


Bases Included With Signal Mast Assemblies

LADDER SUPPORT AND FOUNDATION

To order, specify name shown in bold type and catalog number.

Ref.	Name	Catalog Number
 A - LADDER SUPPORTS	**SUPPORT,** adjustable for use when ladder is to be fastened directly to flat surface; order includes bolts and nuts for attaching to ladder.	A76-325
 B - LADDER FOUNDATION	**FOUNDATION,** for ladder; includes bolts and nuts.	A76-327



ADJUSTABLE LAMP RESISTORS

An adjustable lamp resistor is required for each Type SA-1 operating or inoperative signal mechanism. The resistor must match the lamp used - lamps are listed in Assemblies Catalog Section 46.

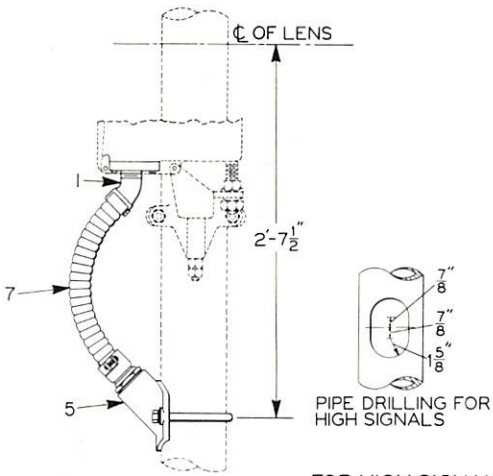
To order, specify "Lamp Resistor" and catalog number.

Resistance, Ohms	Maximum Current	Catalog Number
1	2.5 amps	A76-330
2	1.75 amps	A76-331
5	1.0 amp	A76-332

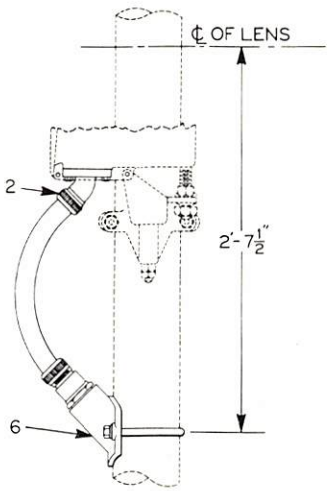
Signed by Israel Jones, texasrails.org 7/16/2026

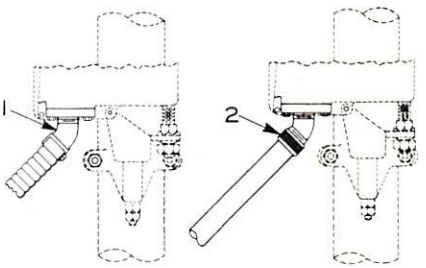
WIRE ENTRANCE COUPLINGS AND CONDUIT

Wire entrance couplings 1, 2, 5, and 6 are for high signal housings; wire entrance couplings 3 and 4 are for dwarf signal housings.

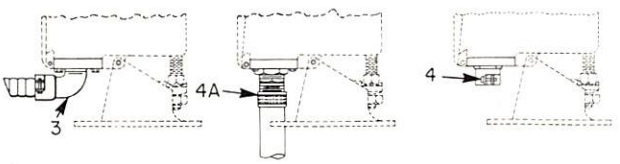


FOR HIGH SIGNALS

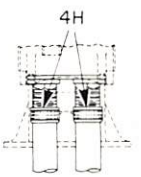




FOR BRIDGE AND BRACKET POST SIGNALS



FOR ALL DWARF SIGNALS



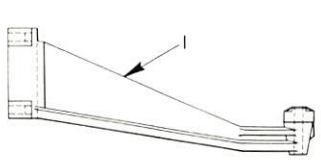
FOR TWO-UNIT DWARF SIGNAL ONLY

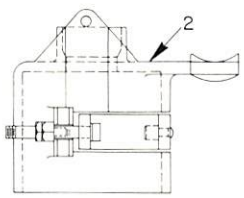
To order, specify name shown in bold type and catalog number.

Ref.	Name	Catalog Number
1	**COUPLING,** 45 degree, for 1-1/2" flexible conduit	A76-526
2	**COUPLING,** 45 degree, for 5/8" to 3/4" dia. cable	A76-527
2A	**COUPLING,** 45 degree, for 3/4" to 7/8" dia. cable	A76-528
2B	**COUPLING,** 45 degree, for 7/8" to 1.0" dia. cable	A76-536
2C	**COUPLING,** 45 degree, for 1.0" to 1-3/16" dia. cable	A76-537
2D	**COUPLING,** 45 degree, for 1-3/16" to 1-3/8" dia. cable	A76-538
2E	**COUPLING,** 45 degree, for 1-3/8" to 1-5/8" dia. cable	A76-539
2F	**COUPLING,** 45 degree, for 1-5/8" to 1-7/8" dia. cable	A76-542
3	**COUPLING,** 90 degree, for 1-1/2" flexible conduit	A76-553

To order, specify name shown in bold type and catalog number.

Ref.	Name	Catalog Number
4	**COUPLING,** straight, for 1-1/2" flexible conduit	A76-564
4A	**COUPLING,** straight, for 5/8" to 3/4" dia. cable	P76-354
4B	**COUPLING,** straight, for 3/4" to 7/8" dia. cable	A76-556
4C	**COUPLING,** straight, for 7/8 to 1.0" dia. cable	A76-557
4D	**COUPLING,** straight, for 1.0" to 1-3/16" dia. cable	A76-558
4E	**COUPLING,** straight, for 1-3/16" to 1-3/8" dia. cable	A76-559
4F	**COUPLING,** straight, for 1-3/8" to 1-5/8" dia. cable	A76-562
4G	**COUPLING,** straight, for 1-5/8" to 1-7/8" dia. cable	A76-563
4H	**COUPLING,** straight, for 1-3/16" to 1-3/8" dia cable for two-unit dwarf signal only	A76-567
5	**COUPLING,** complete with "U" bolt, reducer and gasket for 1-1/2" flexible conduit	A76-568
6	**COUPLING,** complete with "U" bolt, reducer and gasket for 5/8" to 3/4" dia. cable	A76-529
6A	**COUPLING,** same as Ref. 6 for 3/4" to 7/8" dia. cable	A76-530
6B	**COUPLING,** same as Ref. 6 for 7/8" to 1.0" dia. cable	A76-531
6C	**COUPLING,** same as Ref. 6 for 1.0" to 1-3/16" dia. cable	A76-532
6D	**COUPLING,** same as Ref. 6 for 1-3/16" to 1-3/8" dia. cable	A76-533
6E	**COUPLING,** same as Ref. 6 for 1-3/8" to 1-5/8" dia. cable	A76-534
6F	**COUPLING,** same as Ref. 6 for 1-5/8" to 1-7/8" dia. cable	A76-535
7	**CONDUIT,** 1-1/2" flexible, recommended length 2 ft., specify ft. required	A85-868





OPTIONAL MAST MOUNTING BRACKETS

Replaces Side Of Mast Bracket

To order, specify name and catalog number.

Ref.	Name	Catalog Number
1	**Mounting Bracket,** Front of Mast	P76-412
2	**Mounting Bracket,** Top of Mast	P76-540

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GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL

MAIN OFFICE AND PLANT
BOX 600 ROCHESTER NY 14602 Phone: 716 · 436-2020 Cable: GENRASIG (ROCHESTER NY)
Telex: 978317

ATLANTA OFFICE
3379 PEACHTREE ROAD NE ATLANTA GA 30326 Phone: 404 · 233-7373

CHICAGO OFFICE
SUITE 2120 PRUDENTIAL PLAZA CHICAGO IL 60601 Phone: 312 · 467-1221

MONTREAL OFFICE
SUITE 1731 1 PLACE VILLE MARIE MONTREAL QUEBEC H3B 2C1
Phone: 514 · 861-1536

NEW YORK OFFICE
ROOM 928 230 PARK AVENUE NEW YORK NY 10017 Phone: 212 · 697-3681

OAKLAND OFFICE
UNITED CALIFORNIA BANK BUILDING SUITE 915 1330 BROADWAY OAKLAND CA 94612
Phone: 415·893-3100

ST. LOUIS OFFICE
LACLEDE GAS BUILDING 720 OLIVE STREET ST. LOUIS MO 63101
Phone: 314 · 621-4696

ST. PAUL OFFICE
NORTHWESTERN NATIONAL BANK BUILDING SUITE 1380 55 E 5TH STREET ST.PAUL MN 55101
Phone: 612 · 227-9268

WASHINGTON OFFICE
MONTGOMERY CENTER SUITE 613 8630 FENTON STREET SILVER SPRING MD 20910
Phone: 301 · 587-4770

GRS INTERNATIONAL

MAIN OFFICE:
BOX 600 ROCHESTER NEW YORK U.S.A. 14602 Phone: 716 · 436-2020
Cable: GENRASIG (ROCHESTER NY) Telex: 978317

GRS TRADING CORPORATION:
BOX 600 ROCHESTER NEW YORK U.S.A. 14602 Phone: 716 436-2020
Cable: GENRASIG (ROCHESTER NY) Telex: 978317

GEC-GENERAL SIGNAL LIMITED
ELSTREE WAY BOREHAMWOOD HERTFORDSHIRE WD6 1RX ENGLAND Phone: 01-953-8211
Cable: RAILSIGKO BOREHAMWOOD (ENGLAND) Telex: 22777 GECBWD G BOREHAMWOOD (ENGLAND)

ALGEMENE SEIN INDUSTRIE B.V.
CROESELAAN 28 UTRECHT 2503 NETHERLANDS Phone: (030) 94 26 46
Cable: GENRASIG UTRECHT (NETHERLANDS) Telex: 47455 GRASI NL UTRECHT (NETHERLANDS)

REPRESENTATIVES AND LICENSEES IN:
ARGENTINA AUSTRALIA BRAZIL CHILE FRANCE ITALY JAPAN KOREA
MEXICO SAUDI ARABIA SOUTH AFRICA SPAIN TAIWAN TURKEY VENEZUELA



GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL
ROCHESTER NEW YORK 14602

CATALOG SECTION A76

CROSS - INDEX

TYPE SA-1 SEARCHLIGHT SIGNALS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A76-102			SA-1 SEARCHLIGHT SIGNAL COMP.	8
	53051-150GR3		HOUSING	
	53093-14		BRACKET	
	0272-9	2	NUT	
	49127-64		HOOD	
	49162-80		BACKGROUND	
	16194-17	2	U BOLT	
	42333-63	4	NUT	
	59545-150GR3		SA-1 MECHANISM	
A76-103			SA-1 SEARCHLIGHT SIGNAL COMP.	8
	53051-150GR3		HOUSING	
	53093-14		BRACKET	
	0272-9	2	NUT	
	49127-64		HOOD	
	49162-80		BACKGROUND	
	16194-17	2	U BOLT	
	42333-63	4	NUT	
	53052-339GR5		SA-1 MECHANISM	
A76-106			SA-1 SEARCHLIGHT SIGNAL COMP.	8
	53051-100GR6		HOUSING	
	53093-14		BRACKET	
	0272-9	2	NUT	
	49127-64		HOOD	
	49162-80		BACKGROUND	
	16194-17	2	U BOLT	
	42333-63	4	NUT	
	59545-100GR2		SA-1 MECHANISM	
A76-107			SA-1 SEARCHLIGHT SIGNAL COMP.	8
	53051-100GR6		HOUSING	
	53093-14		BRACKET	
	0272-9	2	NUT	
	49127-64		HOOD	
	49162-80		BACKGROUND	
	16194-17	2	U BOLT	
	42333-63	4	NUT	
	53052-387GR1		SA-1 MECHANISM	
A76-110			SA-1 SIGNAL HOUSING A76-110 COMPLETE	8
	53051-100GR4		HOUSING	
	53093-14		BRACKET	
	0272-9	2	NUT	
	49127-64		HOOD	
	49162-80		BACKGROUND	
	16194-17	2	U BOLT	
	42333-63	4	NUT	
	59545-100GR2		SA-1 MECHANISM	
A76-111			SA-1 SIGNAL HOUSING A76-111 COMPLETE	8
	53051-100GR4		HOUSING	
	53093-14		BRACKET	
	0272-9	2	NUT	
	49127-64		HOOD	
	49162-80		BACKGROUND	
	16194-17	2	U BOLT	
	42333-63	4	NUT	
	53052-387GR1		SA-1 MECHANISM	

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TYPE SA-1 SEARCHLIGHT SIGNALS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A76-114			SA-1 SIGNAL WITH MECH A76-0114	8
	53051-150GR3		HOUSING	
	53093-14		BRACKET	
	0272-9	2	NUT	
	49127-64		HOOD	
	49162-25		BACKGROUND	
	16194-17	2	U BOLT	
	42333-63	4	NUT	
	59545-150GR3		SA-1 MECHANISM	
A76-115			SA-1 SIGNAL WITH MECHANISM A76-0115	8
	53051-150GR3		HOUSING	
	53093-14		BRACKET	
	0272-9	2	NUT	
	49127-64		HOOD	
	49162-25		BACKGROUND	
	16194-17	2	U BOLT	
	42333-63	4	NUT	
	53052-339GR5		MECHANISM	
A76-118			SA-1 SEARCHLIGHT SIGNAL COMP.	8
	53051-100GR6		HOUSING	
	53093-14		BRACKET	
	0272-9	2	NUT	
	49127-64		HOOD	
	49162-25		BACKGROUND	
	16194-17	2	U BOLT	
	42333-63	4	NUT	
	59545-100GR2		SA-1 MECHANISM	
A76-119			SA-1 SEARCHLIGHT SIGNAL COMP.	8
	53051-100GR6		HOUSING	
	53093-14		BRACKET	
	0272-9	2	NUT	
	49127-64		HOOD	
	49162-25		BACKGROUND	
	16194-17	2	U BOLT	
	42333-63	4	NUT	
	53052-387GR1		SA-1 MECHANISM	
A76-122			SA-1 SEARCHLIGHT SIGNAL COMP.	8
	53051-100GR7		HOUSING	
	53093-14		BRACKET	
	0272-9	2	NUT	
	49127-64		HOOD	
	49162-25		BACKGROUND	
	16194-17	2	U BOLT	
	42333-63	4	NUT	
	59545-100GR2		SA-1 MECHANISM	
A76-123			SA-1 SEARCHLIGHT SIGNAL COMP.	8
	53051-100GR4		HOUSING	
	53093-14		BRACKET	
	0272-9	2	NUT	
	49127-64		HOOD	
	49162-25		BACKGROUND	
	16194-17	2	U BOLT	
	42333-63	4	NUT	
	53052-387GR1		SA-1 MECHANISM	

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TYPE SA-1 SEARCHLIGHT SIGNALS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A76-130			SA-1 SIGNAL HOUSING A76-130 COMPLETE	9
	53051-150GR3		HOUSING	
	53093-14		BRACKET	
	0272-9	2	NUT	
	49127-64		HOOD	
	49162-80		BACKGROUND	
	16194-17	2	U-BOLT	
	42333-63	4	NUT	
A76-132			SA-1 SIGNAL HOUSING A76-0132 COMPLETE	9
	53051-100GR6		HOUSING	
	53093-14		BRACKET	
	0272-9	2	NUT	
	49127-64		HOOD	
	49162-80		BACKGROUND	
	16194-17	2	U BOLT	
	42333-63	4	NUT	
A76-134			SA-1 SEARCHLIGHT SIGNAL COMP.	9
	53051-100GR4		HOUSING	
	53093-14		BRACKET	
	0272-9	2	NUT	
	49127-64		HOOD	
	49162-82		BACKGROUND	
	16194-17	2	U BOLT	
	42333-63	4	NUT	
A76-136			SA-1 HIGH SIGNAL LESS MECHANISM	9
	53051-150GR3		HOUSING	
	53093-14		BRACKET	
	0272-9	2	NUT	
	49127-64		HOOD	
	49162-25		BACKGROUND	
	16194-17	2	U BOLT	
	42333-63	4	NUT	
A76-138			SA-1 HIGH SIGNAL LESS MECH A76-0138	9
	53051-100GR6		HOUSING	
	53093-14		BRACKET	
	0272-9	2	NUT	
	49127-64		HOOD	
	49162-25		BACKGROUND	
	16194-17	2	U BOLT	
	42333-63	4	NUT	
A76-140			SA-1 SEARCHLIGHT SIGNAL COMP.	9
	53051-100GR4		HOUSING	
	53093-14		BRACKET	
	0272-9	2	NUT	
	49127-64		HOOD	
	49162-25		BACKGROUND	
	16194-17	2	U BOLT	
	42333-63	4	NUT	
A76-154	59545-150GR3		SA-1 SIGNAL OPER MECH	
A76-157	59545-100GR2		SA-1 SIG OPER MECH	
A76-201			SA-1 DWARF SIGNAL COMPLETE WITH MECHANISM	11
	53050-150GR3		HOUSING	
	49127-64		HOOD	
	59545-150GR3		SA-1 MECHANISM	
A76-202			SA-1 SIGNAL COMP.W/MECHANISM	11
	53050-150GR3		HOUSING	
	49127-64		HOOD	
	53052-339GR5		MECHANISM	

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TYPE SA-1 SEARCHLIGHT SIGNALS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A76-206			SA-1 SIGNAL MECH COMPLETE	11
	53050-102GR4		HOUSING	
	49127-64		HOOD	
	59545-100GR2		SA-1 MECHANISM	
A76-207			SA-1 MECHANISM COMPLETE	11
	53050-102GR4		HOUSING	
	49127-64		HOOD	
	53052-387GR1		MECHANISM	
A76-211			SA-1 DWARF SIGNAL COMPLETE	11
	53050-251GR2		HOUSING	
	49127-64	2	HOOD	
	59545-150GR3	2	SA-1 MECHANISM	
A76-212			SA-1 MECHANISM COMPLETE	11
	53050-251GR2		HOUSING	
	49127-64		HOOD	
	53052-339GR5	2	MECHANISM	
A76-216			SA-1 MECH.COMPLETE	11
	53050-203GR3		HOUSING	
	49127-64	2	HOOD	
	59545-100GR2	2	SA-1 MECHANISMS	
A76-217			SA-1 MECHANISM COMPLETE	11
	53050-203GR3		HOUSING	
	49127-64	2	HOOD	
	53052-387GR1	2	MECHANISM	
A76-220			SA-1 DWARF SIGNAL HOUSING LESS MECHANISM	11
	53050-150GR3		HOUSING	
	49127-64		HOOD	
A76-221			TYPE SA-1 SIGNAL HOUSING A76-221	11
	53050-102GR4		HOUSING	
	49127-64		HOOD	
A76-225			DWARF SIGNAL HOUSING LESS MECHANISM	11
	53050-251GR2		HOUSING	
	49127-64	2	HOOD	
A76-226			SA-1 DWARF SIGNAL HOUSING A76-0226	11
	53050-203GR3		HOUSING SA-1 DWARF LESS MECH	
	49127-64	2	HOOD	
A76-302			MAST ASSEMBLY COMPLETE BASE TO BE SPECIFIED	15
	31491-153		POLE	
	43950		BASE	
	1661-4		PINNACLE	
	0551-1		BOLT	
	41739-2		NUT	
	314-142	2	HANDRAIL	
	314-143		HANDRAIL	
	319-219	2	BRACE	
	319-220	2	BRACE	
	313-97GR1		PLATFORM	
	312-125GR2		LADDER	
	312-125GR3		LADDER	
	315-120	2	STAY	
	317-41GR1	3	CLAMP	
	09-2	28	BOLT & NUT	

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TYPE SA-1 SEARCHLIGHT SIGNALS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A76-303			MAST ASSEMBLY COMPLETE BASE TO BE SPECIFIED	15
	31491-154		POLE	
	43950		BASE	
	1661-4		PINNACLE	
	0551-1		BOLT	
	41739-2		NUT	
	314-142	2	HANDRAIL	
	314-143		HANDRAIL	
	319-219	2	BRACE	
	319-220	2	BRACE	
	313-97GR1		PLATFORM	
	312-125GR2		LADDER	
	312-125GR3		LADDER	
	315-120	2	STAY	
	317-41GR1	3	CLAMP	
	09-2	28	BOLT & NUT	
A76-308			MAST ASSEMBLY COMPLETE BASE TO BE SPECIFIED	15
	31491-155		POLE	
	43950		BASE	
	1661-4		PINNACLE	
	0551-1		BOLT	
	41739-2		NUT	
	314-142	2	HANDRAILS	
	314-143		HANDRAIL	
	319-219	2	BRACES	
	319-220	2	BRACES	
	313-97GR1	2	PLATFORMS	
	314-144	2	HANDRAILS	
	312-125GR3		LADDER	
	312-125GR4		LADDER	
	315-120	2	STAYS	
	317-41GR1	5	CLAMPS	
	09-2	36	BOLTS & NUTS	
A76-309			MAST ASSEMBLY COMPLETE BASE TO BE SPECIFIED	15
	31491-156		POLE	
	43950		BASE	
	1661-4		PINNACLE	
	0551-1		BOLT	
	41739-2		NUT	
	314-142	2	HANDRAILS	
	314-143		HANDRAIL	
	319-219	2	BRACES	
	319-220	2	BRACES	
	313-97GR1	2	PLATFORMS	
	314-144	2	HANDRAILS	
	312-125GR3		LADDER	
	312-125GR4		LADDER	
	315-120	2	STAYS	
	317-41GR1	5	CLAMPS	
	09-2	36	BOLTS & NUTS	
A76-312			MAST ASSEMBLY COMPLETE BASE TO BE SPECIFIED	15
	31491-157		POLE	
	43950		BASE	
	1661-4		PINNACLE	
	0551-1		BOLT	
	41739-2		NUT	
	314-142	2	HANDRAILS	
	314-143		HANDRAIL	
	319-219	2	BRACES	
	319-220	2	BRACES	
	313-97GR1	3	PLATFORMS	
	314-144	4	HANDRAILS	
	312-125GR6		LADDER	
	315-120	2	STAYS	
	317-41GR1	7	CLAMPS	
	09-2	40	BOLTS & NUTS	

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TYPE SA-1 SEARCHLIGHT SIGNALS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A76-313			MAST ASSEMBLY COMPLETE BASE TO BE SPECIFIED	15
	31491-158		POLE	
	43950		BASE	
	1661-4		PINNACLE	
	0551-1		BOLT	
	41739-2		NUT	
	314-142	2	HANDRAILS	
	314-143		HANDRAIL	
	319-219	2	BRACES	
	319-220	2	BRACES	
	313-97GR1	3	PLATFORMS	
	314-144	4	HANDRAILS	
	312-125GR6		LADDER	
	315-120	2	STAYS	
	317-41GR1	7	CLAMPS	
	09-2	40	BOLTS & NUTS	
A76-316			MAST ASSEMBLY COMPLETE BASE TO BE SPECIFIED	15
	31491-210		POLE	
	43950		BASE	
	1661-4		PINNACLE	
	0551-1		BOLT	
	41739-2		NUT	
	314-142	2	HANDRAIL	
	314-143		HANDRAIL	
	319-219	2	BRACE	
	319-220	2	BRACE	
	313-97GR1		PLATFORM	
	312-125GR1		LADDER	
	317-41GR1	2	CLAMP	
	51836-12	2	SUPPORT	
	09-2	24	BOLT & NUT	
A76-317			MAST ASSEMBLY COMPLETE BASE TO BE SPECIFIED	15
	31491-211		POLE	
	43950		BASE	
	1661-4		PINNACLE	
	0551-1		BOLT	
	41739-2		NUT	
	314-142	2	HANDRAIL	
	314-143		HANDRAIL	
	319-219	2	BRACE	
	319-220	2	BRACE	
	313-97GR1		PLATFORM	
	312-125GR1		LADDER	
	317-41GR1	2	CLAMP	
	51836-12	2	SUPPORT	
	09-2	24	BOLT & NUT	
A76-318			MOUNTING ASSEMBLY COMPLETE BASE TO BE SPECIFIED	15
	31491-212		POLE	
	43950		BASE	
	1661-4		PINNACLE	
	0551-1		BOLT	
	41739-2		NUT	
	314-142	2	HANDRAIL	
	314-143		HANDRAIL	
	319-219	2	BRACE	
	319-220	2	BRACE	
	313-97GR1	2	PLATFORM	
	314-144	2	HANDRAIL	
	312-125GR1		LADDER	
	312-125GR2		LADDER	
	317-41GR1	4	CLAMP	
	51836-12	2	SUPPORT	
	09-2	36	BOLT & NUT	

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TYPE SA-1 SEARCHLIGHT SIGNALS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A76-319			MAST ASSEMBLY BASE TO BE SPECIFIED	15
	10021-20		POLE	
	43950		BASE	
	1661-4		PINNACLE	
	0551-1		BOLT	
	41739-2		NUT	
A76-320			MAST ASSEMBLY COMPLETE WITH SPLIT JUNCTION BOX BASE BASE TO BE SPECIFIED	15
	31491-210		POLE	
	43950		BASE	
	1661-4		PINNACLE	
	0551-1		BOLT	
	41739-2		NUT	
	314-142	2	HANDRAIL	
	314-143		HANDRAIL	
	319-219	2	BRACE	
	319-220	2	BRACE	
	313-97GR1		PLATFORM	
	312-125GR1		LADDER	
	317-41GR1	2	CLAMP	
	51836-12	2	SUPPORT	
	09-2	24	BOLT & NUT	
A76-321			MAST ASSEMBLY COMPLETE WITH SPLIT JUNCTION BOX BASE BASE TO BE SPECIFIED	15
	31491-211		POLE	
	43950		BASE	
	1661-4		PINNACLE	
	0551-1		BOLT	
	41739-2		NUT	
	314-142	2	HANDRAIL	
	314-143		HANDRAIL	
	319-219	2	BRACE	
	319-220	2	BRACE	
	313-97GR1		PLATFORM	
	312-125GR1		LADDER	
	317-41GR1	2	CLAMP	
	51836-12	2	SUPPORT	
	09-2	24	BOLT & NUT	
A76-322			MOUNTING ASSEMBLY COMPLETE W/ SPLIT JUNCTION BOX BASE BASE TO BE SPECIFIED	15
	31491-212		POLE	
	43950		BASE	
	1661-4		PINNACLE	
	0551-1		BOLT	
	41739-2		NUT	
	314-142	2	HANDRAIL	
	314-143		HANDRAIL	
	319-219	2	BRACE	
	319-220	2	BRACE	
	313-97GR1	2	PLATFORM	
	314-144	2	HANDRAIL	
	312-125GR1		LADDER	
	312-125GR2		LADDER	
	317-41GR1	4	CLAMP	
	51836-12	2	SUPPORT	
	09-2	36	BOLT & NUT	

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TYPE SA-1 SEARCHLIGHT SIGNALS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A76-323			MAST ASSEMBLY WITH JUNCTION BOX BASE -BASE TO BE SPECIFIED	15
	10021-20		POLE	
	43950		BASE	
	1661-4		PINNACLE	
	0551-1		BOLT	
	41739-2		NUT	
A76-327			FOUNDATION COMPLETE	
	36773		FOUNDATION	
	077-1	2	BOLT & NUT	
A76-330	55945-10GR1		RESISTOR	16
A76-331	55945-10GR2		RESISTOR	16
A76-332	55945-10GR3		RESISTOR	16
A76-350			ROUNDEL ASSEMBLY	13
	56955 GR1		RING	
	39157	4	SCREW	
	01273-7	4	WASHER	
A76-353			ROUNDEL ASSEMBLY	13
	56955 GR3		RING	
	39157	4	SCREW	
	01273-7	4	WASHER	
A76-360			PHANKILL ASSEMBLY	13
	56955-2GR1		RING	
	56629-4GR2		PHANKILL	
	35788-5	4	SCREW	
	01273-7	4	WASHER	
A76-362			PHANKILL ASSEMBLY	13
	56955-2GR4		RING	
	56629-4GR2		PHANKILL	
	35788-5	4	SCREW	
	01273-7	4	WASHER	
A76-363			PHANKILL ASSEMBLY	13
	56955-2GR2		RING	
	56629-4GR2		PHANKILL	
	35788-5	4	SCREW	
	01273-7	4	WASHER	
A76-370			PHANKILL ASSEMBLY	13
	56629-4GR1		PHANKILL	
	33287-25	4	SCREW	
	01273-7	4	WASHER	
A76-490	53052-339GR5		SA-1 SIGNAL MECH INOP WITH COMPOUND LENS	
A76-492	53052-387GR1		INOPER. MECHANISM WITH STEPPED LENS	
A76-526			COUPLING	17
	56353-33		COUPLING	
	59202-25		COUPLING	
	35132-32		ELBOW	
A76-527			CONNECTOR & COUPLING	17
	44515-49		CONNECTOR	
	59202-23		COUPLING	
A76-528			COUPLING	17
	44515-46		CONNECTOR	
	59202-23		COUPLING	
A76-529			COUPLING	18
	45689-191		COUPLING	
	13014-158		GASKET	
	41892		REDUCER	
	44515-45		CONNECTOR	
	20476-49		U BOLT	
	1048-6	2	NUT	
	01250-21	2	WASHER	
	01273-10	2	WASHER	

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TYPE SA-1 SEARCHLIGHT SIGNALS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A76-530			COUPLING	18
	45689-191		COUPLING	
	13014-158		GASKET	
	41892		REDUCER	
	44515-60		CONNECTOR	
	20476-49		U BOLT	
	1048-6	2	NUT	
	01250-21	2	WASHER	
	01273-10	2	WASHER	
A76-531			COUPLING	18
	45689-191		COUPLING	
	13014-158		GASKET	
	1439-5		REDUCER	
	56353-6		CONNECTOR	
	20476-49		U BOLT	
	1048-6	2	NUT	
	01250-21	2	WASHER	
	01273-10	2	WASHER	
A76-532			COUPLING	18
	45689-191		COUPLING	
	13014-158		GASKET	
	1439-5		REDUCER	
	56353-8		CONNECTOR	
	20476-49		U BOLT	
	1048-6	2	NUT	
	01250-21	2	WASHER	
	01273-10	2	WASHER	
A76-533			COUPLING	18
	45689-191		COUPLING	
	13014-158		GASKET	
	56353		CONNECTOR	
	20476-49		U BOLT	
	1048-6	2	NUT	
	01250-21	2	WASHER	
	01273-10	2	WASHER	
A76-534			COUPLING	18
	45689-191		COUPLING	
	13014-158		GASKET	
	56353-30		CONNECTOR	
	20476-49		U BOLT	
	1048-6	2	NUT	
	01250-21	2	WASHER	
	01273-10	2	WASHER	
A76-535			COUPLING	18
	45689-191		COUPLING	
	13014-158		GASKET	
	56353-31		CONNECTOR	
	20476-49		U BOLT	
	1048-6	2	NUT	
	01250-21	2	WASHER	
	01273-10	2	WASHER	
A76-536			COUPLING	17
	44515-63		CONNECTOR	
	59202-24		COUPLING	
A76-537			COUPLING	17
	44515-41		CONNECTOR	
	59202-24		COUPLING	
A76-538			COUPLING	17
	44515-34		CONNECTOR	
	59202-24		COUPLING	
A76-539			COUPLING	17
	44515-19		CONNECTOR	
	59202-25		COUPLING	
A76-542			COUPLING	17
	44515-56		CONNECTOR	
	59202-25		COUPLING	
A76-553			ELBOW	17
	0776-1		ELBOW	
	59202-25		COUPLING	
A76-556			COUPLING	18
	44515-60		CONNECTOR	
	59202-23		COUPLING	
A76-557			COUPLING	18
	56353-6		CONNECTOR	
	59202-24		COUPLING	
A76-558			COUPLING	18
	56353-8		CONNECTOR	
	59202-24		COUPLING	
A76-559			COUPLING	18
	56353		CONNECTOR	
	59202-25		COUPLING	
A76-562			COUPLING	18
	56353-30		CONNECTOR	
	59202-25		COUPLING	
A76-563			COUPLING	18
	56353-31		CONNECTOR	
	59202-25		COUPLING	
A76-564			COUPLING	18
	56353-33		COUPLING	
	59202-25		COUPLING	

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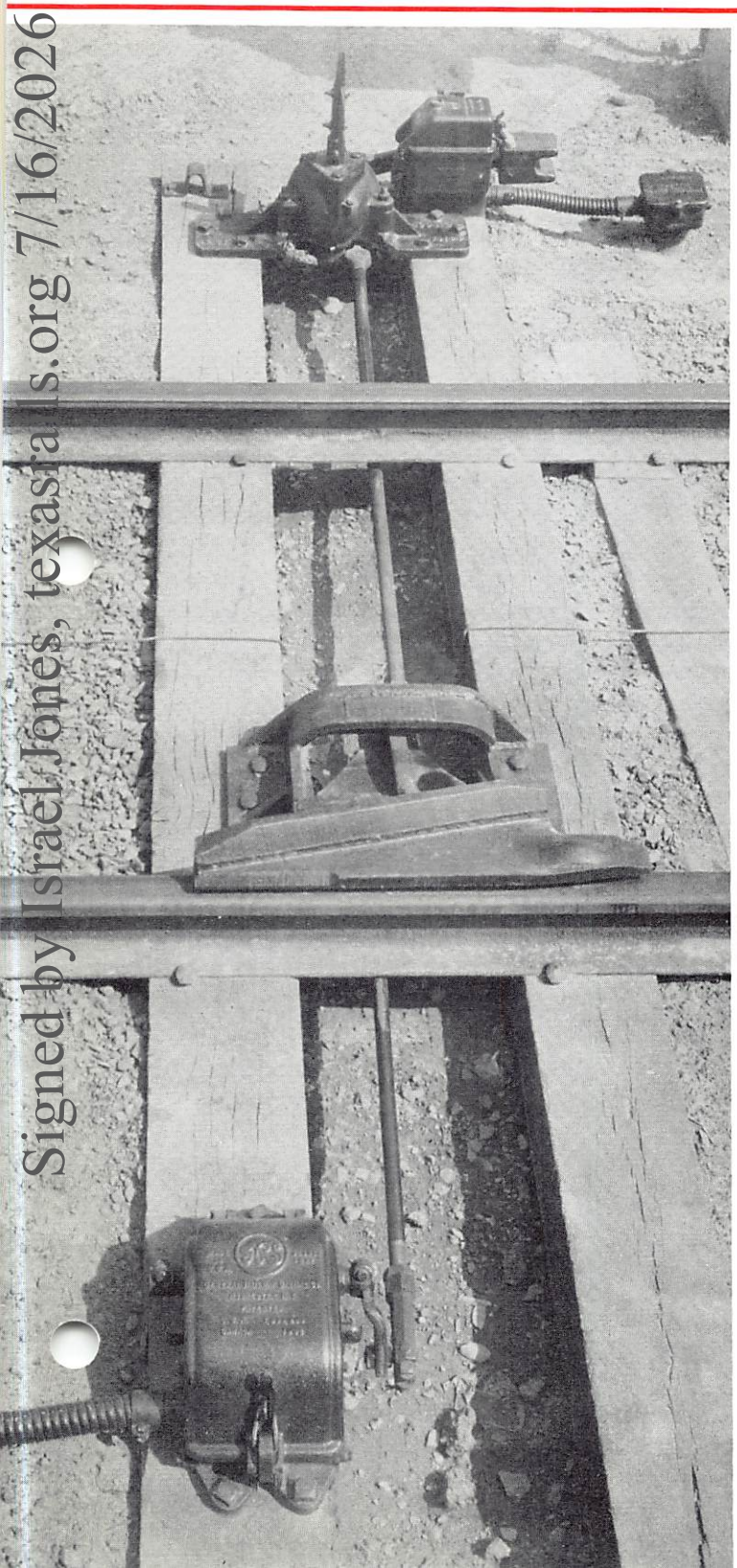
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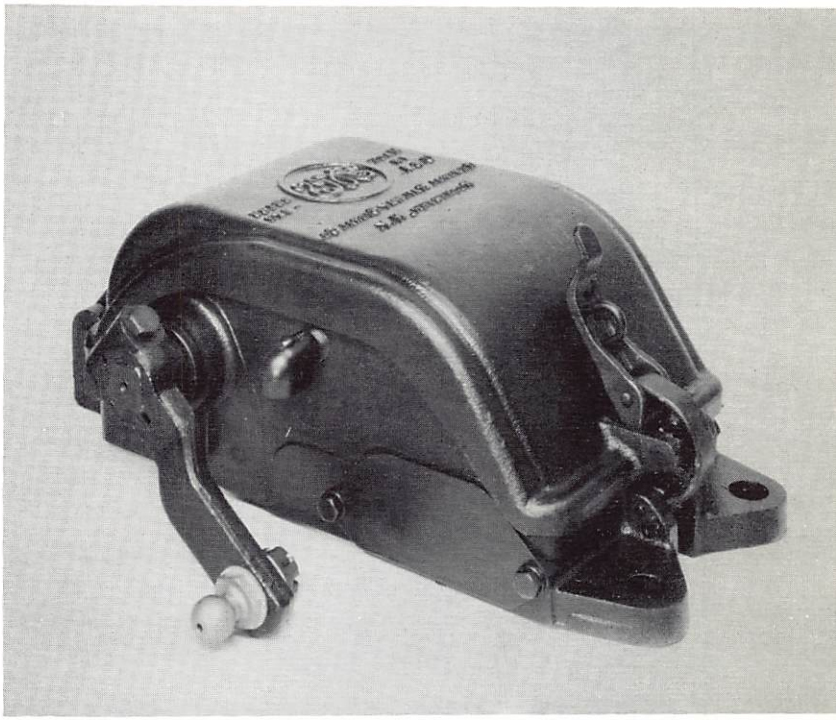
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	56353	2	CONNECTOR	
	59202-26		COUPLING	
A76-568			COUPLING	18
	45689-191		COUPLING	
	13014-158		GASKET	
	56353-33		COUPLING	
	20476-49		U BOLT	
	1048-6	2	NUT	
	01250-21	2	WASHER	
	01273-10	2	WASHER	

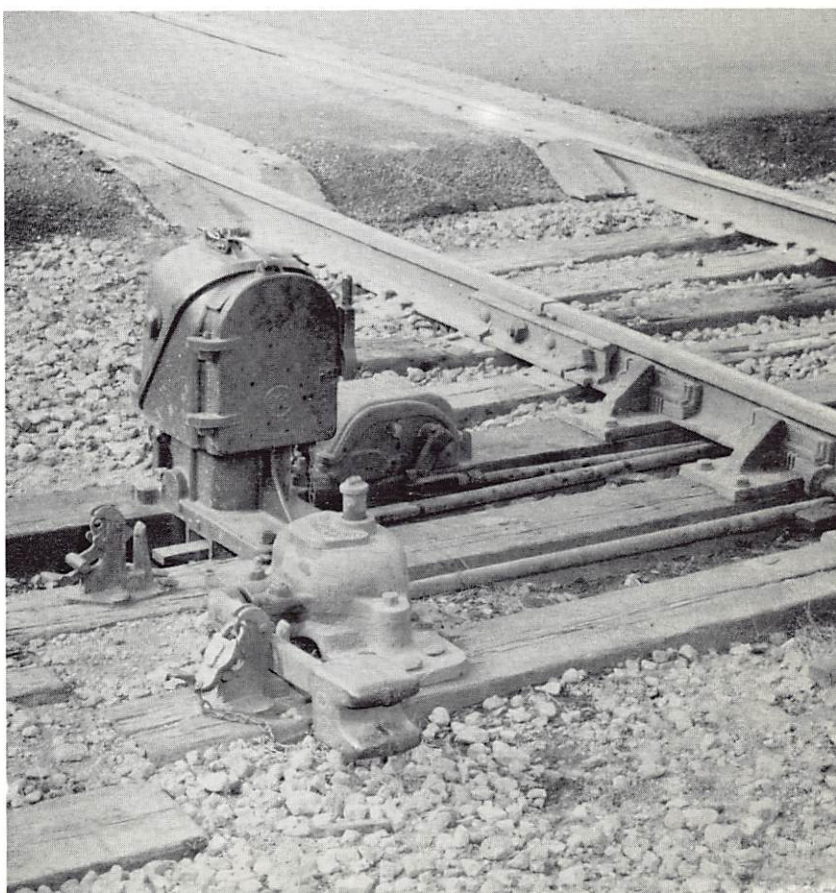
MODELS 7J AND 7K
SWITCH CIRCUIT CONTROLLERS

GRS CATALOG **81-1**

GRS







Signed by Israel Jones, texastracks.org 7/16/2026

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Model 7 3
Wear-Protected Rollers 4
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FEATURES

- **RUGGED** — heavily reinforced case, 1 1/2-inch cold-drawn steel shaft, corrosion and wear-resistant cams, spring steel cam surfaces.
- **SENSITIVE** — a 5-degree movement of the crank transfers the contacts.
- **RELIABLE** — positive action contact mechanism, spring contact pressure, withstands vibration.
- **VERSATILE** — cams adjustable to operate contacts simultaneously or progressively, left or right-hand operation, wide choice of fittings and accessories.

INTRODUCTION

The Model 7 line of switch circuit controllers meets the rigorous demands of the rail industry — high sensitivity, reliability, and rugged strength to withstand great mechanical stress under a wide range of environmental conditions.

The Model 7 consists of four sets of front-back contacts housed in a cast-iron case with a cast-aluminum cover. A mechanical linkage to the crankarm of the controller actuates the contacts. Thus, the controller may be used to integrate the positions of various devices with suitable control circuits. Commonly used with switches to detect switch positions, Model 7 controllers can also detect the positions of derails, bridge locks, slide detectors, etc. They can shunt track circuits as well as control relay circuits.

MODEL 7

Arch Construction

The arched, cast-iron case provides great mechanical strength, eliminates projecting corners, and offers full access to all internal parts. Across the inside of the cast aluminum cover are two reinforcing bridges. With the cover closed, a bridge gasket bears against the top of the terminal board. This seals the terminal compartment from the mechanism compartment, prevents grease and oil from collecting on wires and terminals.

The outside rim of the cover is also gasketed, and a spring-type padlock hasp keeps the cover tightly closed. Dirt and moisture are effectively sealed out.

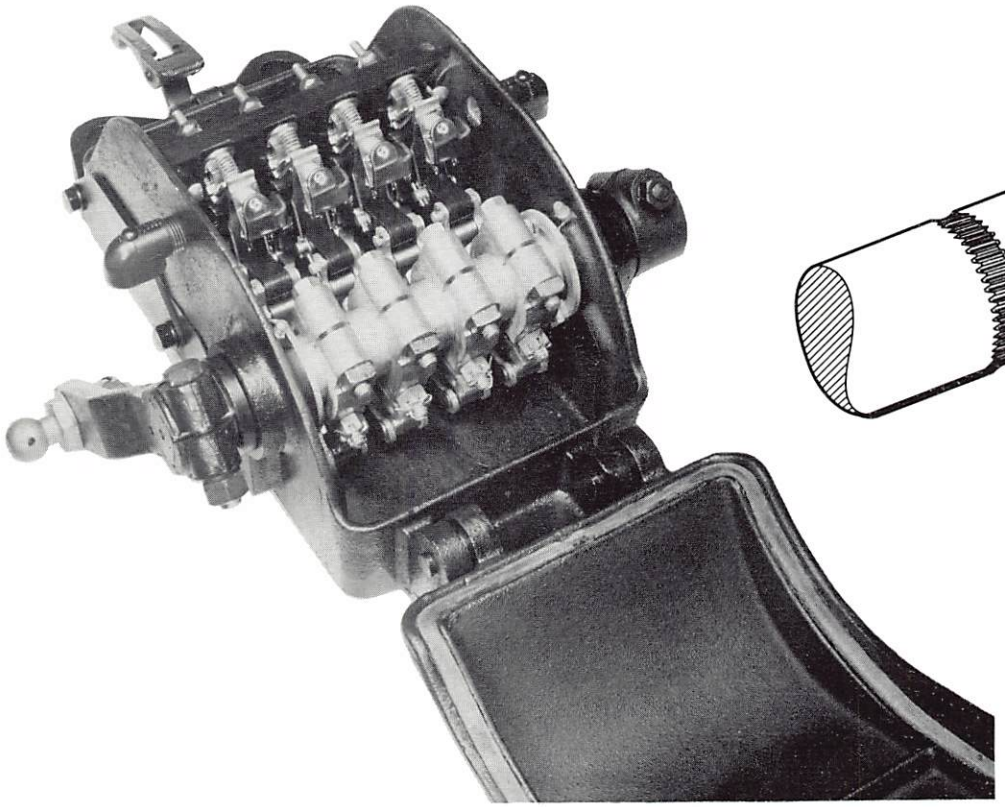
Hinged low on the case, the cover swings down out of the way or, if space is limited can be easily removed. Internal parts are fully exposed. Wire connections, inspections, and adjustments are easy to make.

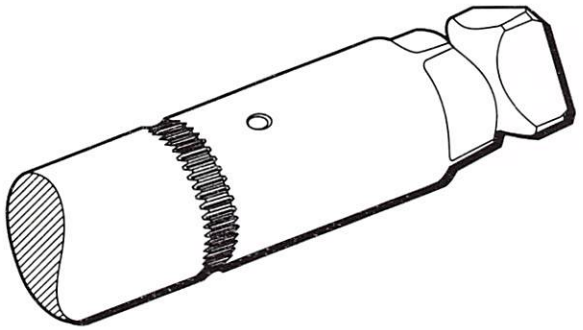
Screened ventilators help equalize internal and external temperatures, thus minimizing internal condensation.

Large Camshaft

The camshaft is a full one and a half inches in diameter. Made of cold-drawn steel for strength and cadmium plated for corrosion resistance, this large shaft provides rigidity and strength for dependable controller operation and long life.

The shaft is mounted in replaceable bronze bearings, pressure lubricated through annular grease grooves. One and one eighth inches square at each end, the shaft provides firm mounting for the crank arm, right-or left-hand, as desired, and for the optional centering attachment.





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WEAR-PROTECTED ROLLERS

Made of bakelite-impregnated fabric, the Model 7J rollers have great mechanical strength and high dielectric characteristics. Long-wearing bushings, molded into the rollers, revolve on heat-treated, stainless-steel pins.

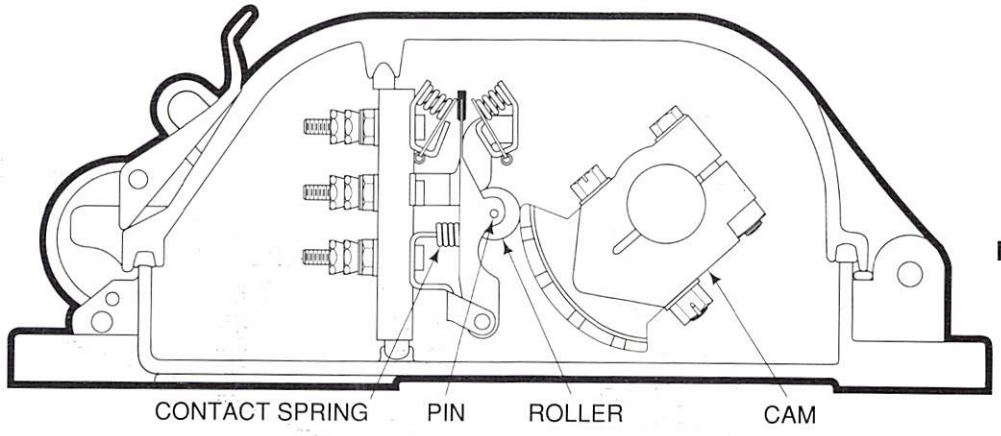
Made of hardened steel, the Model 7K rollers also have great mechanical strength. They revolve on strong, corrosion-resistant pins, made of a copper-silicon alloy.

The roller designs in the Models 7J and 7K controllers protect against the development of flat spots on the rollers and the formation of corrosion on the pins. The rollers always **roll** over the cam surfaces — never slide.

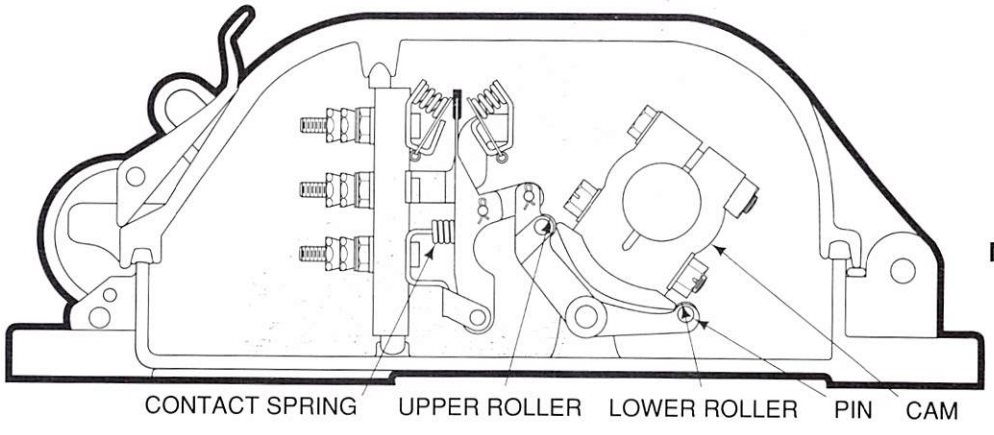
PROTECTION

The operating mechanisms are supersensitive to detectable motion, yet isolate the contacts from vibration. The cam faces and the cam shaft are concentric — they rotate parallel to each other. Thus, crank movements due to vibration cannot affect the contact fingers. Contacts do not chatter, unless vibrations reach a level high enough to overcome the force exerted by the contact spring.

Furthermore, the controller contacts are held tightly closed. In the Model 7J, the combined effect of cam and front-contact spring pressure on the contact fingers provides high front-contact pressure. Contact springs hold the fingers firmly against the back contacts. The rocker assemblies in the Model 7K use cam and spring pressure to hold the contacts firmly, in their closed position. The contact fingers move only when the crank position changes — not with crank or case vibrations.



MODEL 7J



MODEL 7K

CONTACT ARRANGEMENT

Since the front and back contacts are articulated, they cannot take a permanent set due to bending. Firmly seated in locking grooves, the supports keep the contacts properly aligned. Coil springs between the contacts and their supports give high contact pressure and long contact wipe. Flexible copper braid electrically bonds each contact to its support.

The contact fingers are channel shaped for increased strength. Contact springs hold the fingers tightly against the contacts.

Silver contact surfaces provide high electrical conductivity.

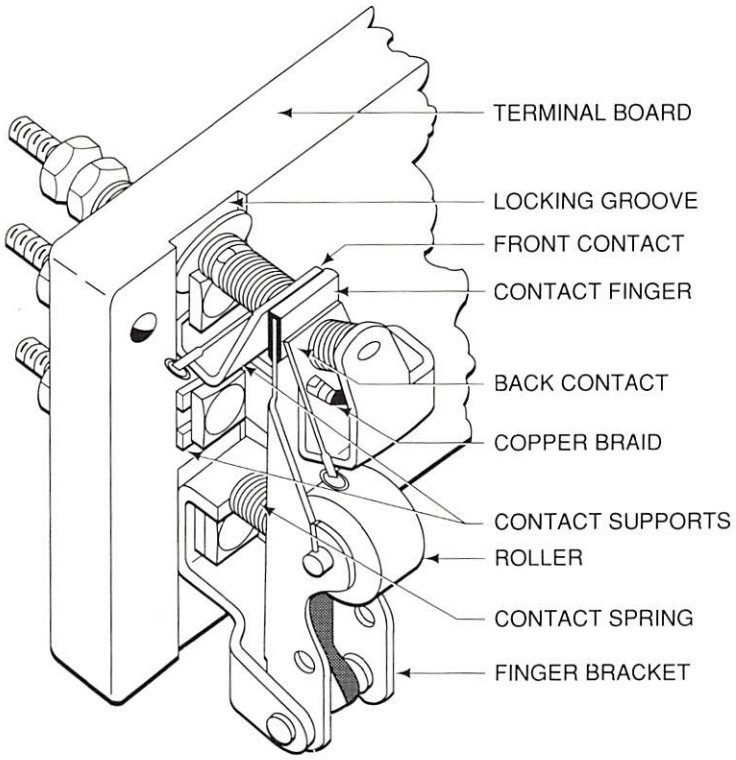
ADJUSTMENT

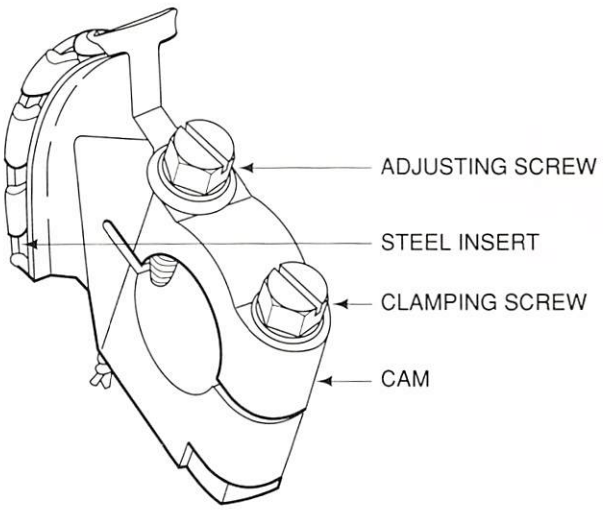
Each of the four cams can be separately adjusted to operate its associated contacts at any desired position of the actuating device.

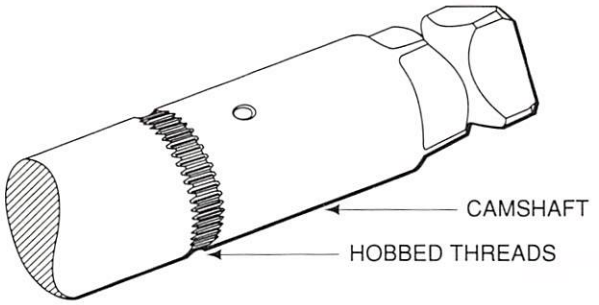
Any cam can be adjusted easily — and with great accuracy — by loosening the clamping screw and turning the adjusting screw. Precisely fitted to hobbed threads in the shaft, the cam can be moved around the shaft to the exact position desired. Tightening the clamping screw locks the cam securely in position.

The screws are easy to reach — no need to disconnect the external linkage and rotate the shaft until the screws are accessible.

Made of die-cast aluminum, the cams resist rust and corrosion. Hardened steel inserts on the roller contacting surfaces protect against cam wear.







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OPERATION

Model 7J Cam and Roller

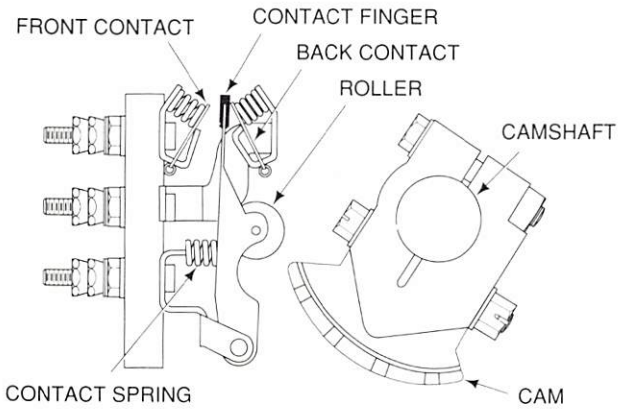
With the switch in the normal position, the pressure of the contact spring holds the contact finger firmly against the back contact.

When the switch points are moved toward reverse, the hardened steel cam face presses against the roller attached to the contact finger. The roller moves up on the cam face, and the contact finger moves, against the pressure of the contact spring, to open the back contact and close the front contact.

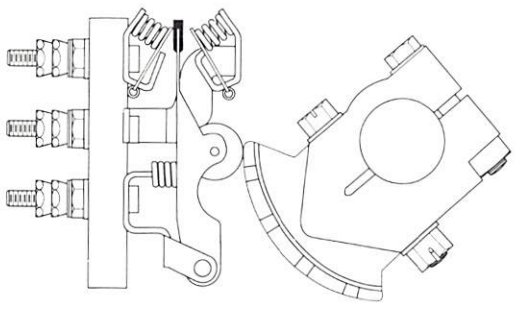
Model 7K Push-Pull

With the switch in the position to rotate the camshaft clockwise, as shown in Figure 1, the cam holds the rocker down, positioning the contact finger against the back contact.

When the switch points are moved, the clockwise rotation of the camshaft causes the cam to press down on the upper roller of the rocker, as shown in Figure 2. The rocker pivots, moving the contact finger against the pressure of the contact spring to open the back contact and close the front contact.



Normal



Reverse

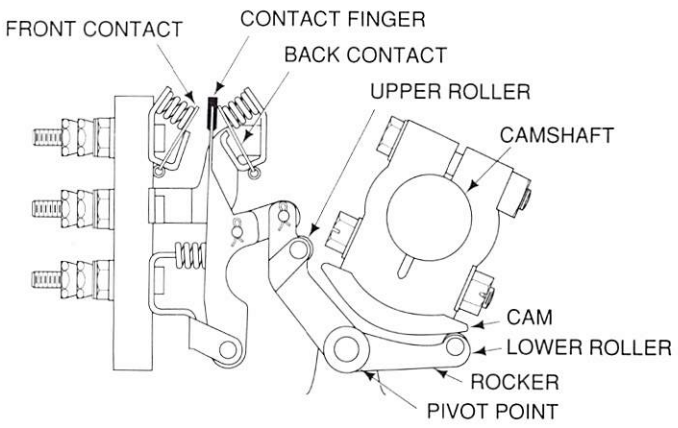


Figure 1.

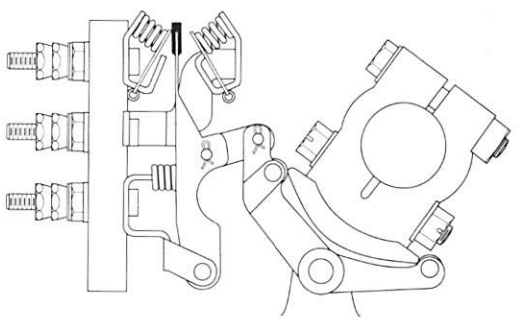


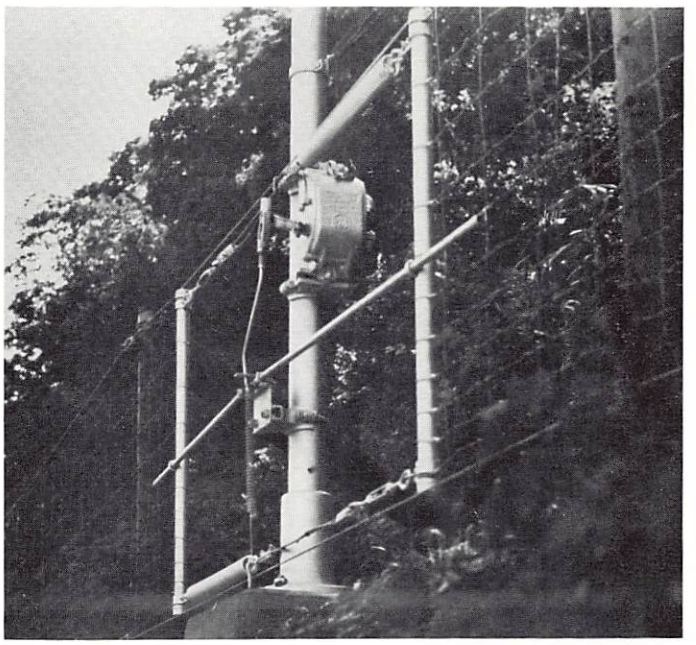
Figure 2.

APPLICATIONS

Use Model 7's to detect:

Switch point positions, normal and reverse. Switch point locking. Bridge locking and rail-joint seating. Bridge positions. Tunnel door positions. Slide detector actuation.

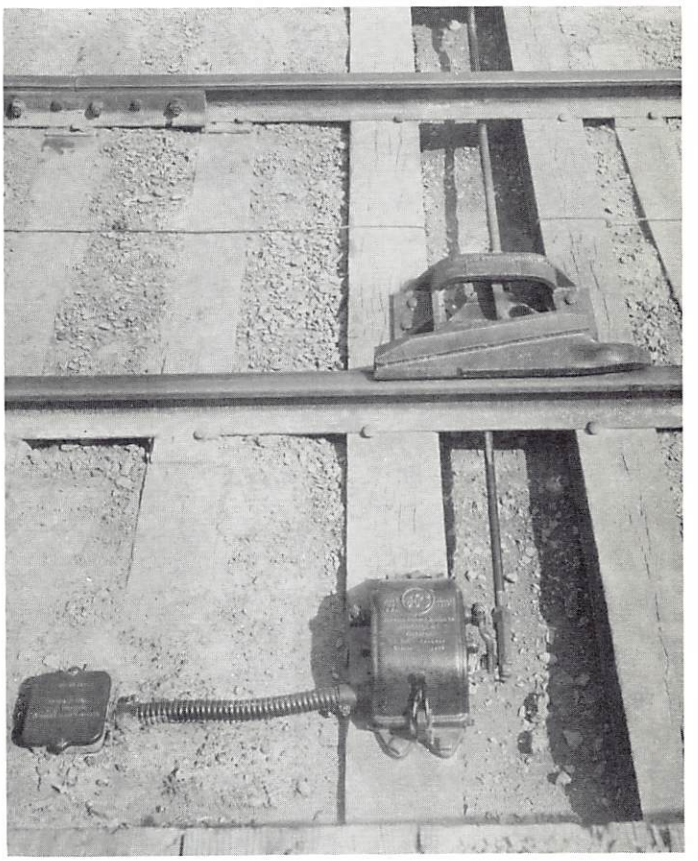
Use a Model 7J or 7K switch circuit controller wherever you need reliable, "circuit-open" or "circuit-closed" indication of the position of any substantial two-position device.



Controller on a slide detector fence.



Controller and Model 9B lock at a switch location.



Controller at a derail installation.

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INSTALLATION

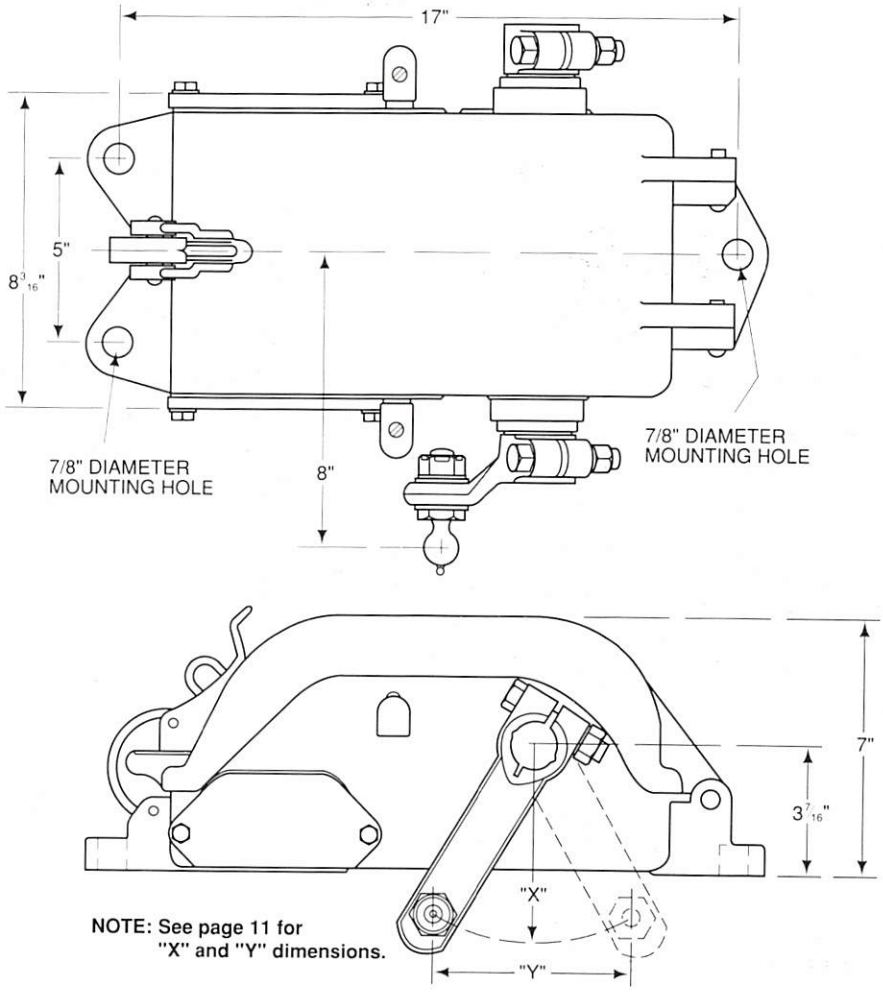
Model 7 controllers are easy to install. They are compact, have low clearance profile, and mount on a single tie.

The two mounting holes at the hasp end of the case are spaced on five-inch centers — ample room for a wrench. The third mounting hole, at the opposite end of the case, is also conveniently located.

The controller should be installed so that it cannot move in relation to the switch rails or actuating device. Install the operating rod and point lug connections — or other mechanical linkage — so that there is little or no lost motion.

Two wire openings, one on each side of the case, are conveniently located at opposite ends of the terminal board. Your choice of wire-entrance fitting A81-130 or -131, page 11, is furnished with each controller. Other optional fittings and accessories are available to meet your installation requirements.

Complete installation and maintenance instructions are detailed on a tag provided with each controller.

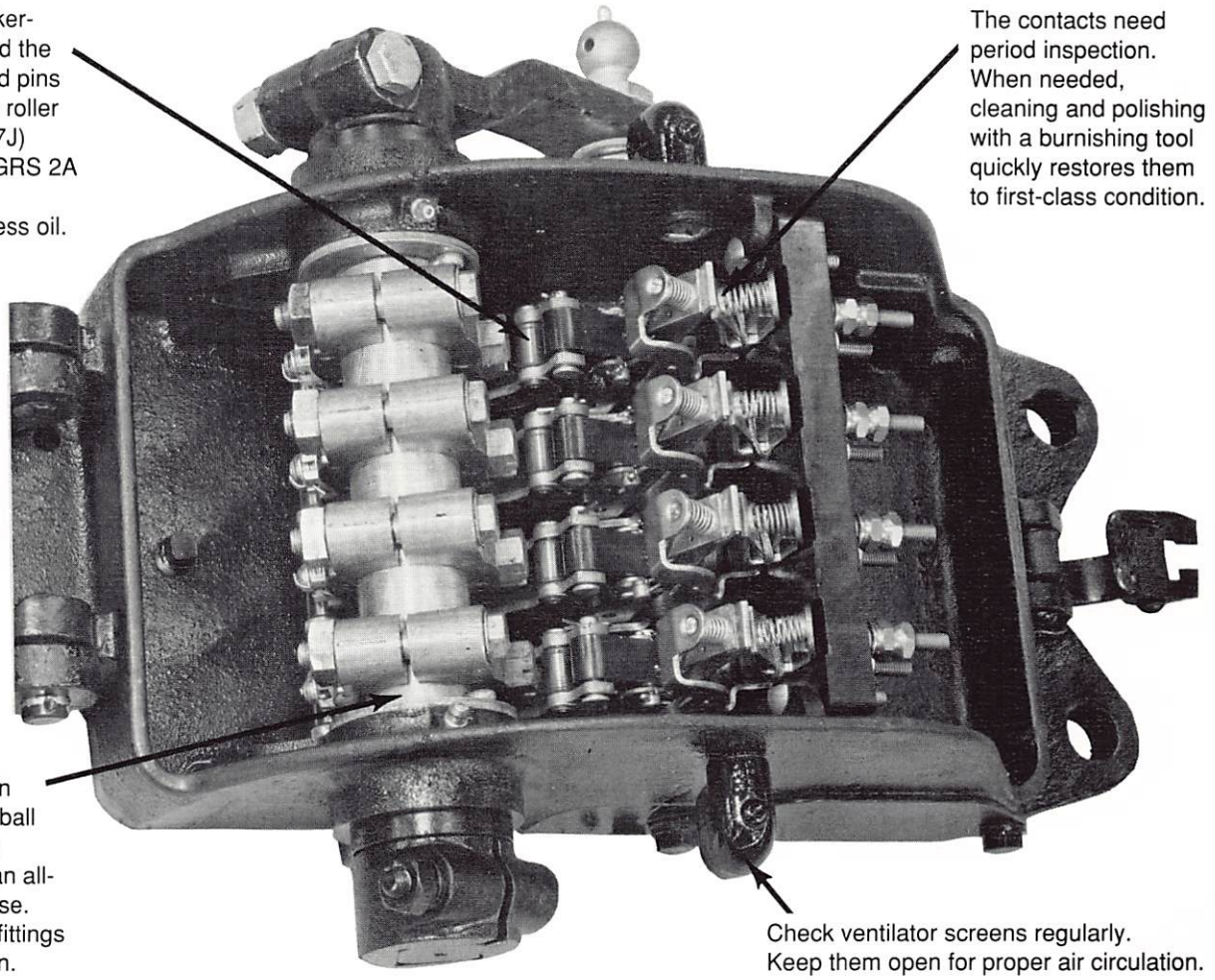


MAINTENANCE

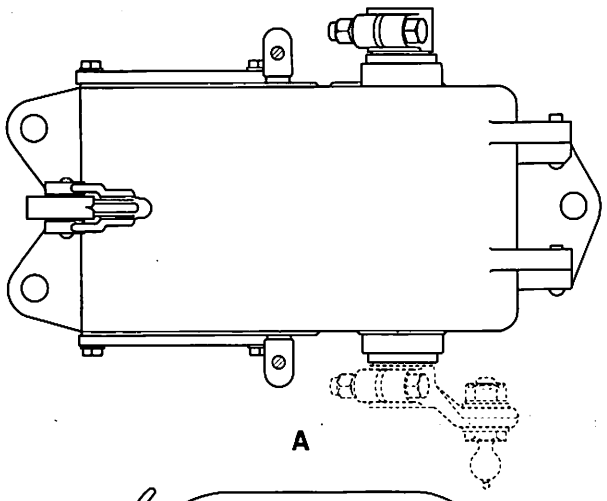
GRS switch circuit controllers should be inspected and tested at least every three months. During the inspection, check that:

1. All screws, nuts, and bolts are tight.
2. Hinges, hasp, and padlock are undamaged.
3. Ventilator screens are unblocked.
4. Inside of case is free of water and debris.
5. Cover, base, and terminal board are undamaged.
6. Internal pins and cotters are in place and secure.
7. Rod, crank, and shaft have no excessive lost motion.
8. Cams and bearings are properly lubricated.
9. Rollers move freely and have no flat spots.
10. Copper braid around each contact arm hinge is in place.
11. Contacts are not contaminated, burned, or worn excessively.
12. Rail connections are secure (for a shunt-type installation).
13. Centering device (if installed) operates properly.

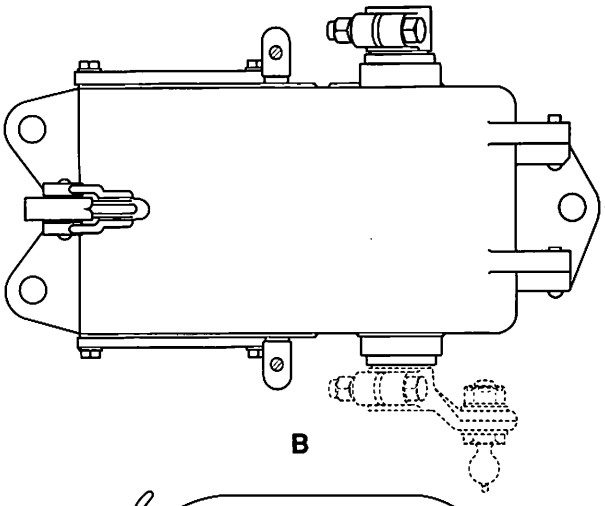
Conduct an obstruction test, adjusting the cams as required. If the contacts are used in circuits with the switch points reversed, conduct a second obstruction test with the switch in the reverse position.



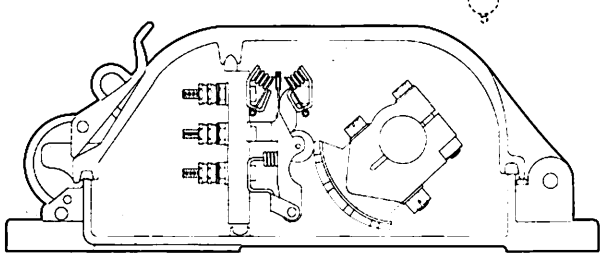
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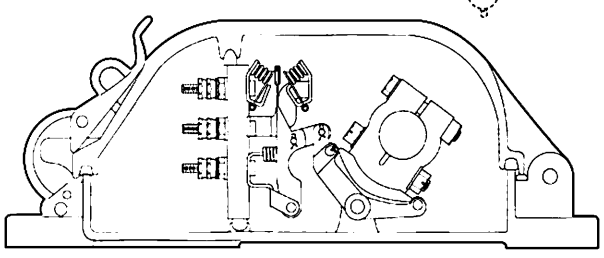


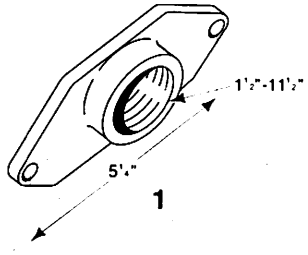
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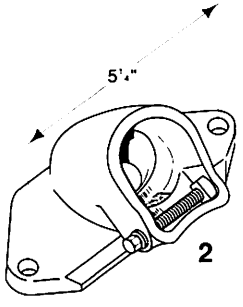
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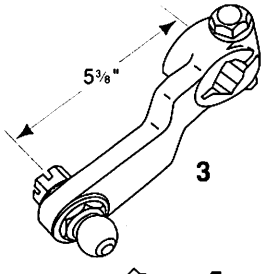




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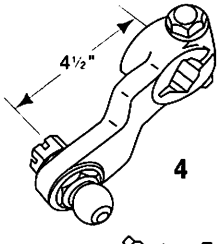


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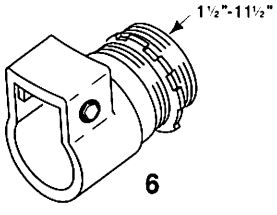
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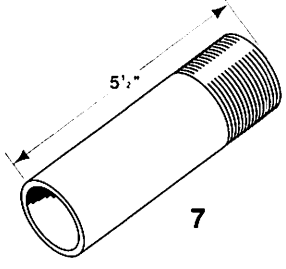


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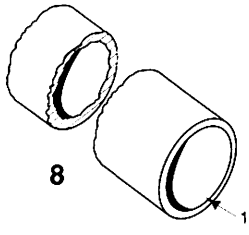
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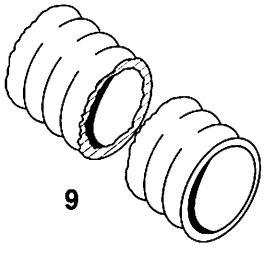
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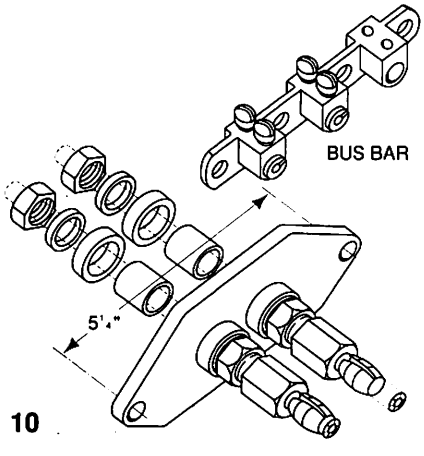
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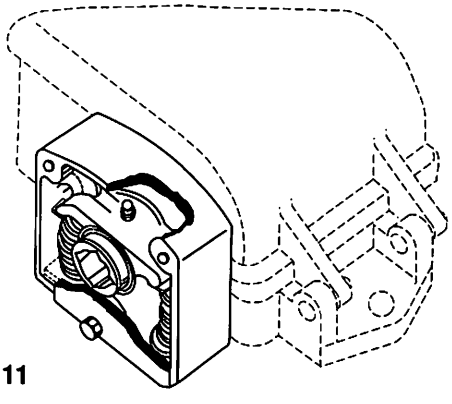
8



9



10



11

ORDERING INFORMATION

To order, specify Model 7J or 7K Switch Circuit Controller, choice of wire entrance coupling 1 or 2, and choice of crank 3 or 4, which are included with the controller. Accessories, Refs. 5-11, if desired, must be ordered separately.

Please order by name, shown in BOLD TYPE, and catalog number

REF.	NAME	CATALOG NUMBER
A	**MODEL 7J SWITCH CIRCUIT CONTROLLER**	**A81-100**
B	**MODEL 7K SWITCH CIRCUIT CONTROLLER**	**A81-105**
1	**CAP,** for wire outlet, with 1-1/2" std. pipe tapped hole	**A81-130**
2	**COUPLING,** 45 degree, for 1-1/2" flexible conduit	**A81-131**
3	**CRANK,** with insulated ball pin, 1" offset, 5-3/8" centers. See table below	**A81-135**
4	**CRANK,** with insulated ball pin, 1" offset, 4-1/2" centers. See table below	**A81-137**

THROW OF CRANKS REFS. 3 AND 4

Crank Ref.	Centers of Crank	Used on Switch Circuit Controller	** Max. Throw or Stroke	With Attachment Ref. 11 Min. Throw or Stroke	With Attachment Ref. 11 Max. Throw or Stroke
3	5-3/8"	Model 7J	6"	3-1/2"	5-1/2"
3	5-3/8"	Model 7K	7"	3-1/2"	5-1/2"
4	4-1/2"	Model 7J	5"	3"	4-5/8"
4	4-1/2"	Model 7K	5-7/8"	3"	4-5/8"

* Dimension "X" shown in illustration on page 8.
For cranks with another dimension "X" consult your GRS Sales Representative.

** Maximum permissible connecting rod movement, dimension "Y" as shown in illustration on page 8.

ACCESSORIES

REF.	NAME	CATALOG NUMBER
5	**OILER,** for cranks Refs 3 and 4	**P81-140**
6	**COUPLING,** for 1-1/2" flexible conduit and with 1-1/2" std. pipe threads	**A85-866**
7	**PIPE NIPPLE,** 1-1/2" std. pipe threads, for 1-7/8" I.D. rubber conduit	**P85-1003**
8	**CONDUIT,** 1-7/8" I.D. solid rubber, specify length required (3' length recommended)	**A85-520**
9	**CONDUIT,** 1-1/2" flexible, specify length required (3' length recommended)	**A85-868**
10	**CAP,** two required, for terminating shunt wires, for two .243" dia. cables, also includes one bus bar	**A81-147**
10A	**CAP,** two required, for terminating shunt wires, for two .190" dia. cables, also includes one bus bar	**A81-149**
11	**CENTERING ATTACHMENT,** for broken switch rod protection, includes gasket	**A81-151**

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GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL

MAIN OFFICE AND PLANT
PO BOX 20600 ROCHESTER NY 14602-0600 Phone: 716 • 436-2020 Cable: GENRASIG (ROCHESTER NY) Telex: 978317

BOSTON OFFICE
THE 128/ONE EXECUTIVE OFFICE BUILDING 990 WASHINGTON STREET SUITE 106 DEDHAM MA 02026-6790
Phone: 617 • 329-6212

CHICAGO OFFICE
PRUDENTIAL PLAZA SUITE 2120 CHICAGO IL 60601 Phone: 312 • 467-1221

JACKSONVILLE OFFICE
8657 BAYPINE ROAD SUITE 209 JACKSONVILLE FL 32256 Phone: 904 • 739-1900

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10220 NORTH EXECUTIVE HILLS BOULEVARD SUITE 456 KANSAS CITY MO 64153 Phone: 816 • 891-7211

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CATALOG SECTION A81

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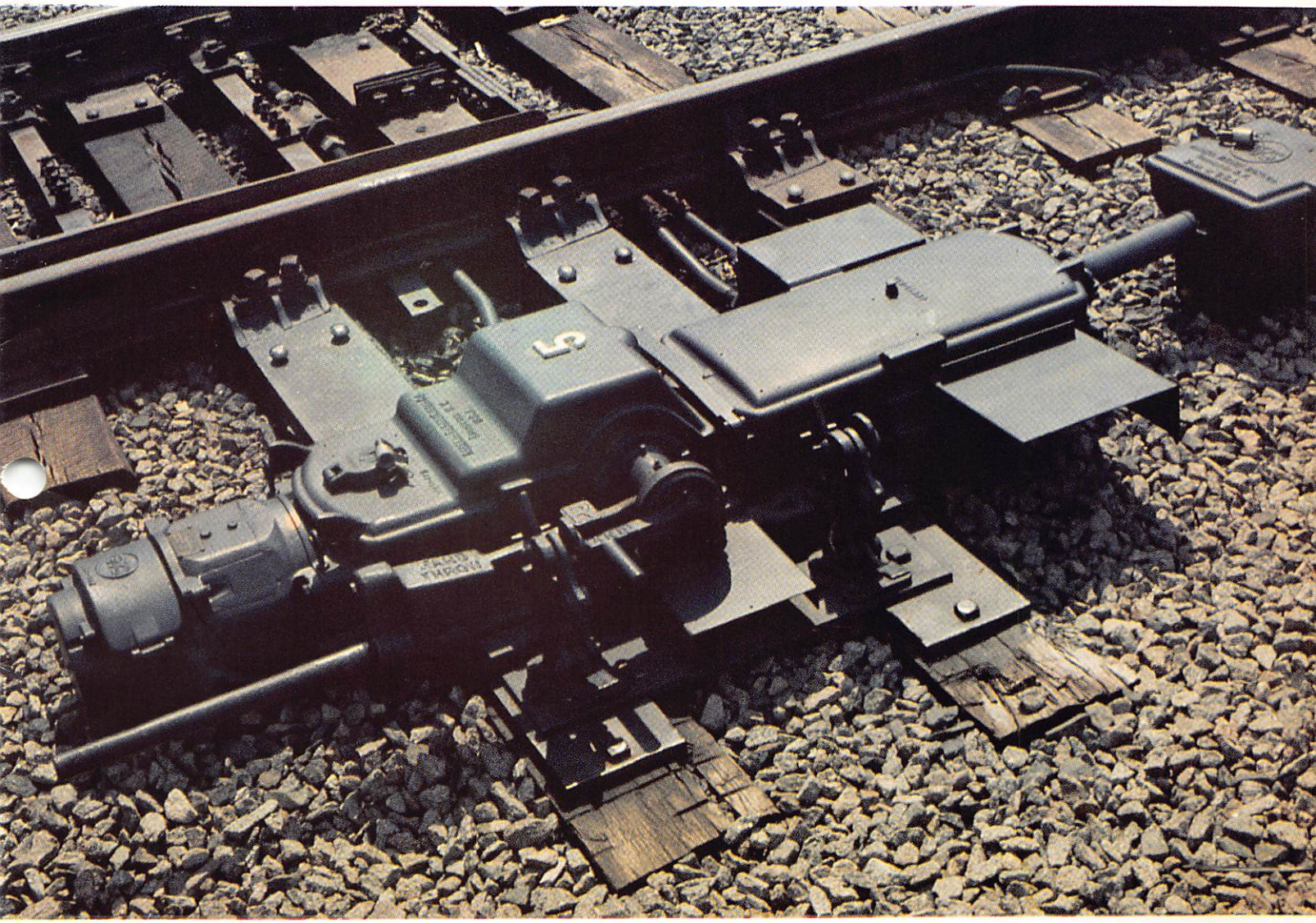
MODELS 7J AND 7K SWITCH CIRCUIT CONTROLLERS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A81-100	53530-30GR1		7J SWITCH BOX	11
A81-105	53530-31GR1		7K SWITCH BOX	11
A81-130	35491-4		CAP	11
A81-131	45688-92GR2		COUPLING	11
A81-135	38660-15GR1		CRANK	11
A81-137	38660-20GR2		CRANK	11
A81-147			CAP	11
	56607-1GR3		CAP	
	57549 GR2		BUSS BAR	
A81-149			CAP	11
	56607-1GR4		CAP	
	57549 GR5		BUSS BAR	
A81-151			CENTERING ATTACHMENT	11
	53231-2GR1		CENT ATTACH	
	13014-299		GASKET	

Signed by Israel Jones, texasrails.org 7/16/2026

MODELS 5A, 5E, 5F, 5G AND 5H ELECTRIC SWITCH MACHINES

GRS



FOR MAINLINE, INTERLOCKING, AND RAPID TRANSIT SERVICE

Signed by Israel Jones, texasrails.org 7/16/2026

INTRODUCTION

GRS Models 5A, 5E, 5F, 5G and 5H electric switch machines are for use in mainline, interlocking, and rapid transit service. Model 5A switch machines are for use only in applications requiring direct operation, dynamic indication for older style interlocking machines. All models operate a single switch, single-slip switch, double-slip switch, or derail, regardless of variations in switch fitting standards and weight of rail.

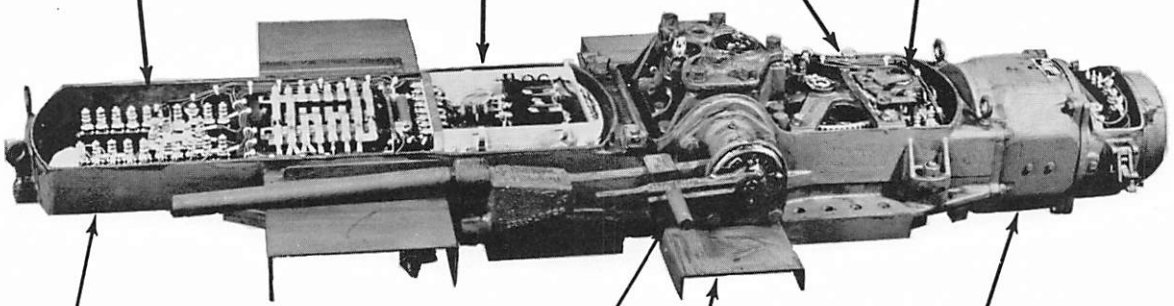
All machines are compact, mount on only two ties, and fit the same standardized layout. They meet the requirements of A.A.R. Load Curve 1457, thus providing ample thrust to operate the heaviest switches.

POINT DETECTOR is an over-and-locked type circuit controller with two normal, two reverse, two shunt and two motor-control contacts. The normal and reverse contacts check and indicate when the switch points are within the proper distance of the stock rail and are locked. The motor control contacts control the motor operating circuit directly in Models 5E and 5F machines and in conjunction with the biased-neutral controller in Models 5G and 5H machines.

BIASED-NEUTRAL CONTROLLER in Models 5G and 5H machines has two biased-neutral, mechanically interlocked contactors, a blocking rectifier, and an overload relay. Each contactor has one dependent, front-back contact with a permanent magnet blowout (arc suppression). A snubbing contact provides dynamic motor braking at the end of the stroke. The magnetic structure prohibits armature operation until voltage of the proper polarity is applied across the coils.

OVERLOAD FRICTION CLUTCH in the gear train absorbs shocks encountered in switch operation. It is factory adjusted to slip when the motor operating current is from 12 to 14 amperes for 110-volt machines, and 18 to 20 amperes for 24-volt machines. The clutch in Models 5F and 5H can be removed without disassembling the dual control mechanism.

REMOVABLE HAND CRANK is available on all Model 5 machines for maintenance and emergency use. An automatic cutout contact with a latchout feature and manual reset protects the operator.



6-inch stroke

HEATERS are provided in the motor, controller, and point detector compartments.

The machines have renewable box style bearings for the throw bar, and wear plates for the lock and detector rods.

DUAL CONTROL MECHANISM in Models 5F and 5H machines permits either power or hand-throw operation.

RUGGED MOTOR provides long, reliable service. It has series split connected epoxy-coated insulated field coils and an epoxy-coated armature. Dynamic snubbing limits motor overrun at the end of the stroke, and a simple magnetic detent holding device then locks the motor armature. Magnetic holding is frictionless and virtually maintenance-free -- nothing to wear out.

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DESCRIPTION

Models 5A, 5E, 5F, 5G and 5H switch machines basically consist of an electrically operated switch and lock movement, with lock rod, point detector rod and built-in contacts that check the machine over-and-locked in both the normal and reverse positions.

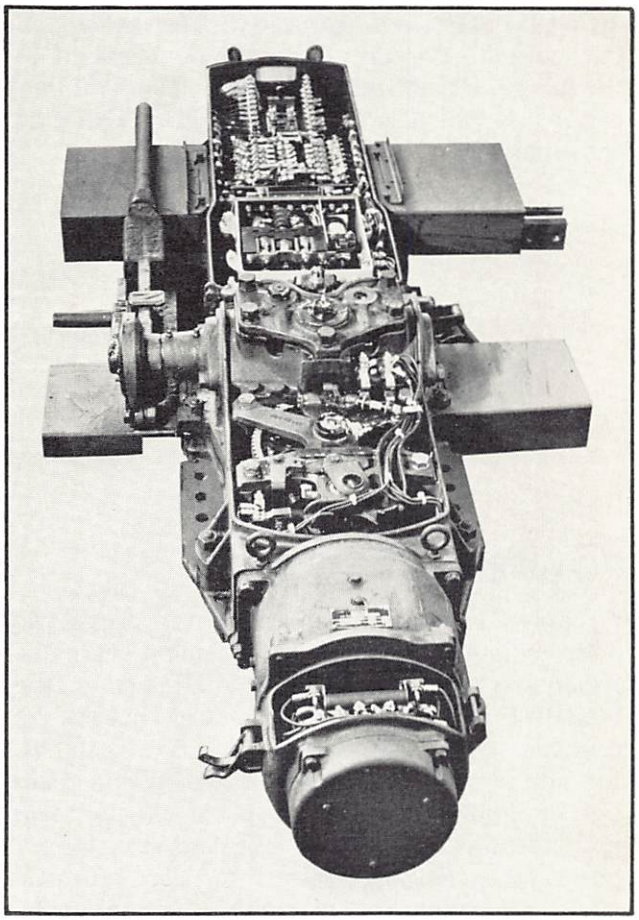
Models 5A, 5E and 5G machines are designed for power operation only; Models 5F and 5H machines have a dual control mechanism which permits either power or hand-throw operation. All models can be hand cranked for making and checking adjustments; for power-only models, hand cranking is used for emergency switch operation in case of power failure.

Control and overload relays for Models 5E and 5F are housed externally. Models 5G and 5H have a built-in biased-neutral controller operated by a low-voltage d-c, two-wire polarized line circuit. The controller, in turn, applies 24- or 110-volt d-c to the motor. This control voltage can be easily changed in the field from 24 to 10 volts to suit railroad requirements. All models (except 5A) are designed for battery indication.

Operating time is approximately 3 seconds for 110-volt machines and 8 to 10 seconds for 24-volt machines.

All models (except 5A) have a permanent magnet holding device which holds the motor after the end of the stroke. The magnetic detent then holds the motor armature against vibration and low-level stray electrical currents. Dynamic snubbing on all models serves to bring the machine to rest without shock upon the completion of the stroke. Model 5A snubs through its line wires and its interlocking machine. Internal dynamic snubbing is provided in Models 5E and 5F through contacts in the point detector, and in Models 5G and 5H through contacts in the biased-neutral controller.

The point detector has knife-edged contacts which exert extra-heavy pressure. The Model 5A has three normal, three reverse, and two shunt contacts; Models 5E, 5F, 5G and 5H have two normal, two reverse, two motor control, and two shunt contacts. The motor control contacts in Models 5E and 5F carry and break the motor current directly. Only the 5A switch machine lacks a magnetic detent as it is designed to be energized from an interlocking machine at all



MODEL REFERENCE CHART

MODEL	DUAL CONTROL	BUILT-IN CONTROLLER
5A	NO	NO
5E	NO	NO
5F	YES	NO
5G	NO	YES 10/24 vdc
5H	YES	YES 10/24 vdc

Machines provided with 110 d-c motors can be operated from 110 a-c through rectifiers external to the machine.

times. The Model 5A contains an electromagnetically-operated pole changer.

Models 5E, 5F, 5G and 5H are frost protected by 110-volt heaters located in the motor, controller, and contact compartments. If the installed heaters are not used, a frost shield and felt commutator cover should be installed in the motor. These items are available in a modification kit which is listed later under "Ordering Information."

POWER OPERATION

To move switch points, the motor drives the intermediate gear train and the main gear. The lower end of the stud in the main gear of the Models 5A, 5E, and 5G machines engages the cam bar. On the Models 5F and 5H machines, the lower end of the crank pin in the main splined crank engages the cam bar. As the main gear rotates from either extreme position, it pushes the cam bar toward the wire entrance end of the machine. This moves the dog on the cam bar out of the notch in the lock rod, unlocking the switch points and simultaneously causing the two rollers on the point detector yoke to be centered in the lock dog. Thus, the point detector yoke is moved to the vertical position to open the normal and reverse contacts and to close the motor control contacts. Continued rotation of the main gear causes the roller bearing to move the throw bar six inches. The throw bar moves the switch points which, in turn, move the lock and detector rods.

When the switch points close in the opposite position, the point detector rod is in position so that the point detector yoke and the attached contact block are forced by spring pressure to close the opposite indication contacts. This occurs during the last stage of the cam bar movement, when the bar is withdrawn from the detector yoke rollers and simultaneously locks the lock rod in position.

MANUAL OPERATION

On Models 5F and 5H with dual-control, the selector lever contacts on the dual-control mechanism open the motor and repeater relay circuits when the manually-operated selector lever is moved from the POWER to the HAND position.

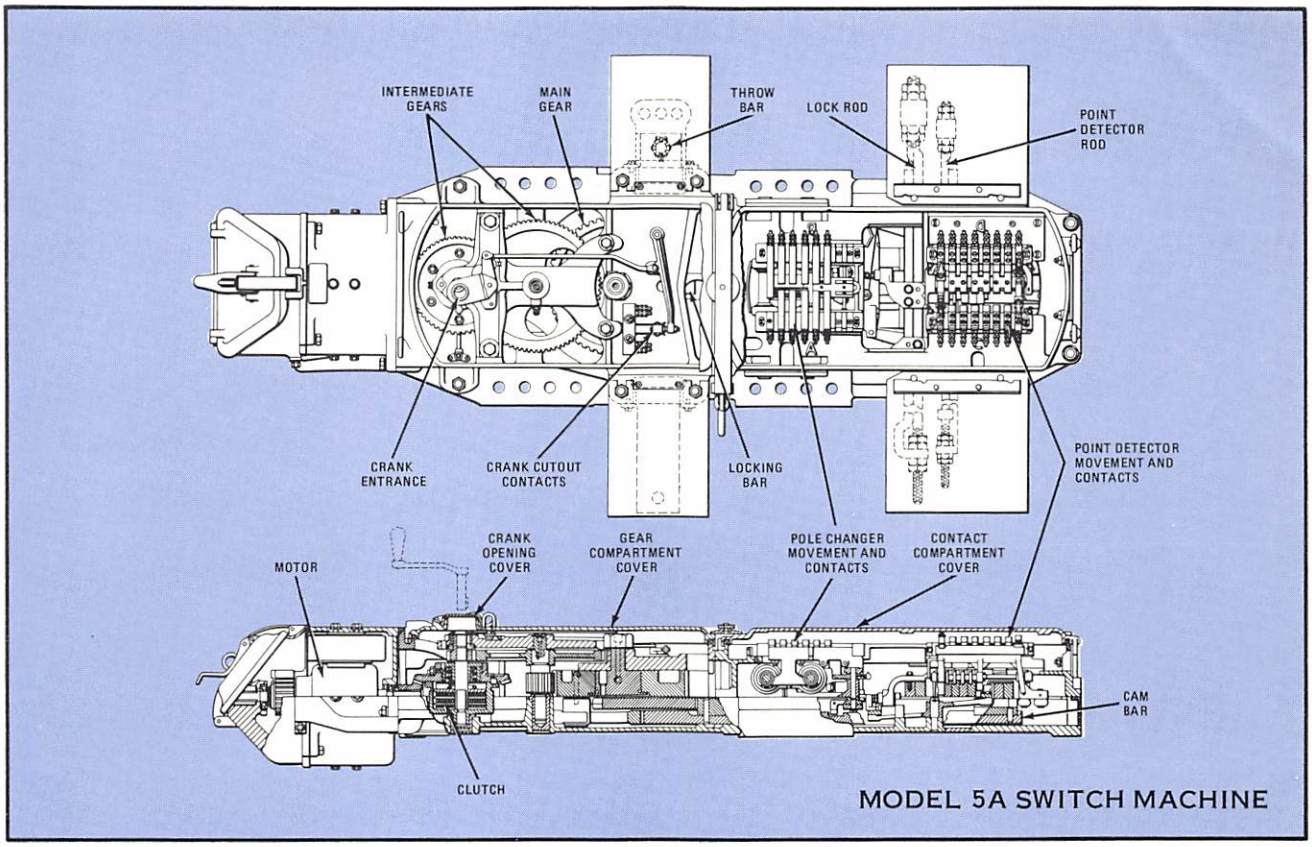
During hand-throw operation, cam bar movement forces the rollers on the point detector yoke to be centered in the lock dog. Thus, the point detector yoke is moved to the vertical position to open the detector contacts. The normal and reverse detector contacts do not reclose until the selector lever is returned to the POWER position and the machine, under power operation, locks into the called-for switch position.

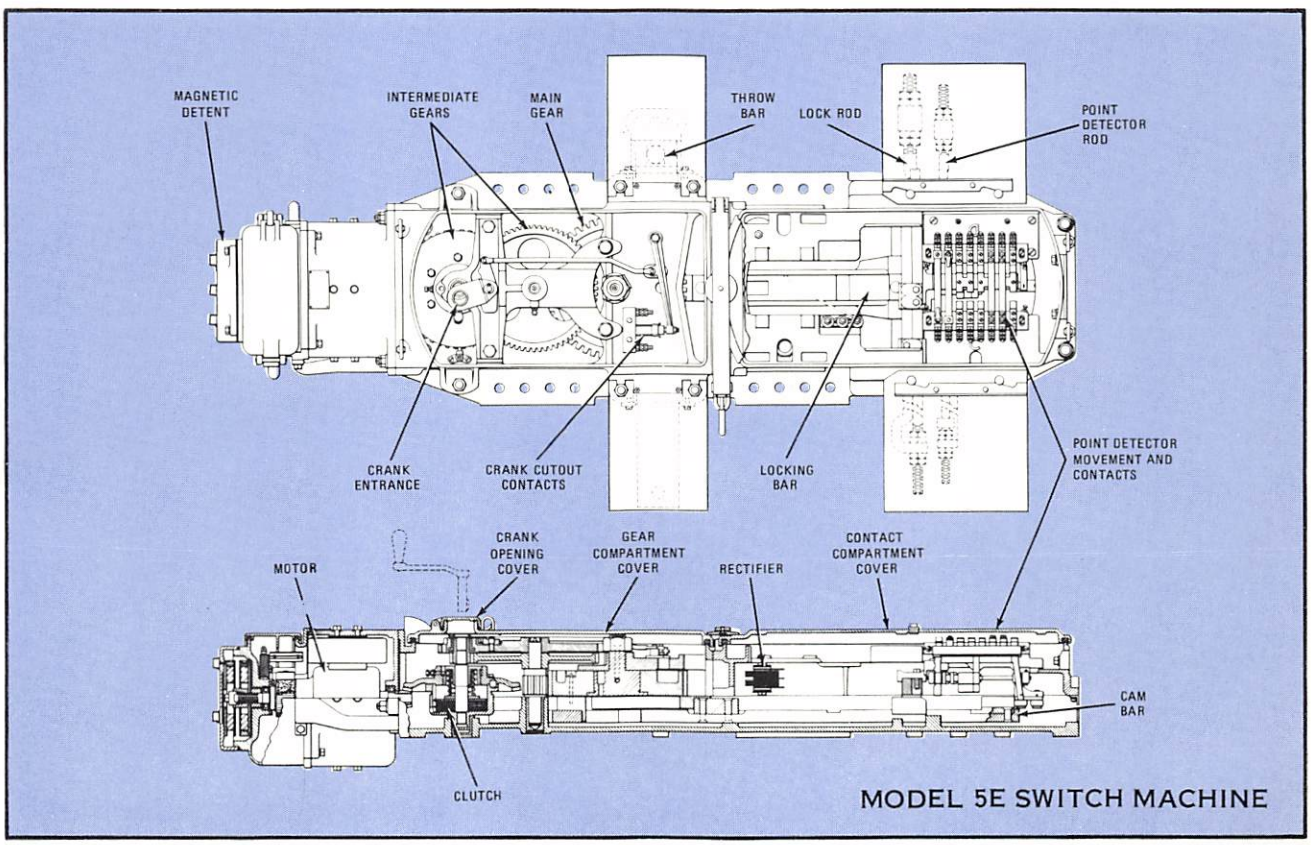
INSTALLATION

Installation and adjustment of the switch machines are relatively straightforward. Its versatility permits a number of configurations, some of which can be changed in the field.

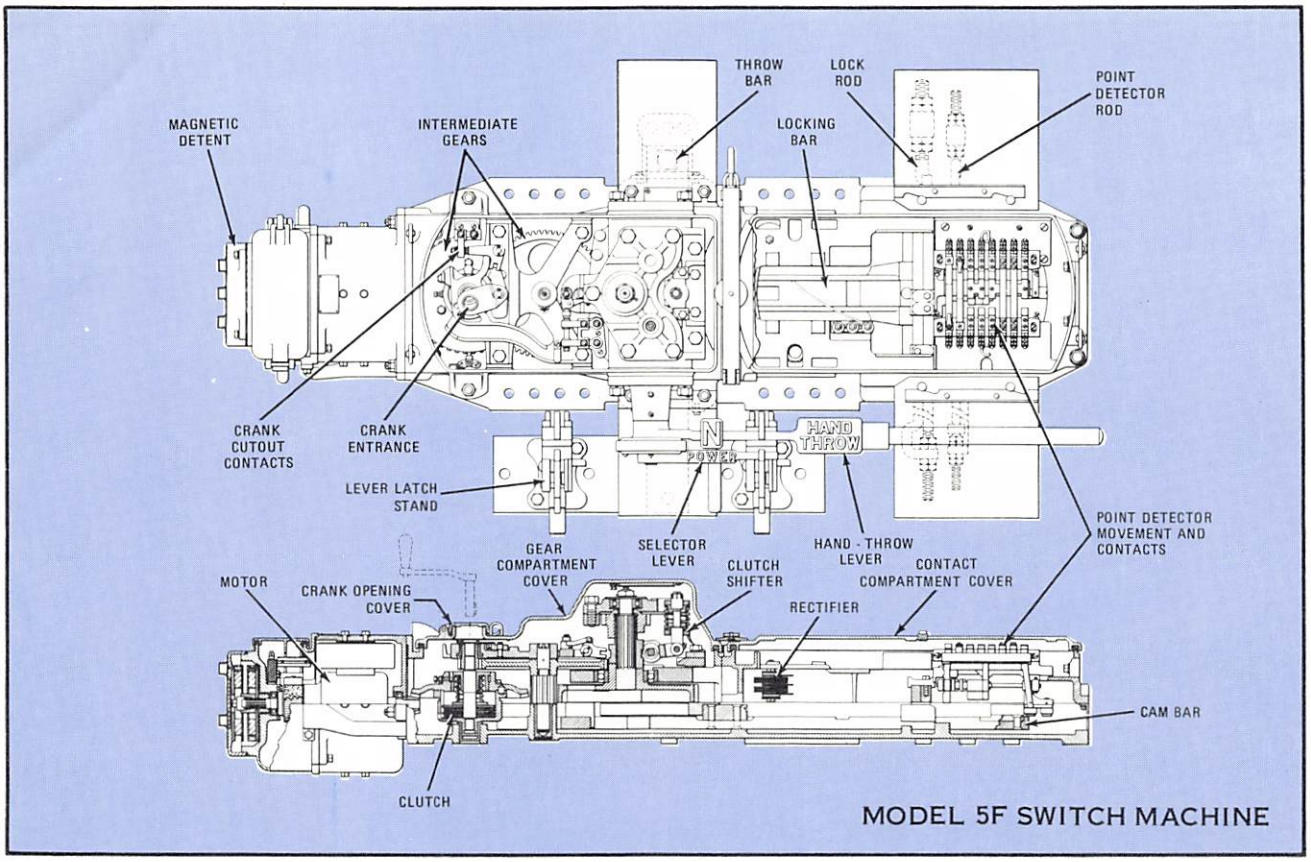
A right-hand machine is one located on the right-hand side of the track when the observer faces the switch points. Power-only machines, Models 5A, 5E, and 5G, ordered with one lock rod and one point detector rod, are shipped in the right-hand configuration only. These can be easily altered in the field to left-hand by reversing the lock rod and point detector rod in the machine and by moving the throw bar connection to the opposite end. Since changeover is more complex, the Model 5A for a movable point frog and Models 5F and 5H dual-control machines may be ordered in either right- or left-hand configurations. Complete operation, installation, and maintenance data are contained in Pamphlet 1559 for the Model 5A machine and Pamphlet 1293 for the Models 5E, 5F, 5G and 5H machines.

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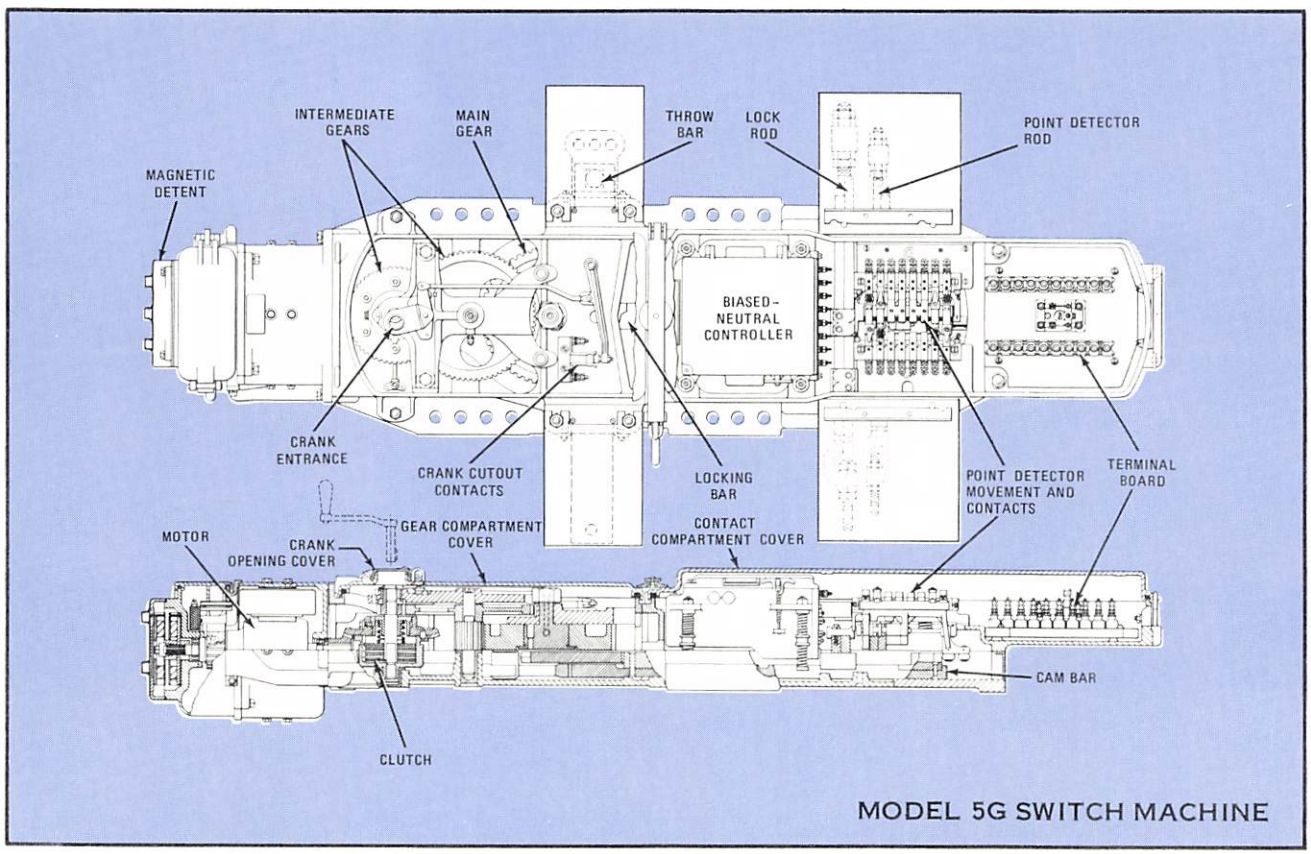

INTERMEDIATE GEARS
MAIN GEAR
THROW BAR
LOCK ROD
POINT DETECTOR ROD
CRANK ENTRANCE
CRANK CUTOUT CONTACTS
LOCKING BAR
POINT DETECTOR MOVEMENT AND CONTACTS
MOTOR
CRANK OPENING COVER
GEAR COMPARTMENT COVER
POLE CHANGER MOVEMENT AND CONTACTS
CONTACT COMPARTMENT COVER
CAM BAR
CLUTCH
MODEL 5A SWITCH MACHINE


MAGNETIC DETENT
INTERMEDIATE GEARS
MAIN GEAR
THROW BAR
LOCK ROD
POINT DETECTOR ROD
CRANK ENTRANCE
CRANK CUTOUT CONTACTS
LOCKING BAR
POINT DETECTOR MOVEMENT AND CONTACTS
MOTOR
CRANK OPENING COVER
GEAR COMPARTMENT COVER
RECTIFIER
CONTACT COMPARTMENT COVER
CAM BAR
CLUTCH
MODEL 5E SWITCH MACHINE

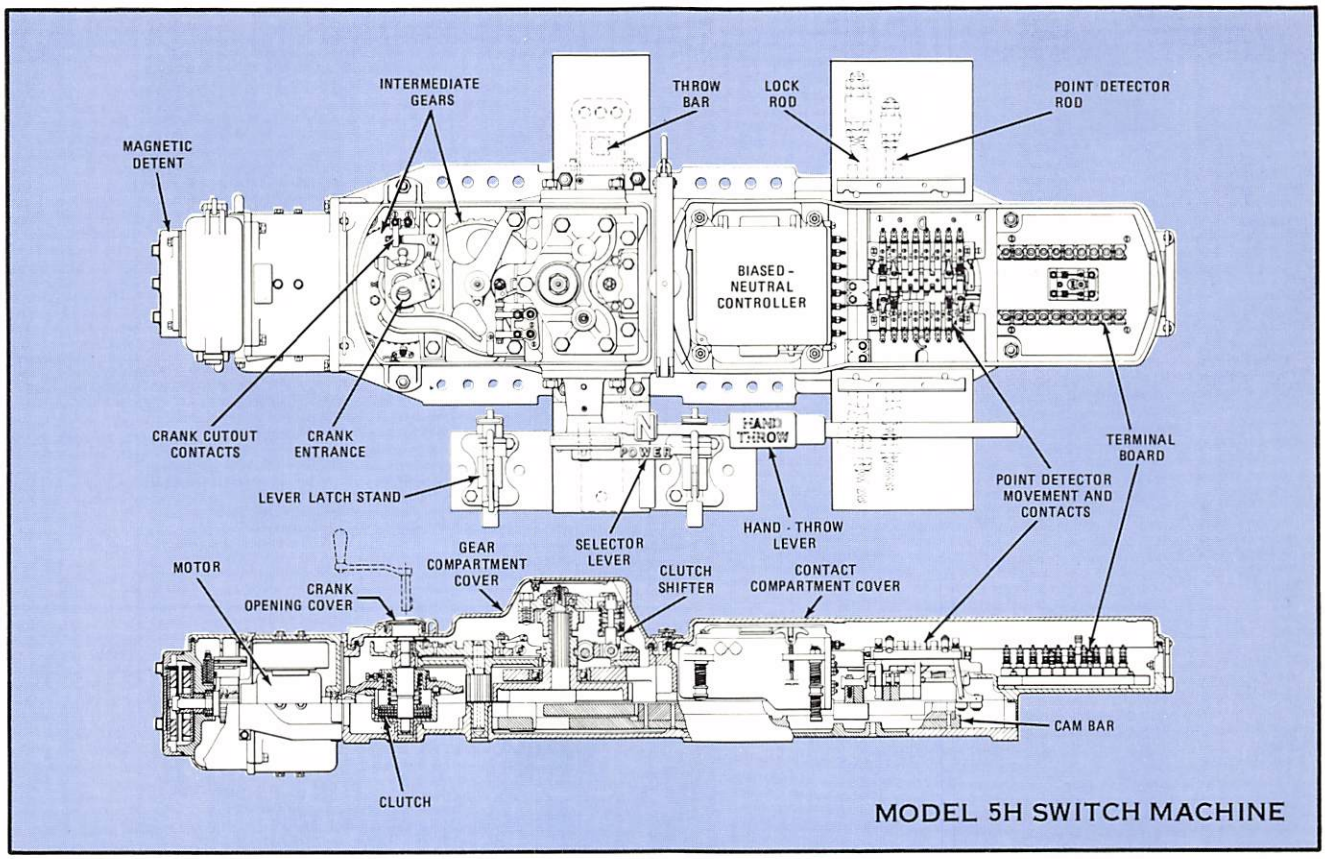
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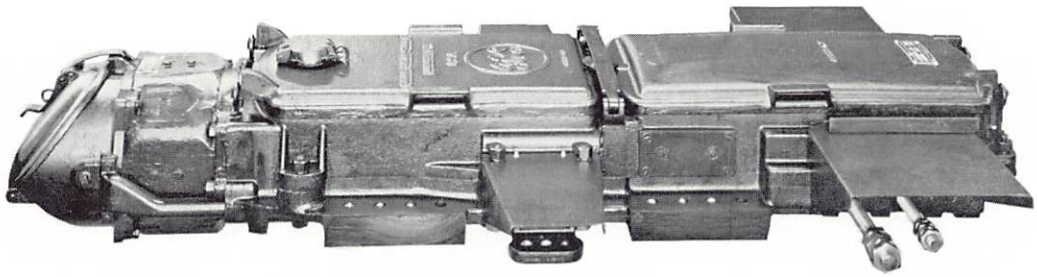
MODEL 5F SWITCH MACHINE



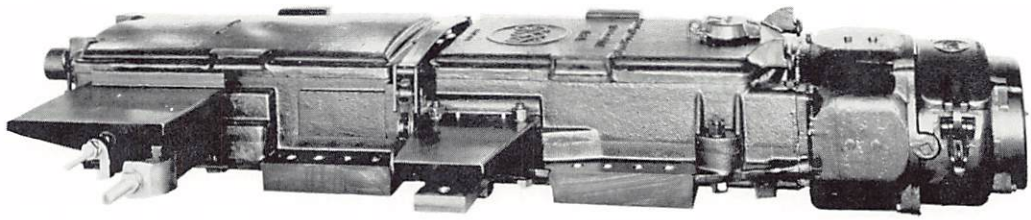
MODEL 5G SWITCH MACHINE


INTERMEDIATE GEARS
THROW BAR
LOCK ROD
POINT DETECTOR ROD
MAGNETIC DETENT
BIASED - NEUTRAL CONTROLLER
CRANK CUTOUT CONTACTS
CRANK ENTRANCE
HAND THROW
TERMINAL BOARD
LEVER LATCH STAND
POINT DETECTOR MOVEMENT AND CONTACTS
SELECTOR LEVER
HAND - THROW LEVER
MOTOR
GEAR COMPARTMENT COVER
CLUTCH SHIFTER
CONTACT COMPARTMENT COVER
CRANK OPENING COVER
CAM BAR
CLUTCH
MODEL 5H SWITCH MACHINE

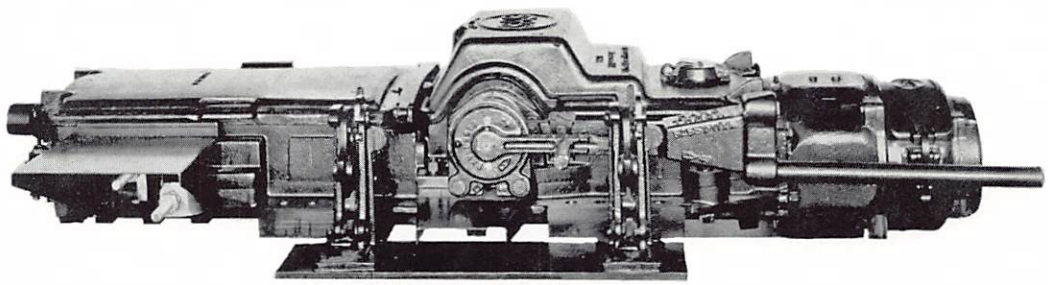
MODEL 5 SERIES SWITCH MACHINES



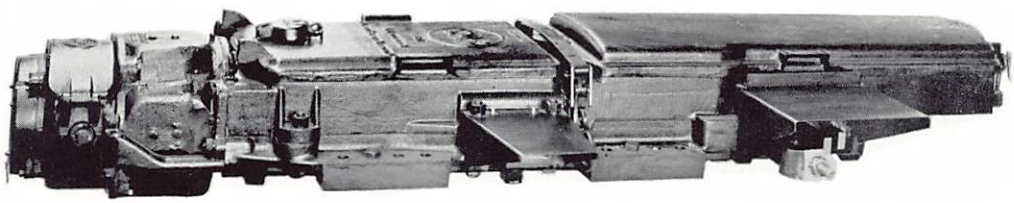
5A



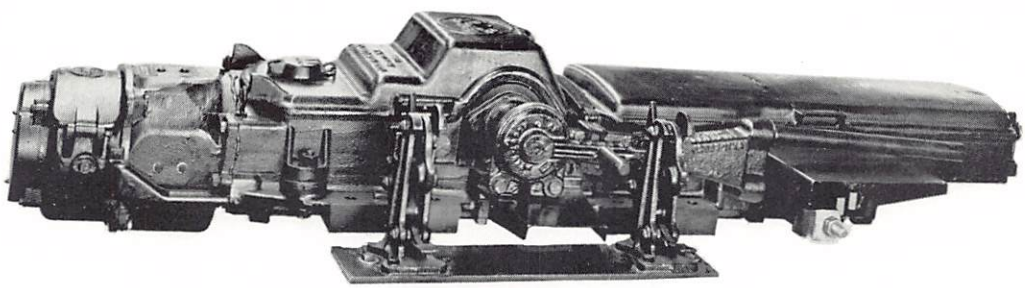
5E



5F



5G



5H

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ORDERING INFORMATION

Models 5A, 5E, 5F, 5G and 5H switch machines are provided with one lock rod and one point detector rod for control of a single switch, single-slip switch, derail, or double-slip switch. Machines with two lock rods and two detector rods are available; see your GRS sales engineer for details.

NOTE: If you desire to have GRS select all parts for a complete switch layout, please complete the questionnaire on page 18.

MODEL 5A SWITCH MACHINE

The Model 5A DOES NOT INCLUDE the following; please order separately:

- Accessories; see pages 15, 16, and 17.
- Lock and point detector rods, throw rods, and junction boxes; see Assemblies Catalog Section 91.

To order, specify "Model 5A Switch Machine" and give catalog number.

For single switch; single-slip switch; derail; or double-slip switch with machine having 1 lock and 1 point detector rod:

Operating Voltage D-c	Right or Left Hand	Catalog Number
110	Right*	A85-100

Same as above, except have throw-bar detection switch:

110	Right	A85-145
110	Left	A85-146

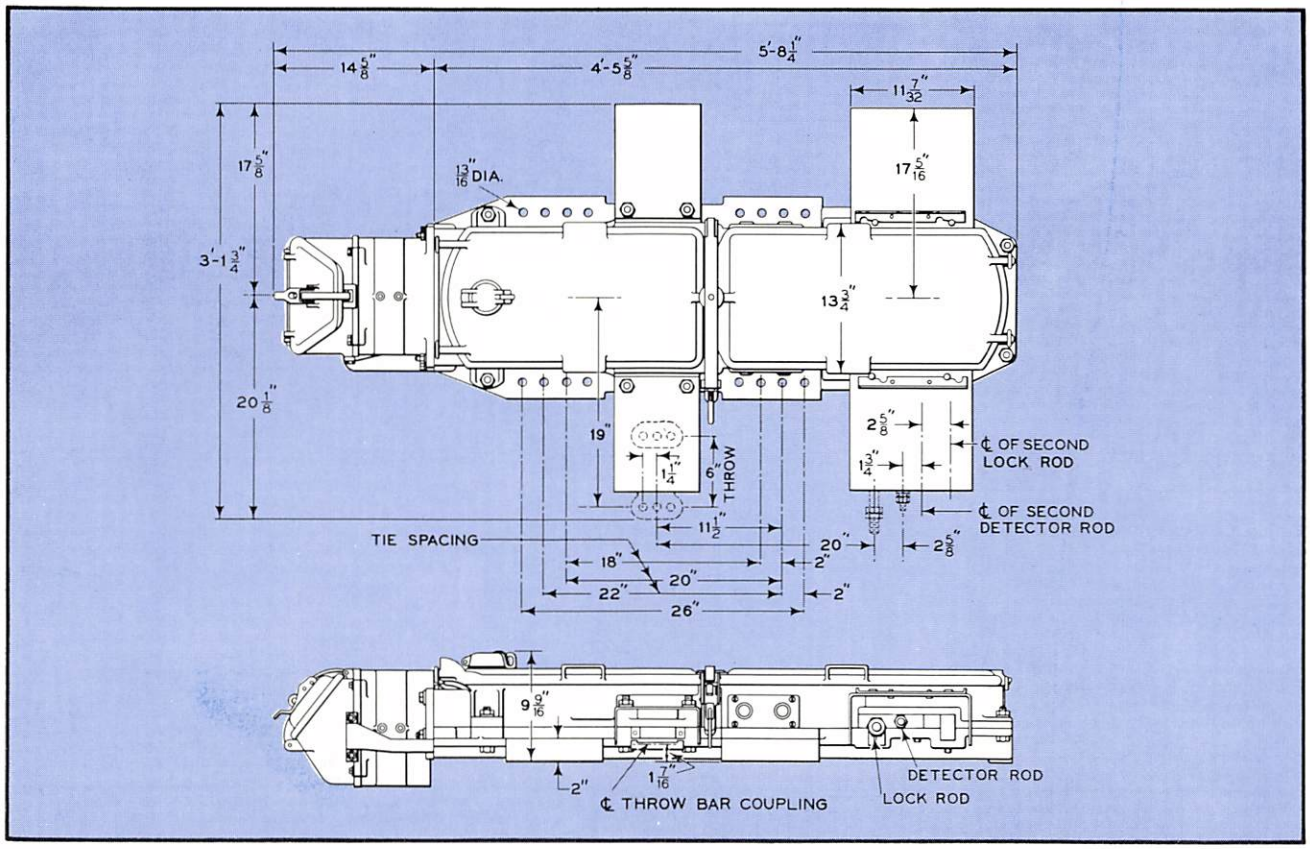
For movable point frog:

Operating Voltage D-c	Right or Left Hand	Catalog Number
110	Right	A85-130
110	Left	A85-140

Same as above, except have throw-bar detection switch:

110	Right	A85-147
110	Left	A85-148

*Can be changed to left-hand layout in field; see page 4.



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MODEL 5E SWITCH MACHINE

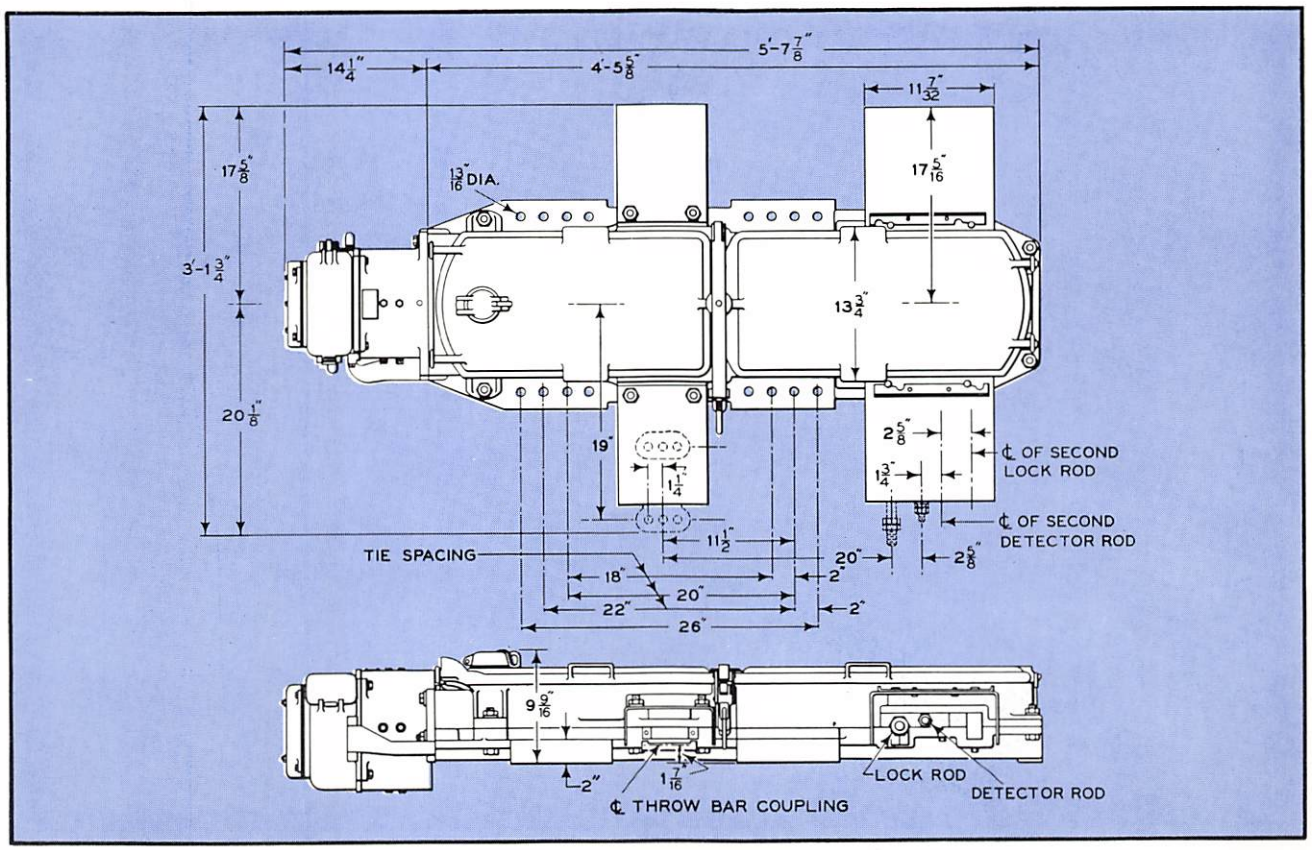
The Model 5E DOES NOT INCLUDE the following; please order separately:

- Accessories; see pages 15, 16, and 17.
- Type B or Type K switch control and switch overload relays; see Assemblies Catalog Sections 62 and 65.
- Lock and point detector connecting rods, throw rods, and junction boxes; see Assemblies Catalog Section 91.

To order, specify "Model 5E Switch Machine" and give catalog number.

Operating Voltage D-c	Right or Left Hand	Catalog Number
110	Right Only*	A85-151
24	Right Only*	A85-153

*Can be changed to left-hand layout in field; see page 4.



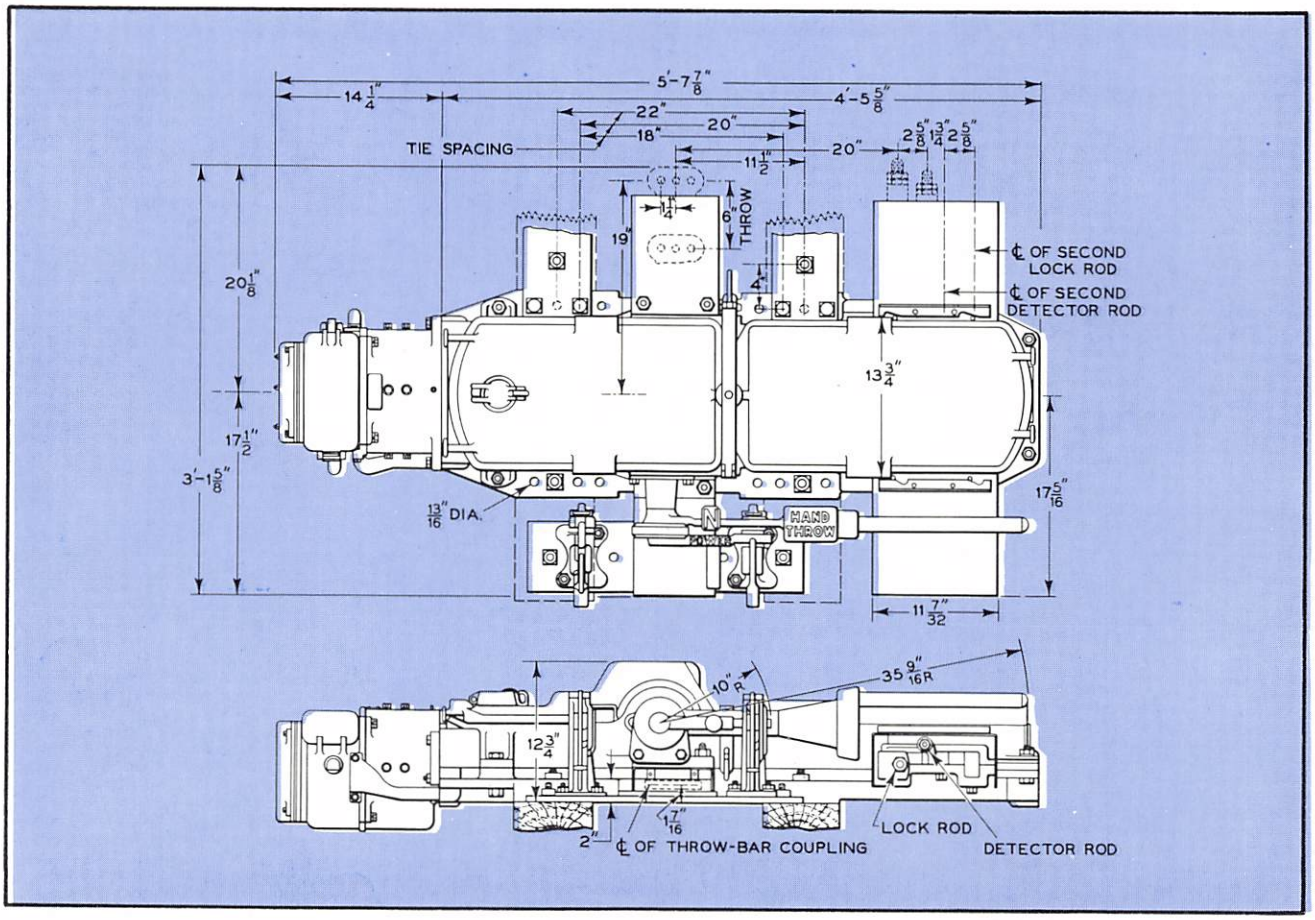
MODEL 5F DUAL CONTROL SWITCH MACHINE

The Model 5F DOES NOT INCLUDE the following; please order separately:

- Accessories; see pages 15, 16, and 17.
- Type B or Type K switch control and switch overload relays; see Assemblies Catalog Sections 62 and 65.
- Lock and point detector connecting rods, throw rods, and junction boxes; see Assemblies Catalog Section 91.

To order, specify "Model 5F Switch Machine" and give catalog number.

Operating Voltage D-c	Right or Left Hand	Catalog Number
110	Right	A85-201
110	Left	A85-203
24	Right	A85-206
24	Left	A85-208



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MODEL 5G SWITCH MACHINE

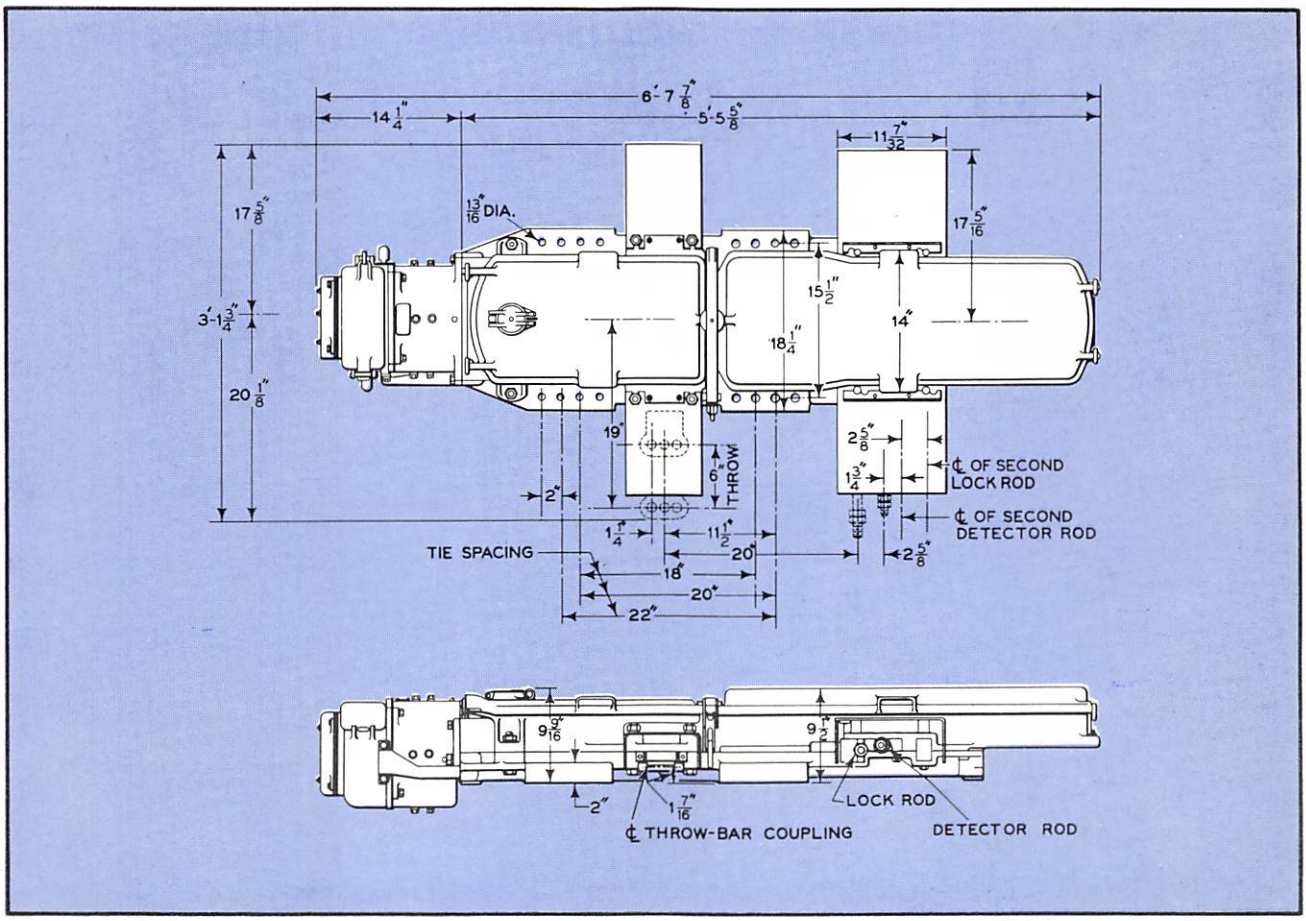
The Model 5G DOES NOT INCLUDE the following; please order separately:

- Accessories; see pages 15, 16, and 17.
- Lock and point detector connecting rods, throw rods, and junction boxes; see Assemblies Catalog Section 91.

To order, specify "Model 5G Switch Machine" and give catalog number.

Operating Voltage D-c	Control Voltage D-c	Right or Left Hand	Catalog Number
110	10 or 24	Right Only*	A85-247
24	10 or 24	Right Only*	A85-251

*Can be changed to left-hand layout in field; see page 4.



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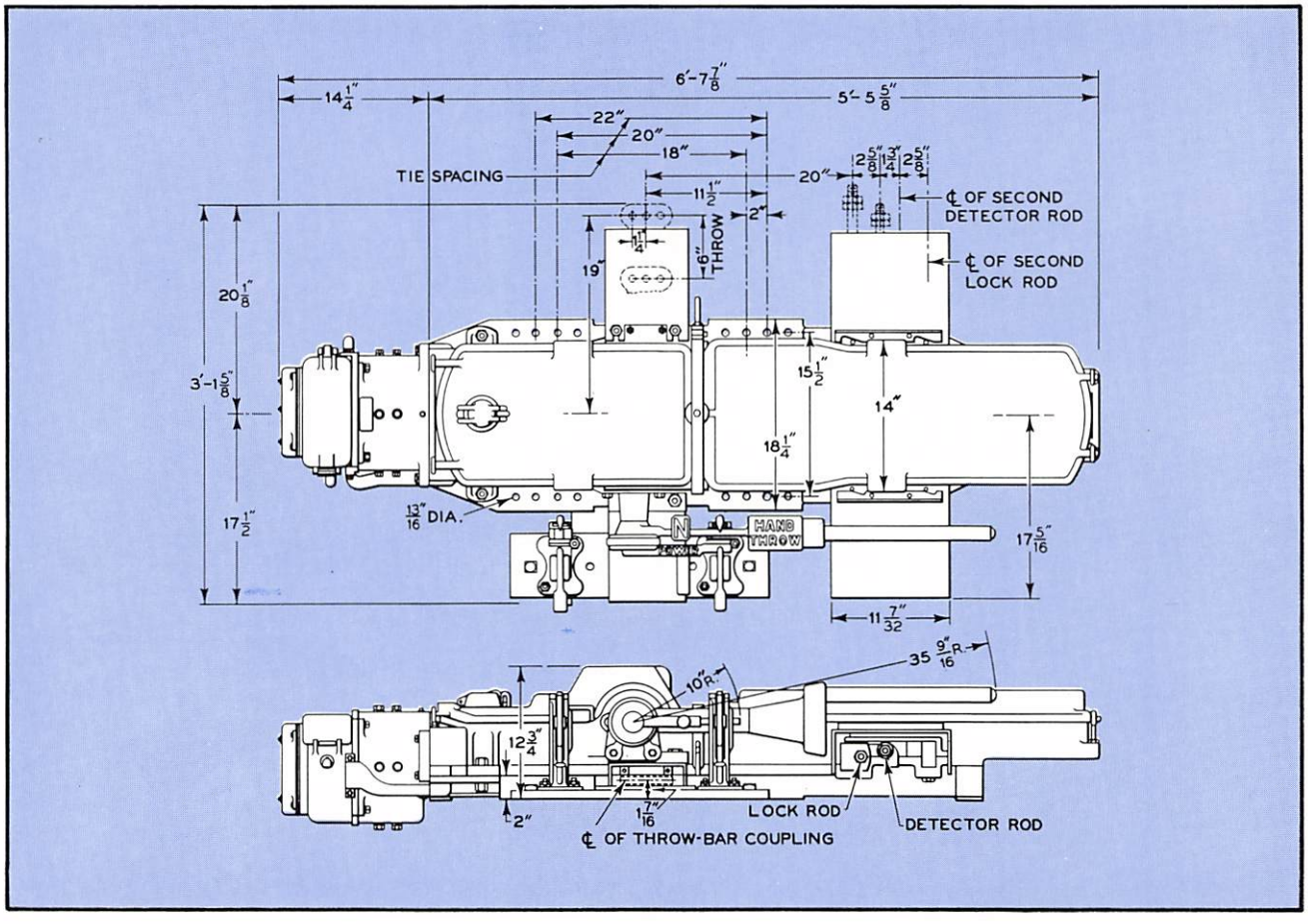
MODEL 5H DUAL CONTROL SWITCH MACHINE

The Model 5H DOES NOT INCLUDE the following; please order separately:

- Accessories; see pages 15, 16, and 17.
- Lock and point detector connecting rods, throw rods, and junction boxes; see Assemblies Catalog Section 91.

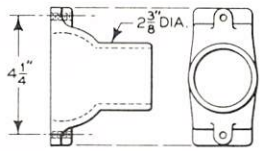
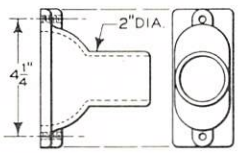
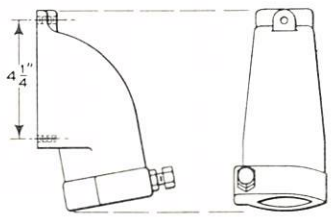
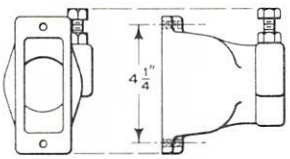
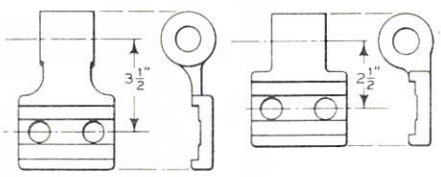
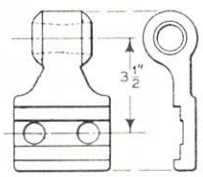
To order, specify "Model 5H Switch Machine" and give catalog number.

Operating Voltage D-c	Control Voltage D-c	Right or Left Hand	Catalog Number
110	10 or 24	Right	A85-302
110		Left	A85-304
24	10 or 24	Right	A85-312
24		Left	A85-314



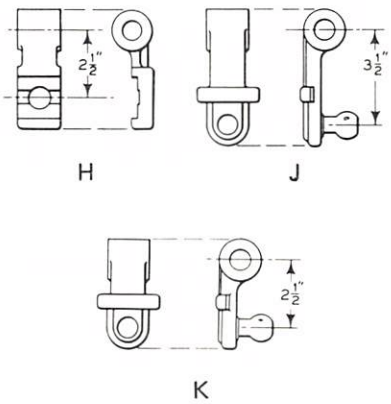
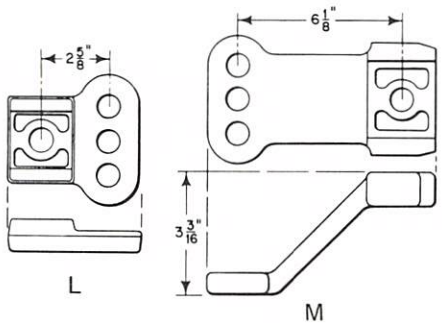
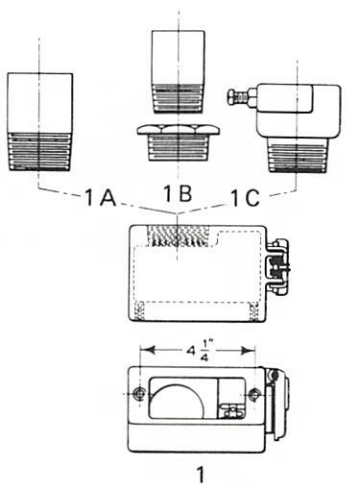
ACCESSORIES

PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE

REFERENCE	NAME	CATALOG NUMBER
 A	A. **COUPLING,** wire entrance, for 2-3/8" I. D. split or solid rubber conduit	A85-500
 B	B. **COUPLING,** wire entrance, for 1-7/8" I.D. split or solid rubber conduit	A85-501
 C	C. **COUPLING,** wire entrance, offset, for 2" flexible conduit	A85-502
 D	D. **COUPLING,** wire entrance, straight, for 2" flexible conduit	A85-503
 E F	E. **LUG,** lock rod, 3-1/2" spacing, for 1" diameter lock rod	A85-560
	F. **LUG,** lock rod, 2-1/2" spacing, for 1" diameter lock rod	A85-561
 G	G. **LUG,** lock rod, 3-1/2" spacing, swivel type, for 1" diameter lock rod, includes cap nuts	A85-562

ACCESSORIES (cont'd)

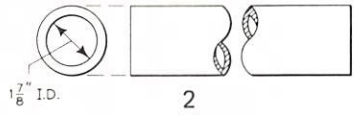
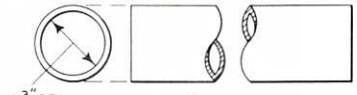
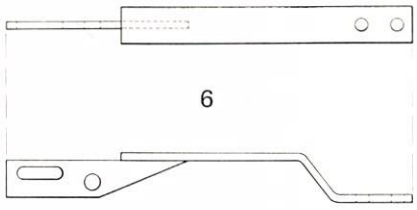
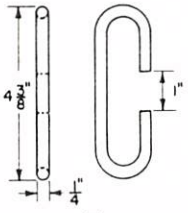
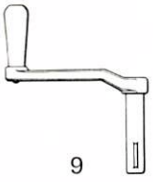
PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE

REFERENCE	NAME	CATALOG NUMBER
 H J K	**H. LUG,** detector rod, 2-1/2" spacing, for 3/4" diameter rod, noninsulated	**A85-563**
	J. LUG, detector rod, 3-1/2" spacing, for 3/4" diameter detector rod, noninsulated, needs grease fitting, reference 5 . .	**A85-564**
	K. LUG, detector rod, 2-1/2" spacing, for 3/4" diameter detector rod, noninsulated, needs grease fitting, reference 5 . .	**A85-565**
	K1. LUG, same as K above except insulated	**A85-566**
	K2. LUG, same as K above except insulated and for 1" diameter detector rod	**A85-567**
	**L. COUPLING,** throw bar	**P85-709**
	M. COUPLING, offset for throw bar	**P85-925**
	**1. WIRE ENTRANCE COUPLING,** with telephone jack, mounted in case, no conduit fittings	**A85-510**
	1A. As above, except with fitting for 2-3/8" I. D. rubber conduit	**A85-511**
	1B. Same as Ref. 1, except with fitting for 1-7/8" I.D. rubber conduit	**A85-512**
	1C. Same as Ref. 1, except with fitting for 2" flexible conduit	**A85-513**

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ACCESSORIES (cont'd)

PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE

REFERENCE	NAME	CATALOG NUMBER
 2	2. **CONDUIT,** 1-7/8" I. D., solid rubber, recommended length 3' -- specify number of feet required	A85-520
 3	3. **CONDUIT,** 2" flexible, recommended length 3' --specify number of feet required	A85-530
 4	4. **CONDUIT,** 2-3/8" I. D., solid rubber, recommended length 3' -- specify number of feet required	A85-535
 5	5. **GREASE FITTING,** for detector rod lugs.	P87-101
 6	6. **TEST BAR,** provides means to check operation of machine and circuits before connecting machine to switch	P85-1357
 7	7. **GAUGE,** for adjustment of point detector rod without releasing lock rod.	P85-1216
	8. **MODIFICATION KIT,** frost shield and felt commutator cover for the motor, required when heaters will not be used in switch machines	P85-1356
 9	9. **HAND CRANK,** for set-up and emergency operation of switch machine	P85-826

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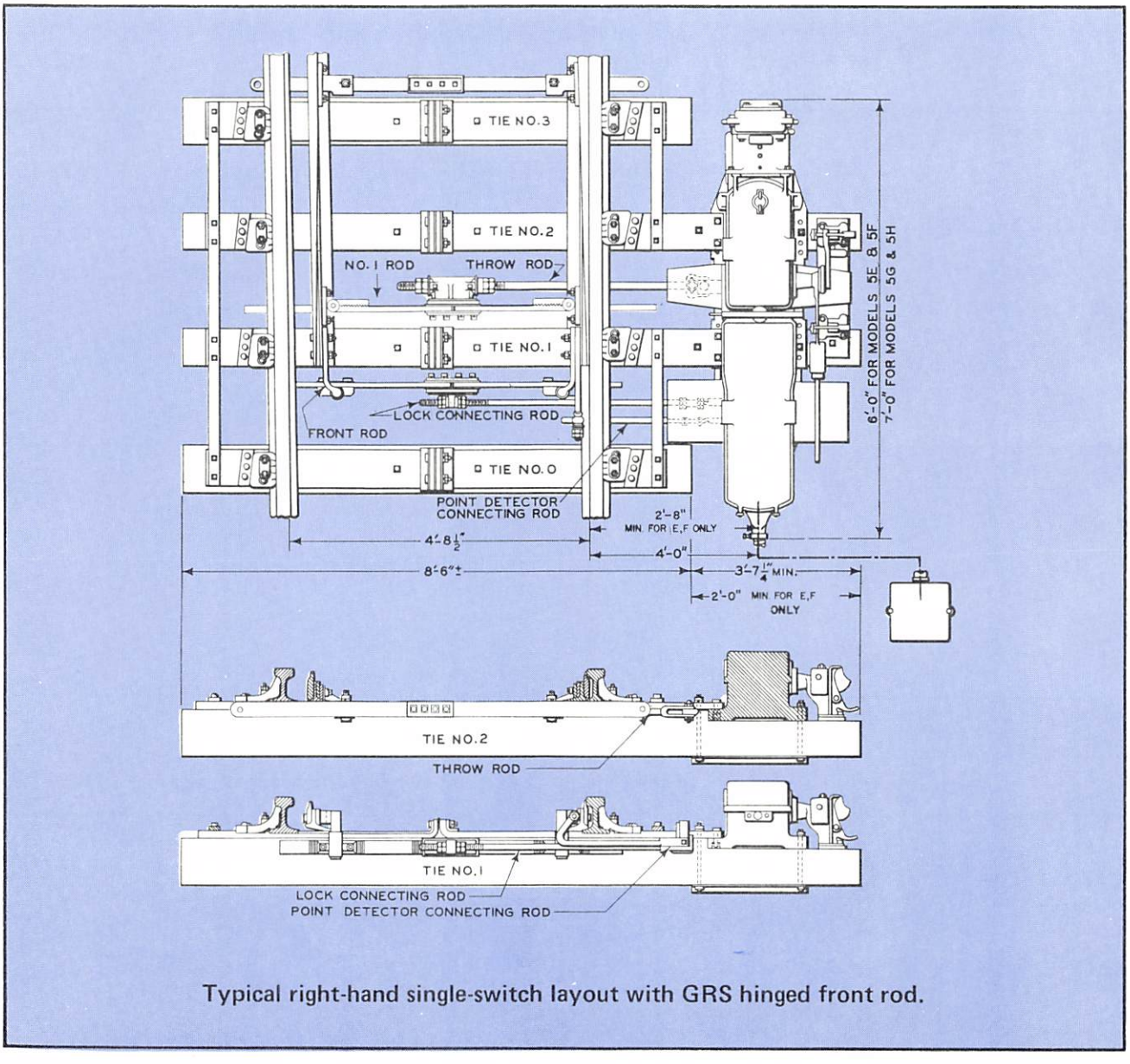
QUESTIONNAIRE

Complete Switch Layout

If you wish, GRS can select all parts for you to make up a complete layout as shown here (but not including: rails, rail fastenings, ties, tie straps, number one rod, or gauge plates). Bolts furnished will be for full length, one inch thick gauge plates, as shown. Also, the necessary connecting plate, bolts, insulation, etc. will be included to insulate your number one rod. Front rod and junction terminal box will not be included unless you specify same. Please give us the following information:

1. Catalog number of Model 5 switch machine you want. Refer to pages 10 through 14. You need not specify conduit, lugs, etc., unless you have a particular preference, as we will select them for you.
2. Characteristics of your number one rod:
   Horizontal: _____ Vertical: _____ Inches thick: _____
3. Distance from centerline of switch machine to gauge of rail: _____
4. Weight of rail: _____
5. Do you wish to include:
   Junction Terminal Box A91-230?
   Yes: _____ No: _____

Front Rod? If so, please select from Catalog Section 91 and state catalog number: _____



Typical right-hand single-switch layout with GRS hinged front rod.

GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL

MAIN OFFICE AND PLANT
BOX 600 ROCHESTER NY 14692 Phone: 716 • 436-2020 Cable: GENRASIG (ROCHESTER NY)
Telex: 978317

ATLANTA OFFICE
3379 PEACHTREE ROAD NE ATLANTA GA 30326 Phone: 404 • 233-7373

CHICAGO OFFICE
SUITE 2120 PRUDENTIAL PLAZA CHICAGO IL 60601 Phone: 312 • 467-1221

MONTREAL OFFICE
POINTE-CLAIRE COMMERCE CENTER 6600 TRANSCANADA HIGHWAY POINTE-CLAIRE QUEBEC H9R 4S2
Phone: 514 • 694-7350

NEW YORK OFFICE
ROOM 928 230 PARK AVENUE NEW YORK NY 10169 Phone: 212 • 697-3681

OAKLAND OFFICE
FIRST INTERSTATE BANK OF CALIFORNIA BUILDING SUITE 1440 1330 BROADWAY OAKLAND CA 94612
Phone: 415 • 893-3100

ST. LOUIS OFFICE
LACLEDE GAS BUILDING 720 OLIVE STREET ST. LOUIS MO 63101
Phone: 314 • 621-4696

ST. PAUL OFFICE
NORTHWESTERN NATIONAL BANK BUILDING SUITE 1380 55 E 5TH STREET ST. PAUL MN 55101
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Phone: 301 • 587-4770

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G.R.S. TRADING CORPORATION:
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GEC-GENERAL SIGNAL LIMITED
ELSTREE WAY BOREHAMWOOD HERTFORDSHIRE WD6 1RX ENGLAND Phone: 01-953-8211
Cable: RAILSIGKO BOREHAMWOOD (ENGLAND) Telex: 22777 GECBWD G BOREHAMWOOD (ENGLAND)

ALGEMENE SEIN INDUSTRIE B.V.
CROESELAAN 28 3521 CB UTRECHT NETHERLANDS Phone: (030) 94 26 46
Cable: GENRASIG UTRECHT (NETHERLANDS) Telex: 47455 GRASI NL UTRECHT (NETHERLANDS)

REPRESENTATIVES AND LICENSEES THROUGHOUT THE WORLD

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GRS

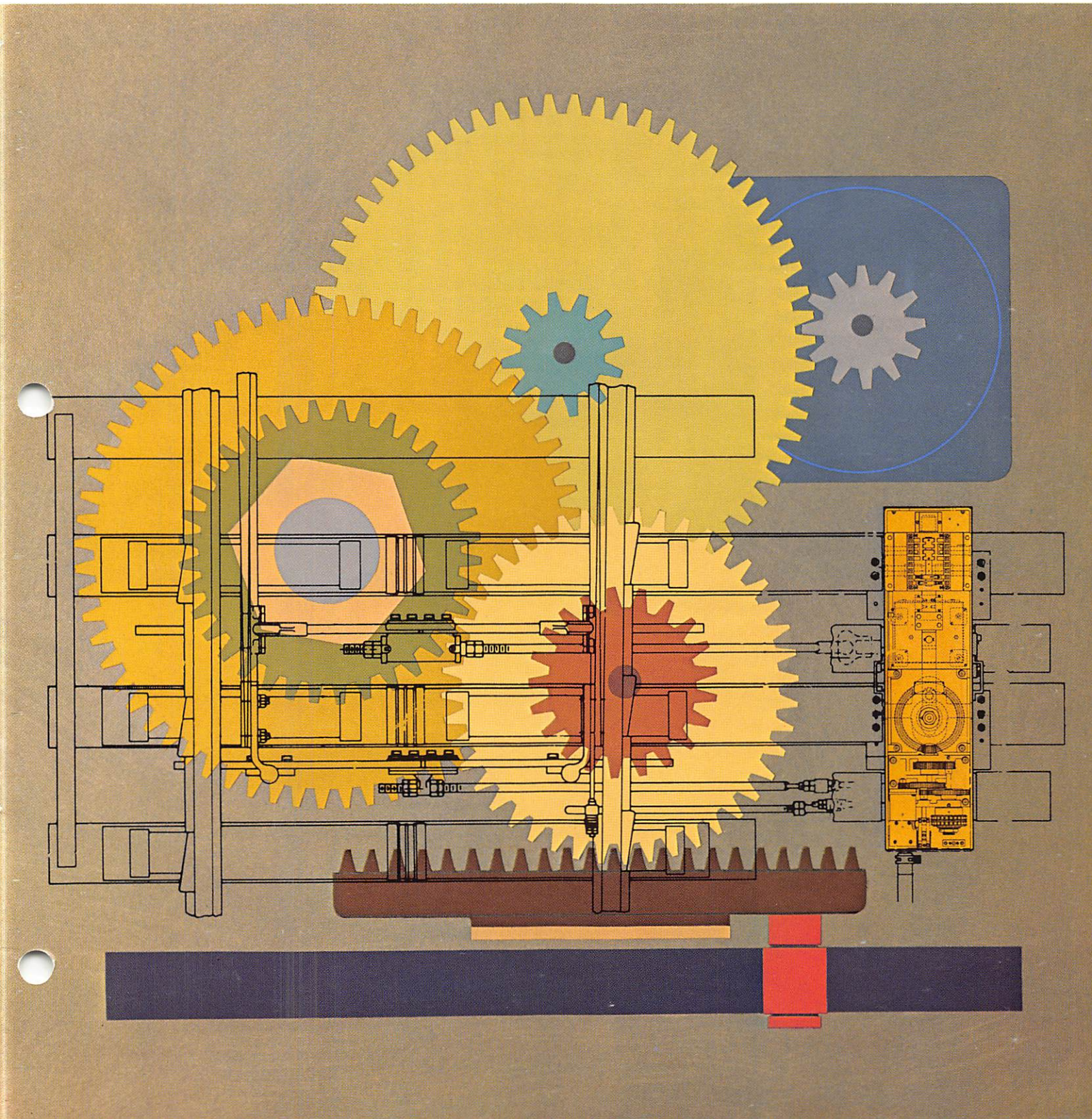
GENERAL RAILWAY SIGNAL

A UNIT OF GENERAL SIGNAL

MODEL 55
ELECTRIC SWITCH MACHINES

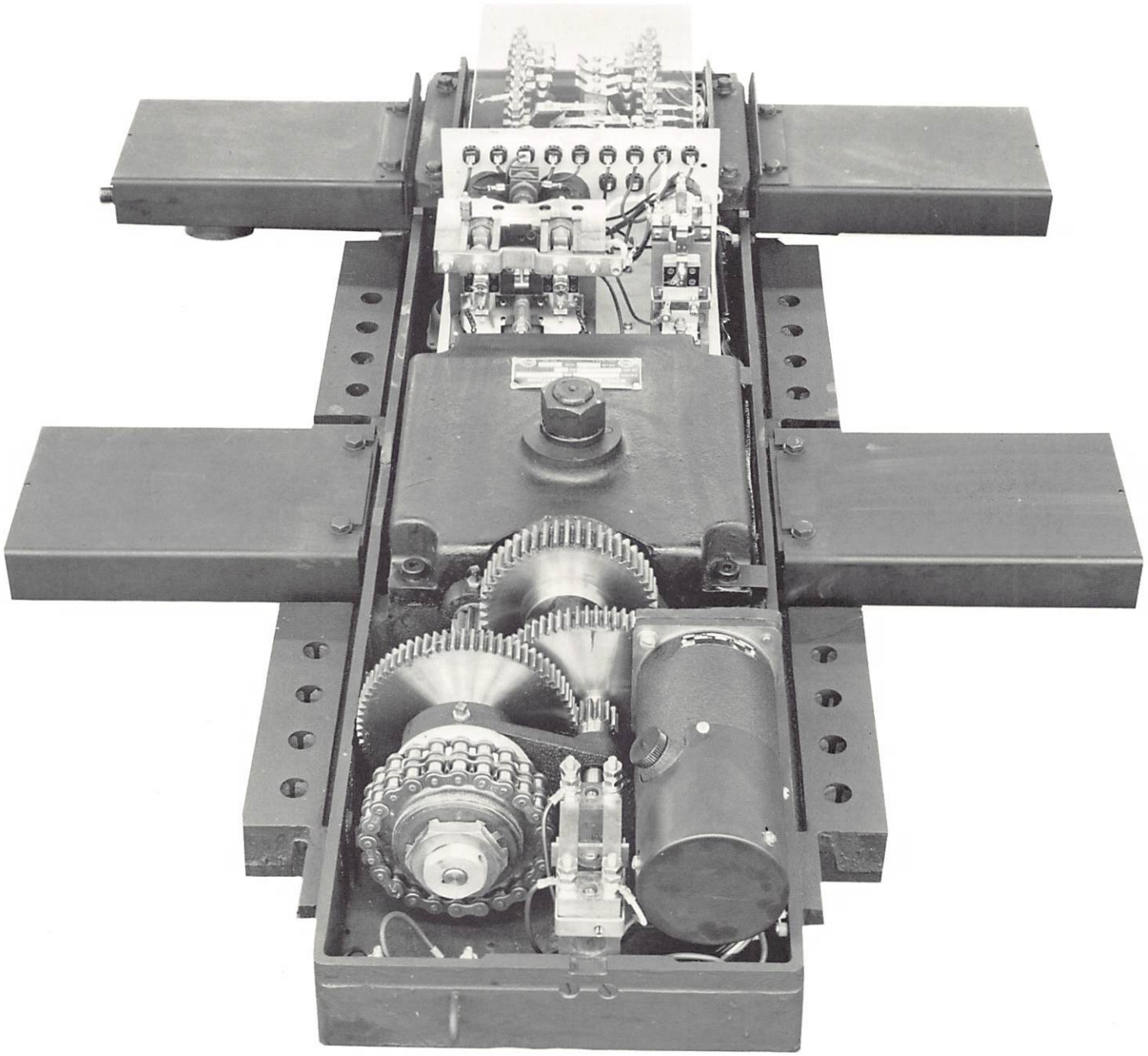
FOR MAINLINE, INTERLOCKING, AND RAPID TRANSIT SERVICE

GRS CATALOG **85-2**



MODEL 55 ELECTRIC SWITCH MACHINES

- Versatile
- Lightweight (500 pounds)
- Easy Installation
- "Easy Access" Design
- Reduced Maintenance
- Unit Construction
- Wide Range of Operating and Control Voltages



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INTRODUCTION

The Model 55 electric switch machine is for use in mainline, interlocking, and rapid transit service. It can operate either a single switch, single-slip switch, double-slip switch with continuous front rod, or any type derail.

General Description

The Model 55 switch machine is available in two Models: 55E and 55G. It basically consists of an electrically operated switch and lock movement, with lock rod, point detector rod and built-in circuit controller contacts that check the machine over-and-locked in both the normal and reverse positions. The machines can be hand cranked for making and checking adjustments; hand cranking is used for emergency switch operation in case of power failure.

Control and overload relays for the Model 55E are housed externally. The Model 55G has a built-in biased-neutral controller operated by a low-voltage d-c, two-wire polarized line circuit. The controller, in turn, applies 24- or 110-volt d-c to the motor. This control voltage can be easily changed in the field from 24 to 10 volts to suit railroad requirements. Both models are designed for battery indication. Machines provided with 110 d-c motors can be operated from 110 a-c through rectifiers.

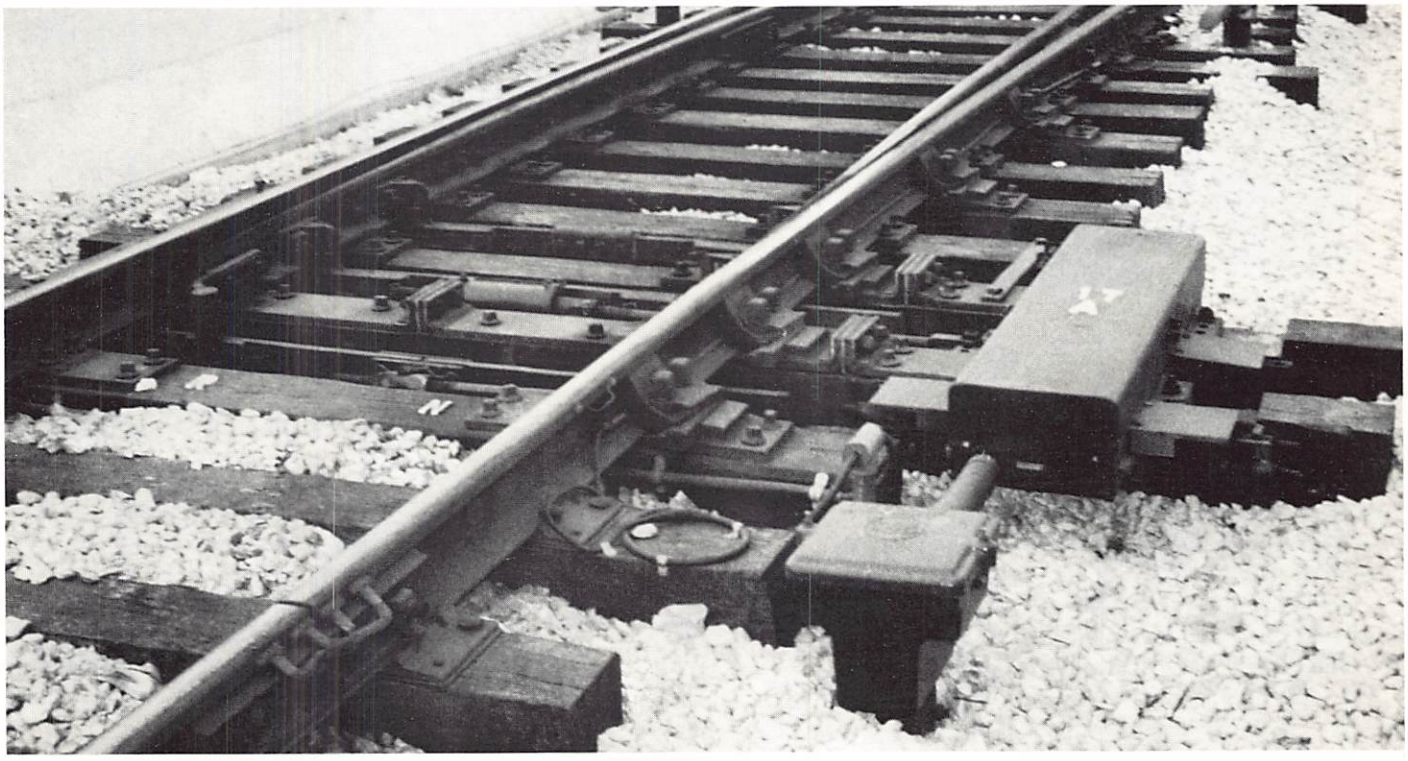
Operating time is approximately 3 seconds for 110-volt machines, and 8 to 10 seconds for 24-volt machines.

A permanent magnet holding device holds the motor after the end of the stroke. The magnetic detent then holds the motor armature against vibration and low-level stray electrical currents.

The point detector has knife-edged contacts which exert extra-heavy pressure to combat frost. There are two normal, two reverse, two motor control, and two shunt contacts. The motor control contacts in the Model 55E carry and break the motor current directly.

The machines are frost protected by 110-volt heaters, located in the motor, controller, and contact compartments, and by a transparent cover mounted over the point detector contacts.

Unit construction of major assemblies—motor, intermediate gear train, and clutch; main gear and shaft; point detector; biased-neutral controller—facilitates inspection and replacement, thus, reducing down time and saving valuable man hours. The one-piece deep-sided cover, when removed, leaves internal assemblies readily accessible for easier maintenance. Special hardware is used at critical points in the assemblies to prevent loosening during periods of vibration.

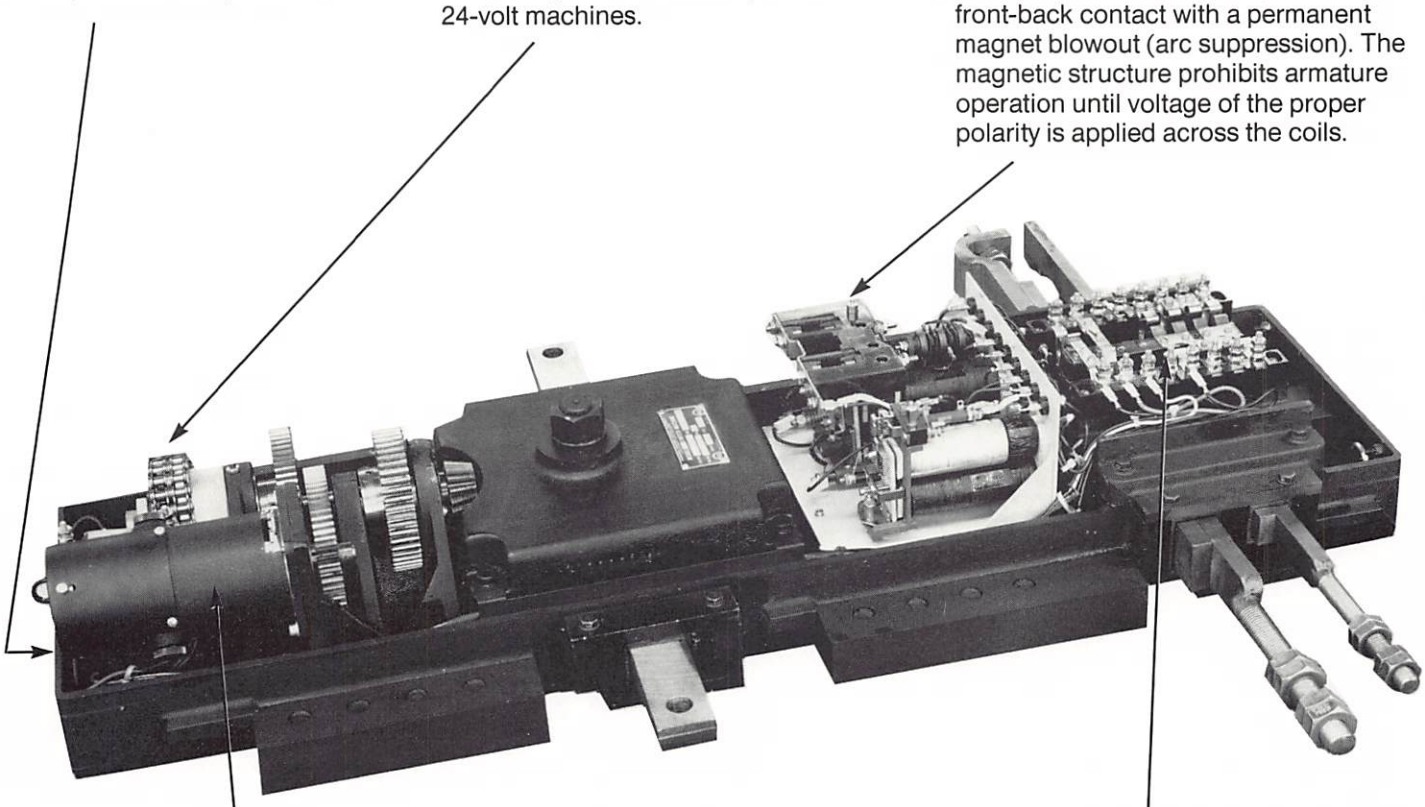


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Removable Hand Crank
is provided on all Model 55 machines for maintenance and emergency use. An automatic cutout contact with a latchout feature and manual reset protects the operator.

Overload Friction Clutch
in the gear train absorbs shocks encountered in switch operation. It is factory adjusted to slip when the motor operating current is from 9 to 11 amperes for 110-volt d-c and a-c machines, and 18 to 20 amperes for 24-volt machines.

Biased-Neutral Controller
in Model 55G machine has two biased-neutral, mechanically interlocked contactors, a blocking rectifier, and an overload relay. A single-phase bridge rectifier is included for a-c operation. Each contactor has one dependent, front-back contact with a permanent magnet blowout (arc suppression). The magnetic structure prohibits armature operation until voltage of the proper polarity is applied across the coils.



Compact Motor
(only 4 inches in diameter) has a series split-connected encapsulated field coils and armature for maximum protection against moisture. A simple magnetic holding device locks the motor armature after the machine completes a stroke. Magnetic holding is frictionless and virtually maintenance free—nothing to wear out.

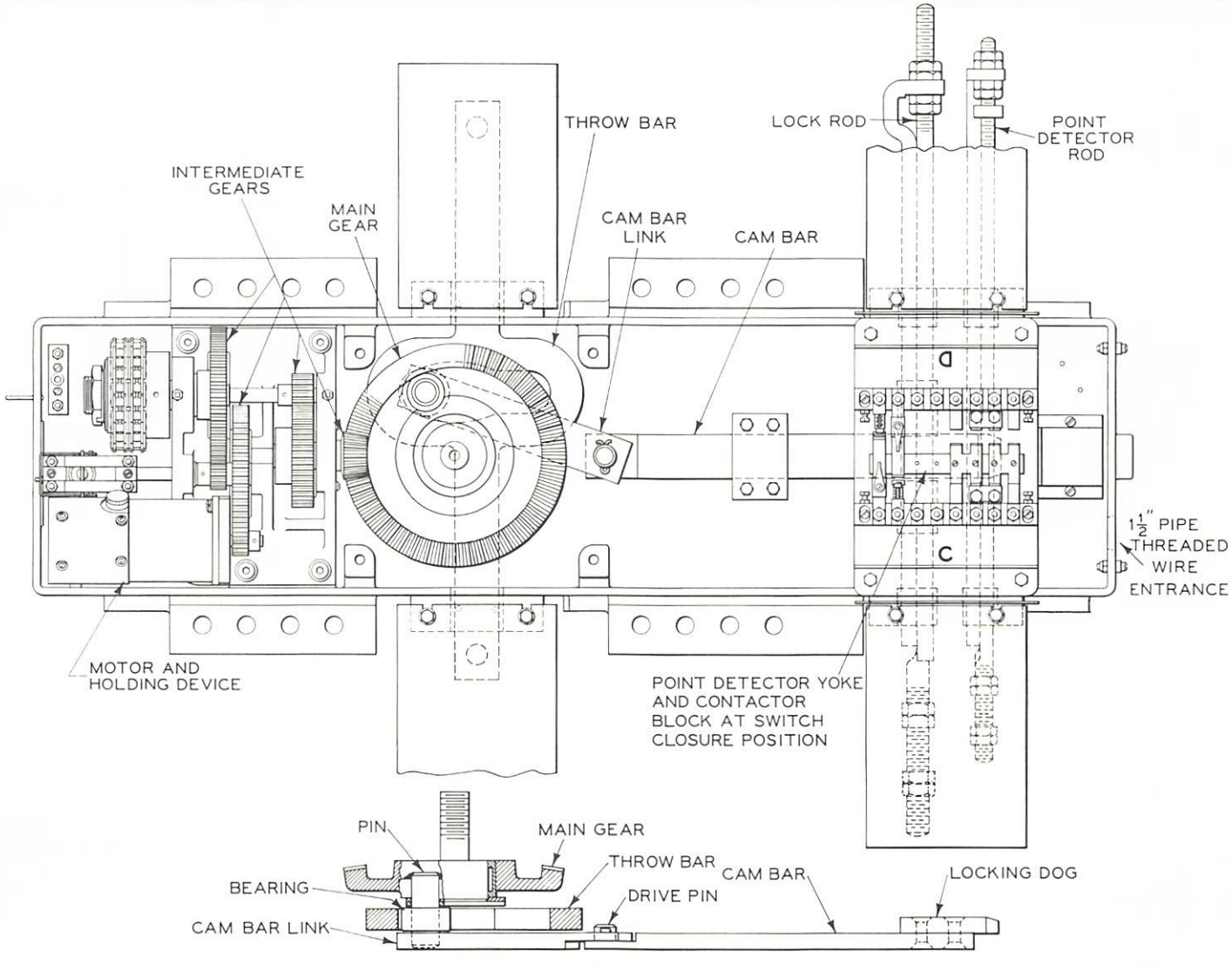
Heaters
are provided in the motor, controller, and point detector compartments.

Wear Points
The machines have renewable box style bearings for the throw bar, and wear plates for the lock and detector rods.

Point Detector
is an over-and-locked type circuit controller with two normal, two reverse, two shunt, and two motor-control contacts. The normal and reverse contacts check and indicate when the switch points are within the proper distance of the stock rail and are locked. The motor-control contacts control the motor-operating circuit directly in the Model 55E machine and in conjunction with the biased-neutral controller in the Model 55G machine.

To move the switch points, the motor drives the intermediate gear train and the main gear. The lower end of the roller bearing stud in the main gear engages the cam bar via a link. As the main gear rotates from either extreme position, it pushes the cam bar toward the wire entrance end of the machine. This moves the dog on the cam bar out of the notch in the lock rod, unlocking the switch points and simultaneously causing the two rollers on the point detector yoke to be centered in the lock dog. Thus, the point detector yoke is moved to the vertical position to open the normal and reverse contacts and to close the motor control contacts. Continued rotation of the main gear causes the roller bearing to move the throw bar six inches. The throw bar moves the switch points which, in turn, move the lock and detector rods.

When the switch points close in the opposite position, the point detector rod is in position so that the point detector yoke and the attached contact block are forced by spring pressure to close the opposite indication contacts. This occurs during the last stage of the cam bar movement, when the bar is withdrawn from the detector yoke rollers and simultaneously locks the lock rod in position.



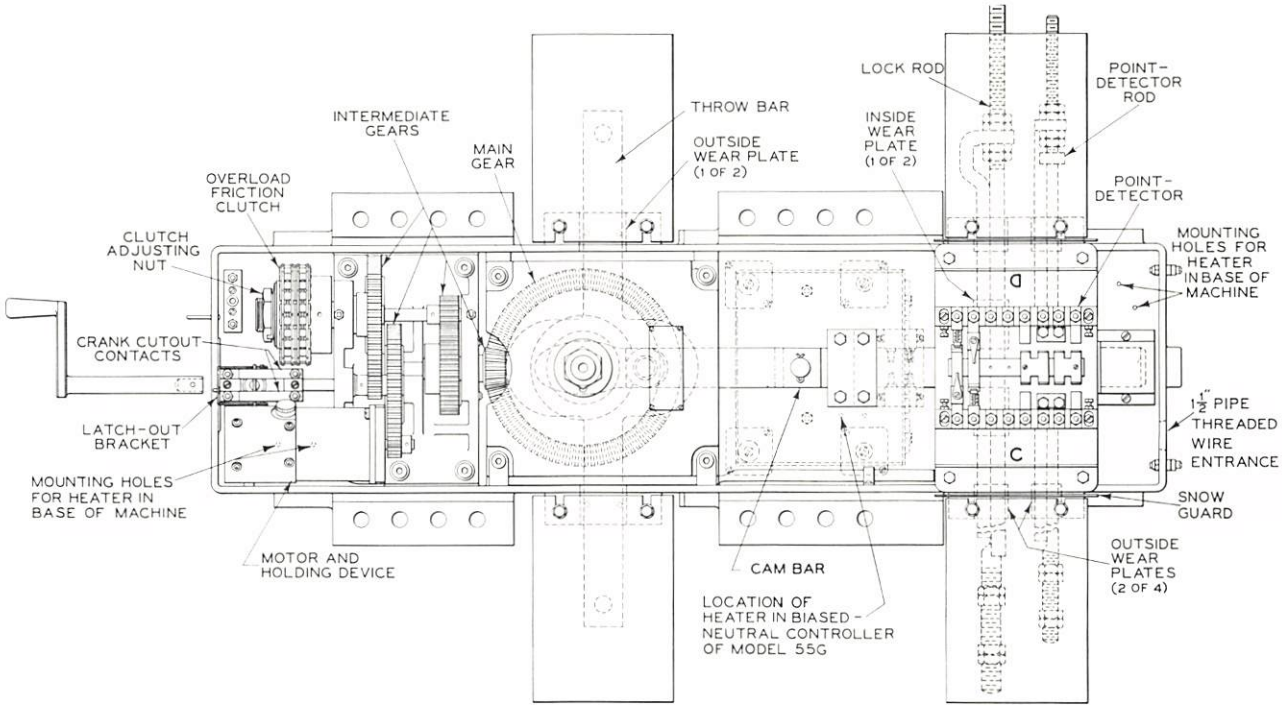
CAM BAR ASSEMBLY - SIDE VIEW

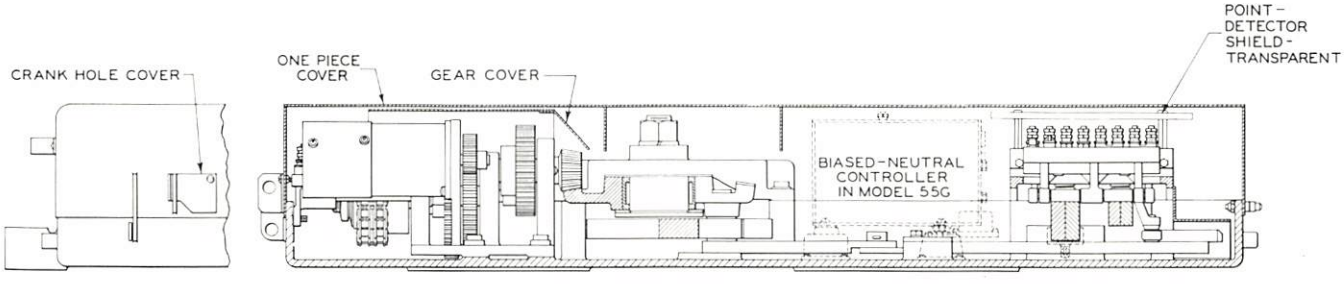
Signed by Israel Jones, texasrails.org 7/16/2026

INSTALLATION

Installation and adjustment of the switch machine is relatively straightforward. Its versatility permits a number of configurations, some of which can be changed in the field.

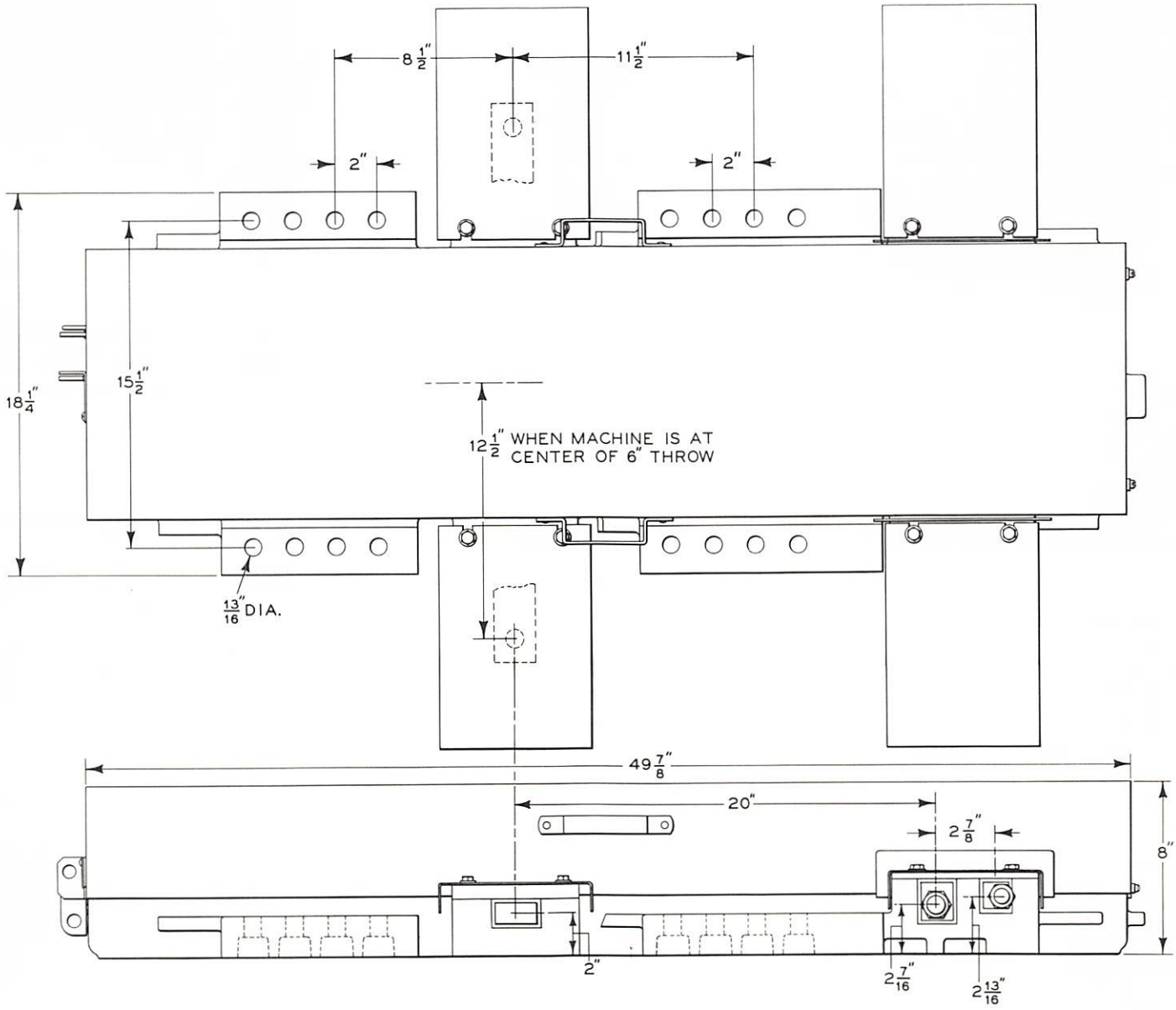
A right-hand machine is one located on the right-hand side of the track when the observer faces the switch points. Machines ordered with one lock rod and one point detector rod are shipped in the right-hand configuration only. These can be easily altered in the field to left hand by reversing the lock rod and point detector rod in the machine and by moving the throw bar connection to the opposite end. Complete operation, installation, and maintenance data are contained in Pamphlet 1217.





Models 55E and 55G switch machines are provided with one lock rod and one point detector rod for control of a single switch, single-slip switch, derail, or double-slip switch. Machines with two lock rods and two detector rods are available; see your GRS sales engineer for details.

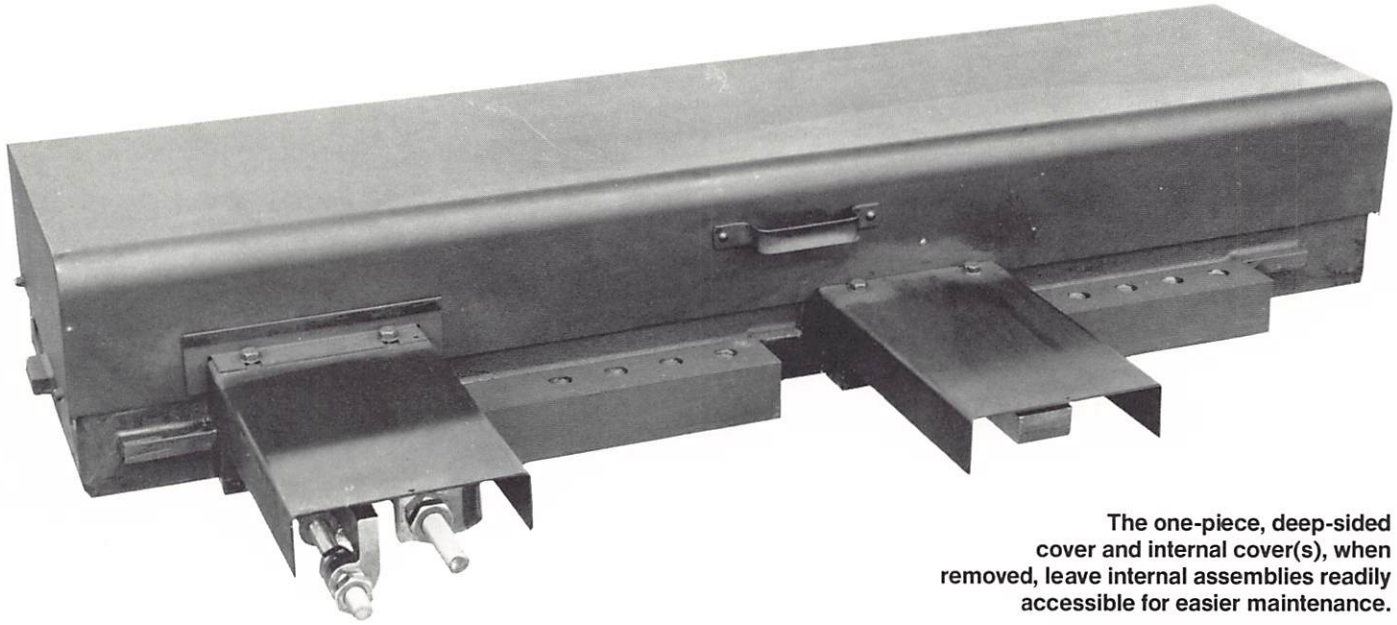
NOTE: If you desire to have GRS select all parts for a complete switch layout, please complete the questionnaire on the inside back cover.



MODEL 55E SWITCH MACHINE

The Model 55E DOES NOT INCLUDE the following; please order separately:

- **Accessories; see page 10.**
- **Type B or Type K switch control and switch overload relays; see Assemblies Catalog Sections 62 and 65.**
- **Lock and point detector connecting rods, throw rods, and junction boxes; see Assemblies Catalog Section 91.**



The one-piece, deep-sided cover and internal cover(s), when removed, leave internal assemblies readily accessible for easier maintenance.

TO ORDER, SPECIFY "MODEL 55E SWITCH MACHINE" AND GIVE CATALOG NUMBER.

Operating Voltage D-c	Right or Left Hand	CATALOG NUMBER
110	Right Only*	**A85-900**
24	Right Only*	**A85-901**

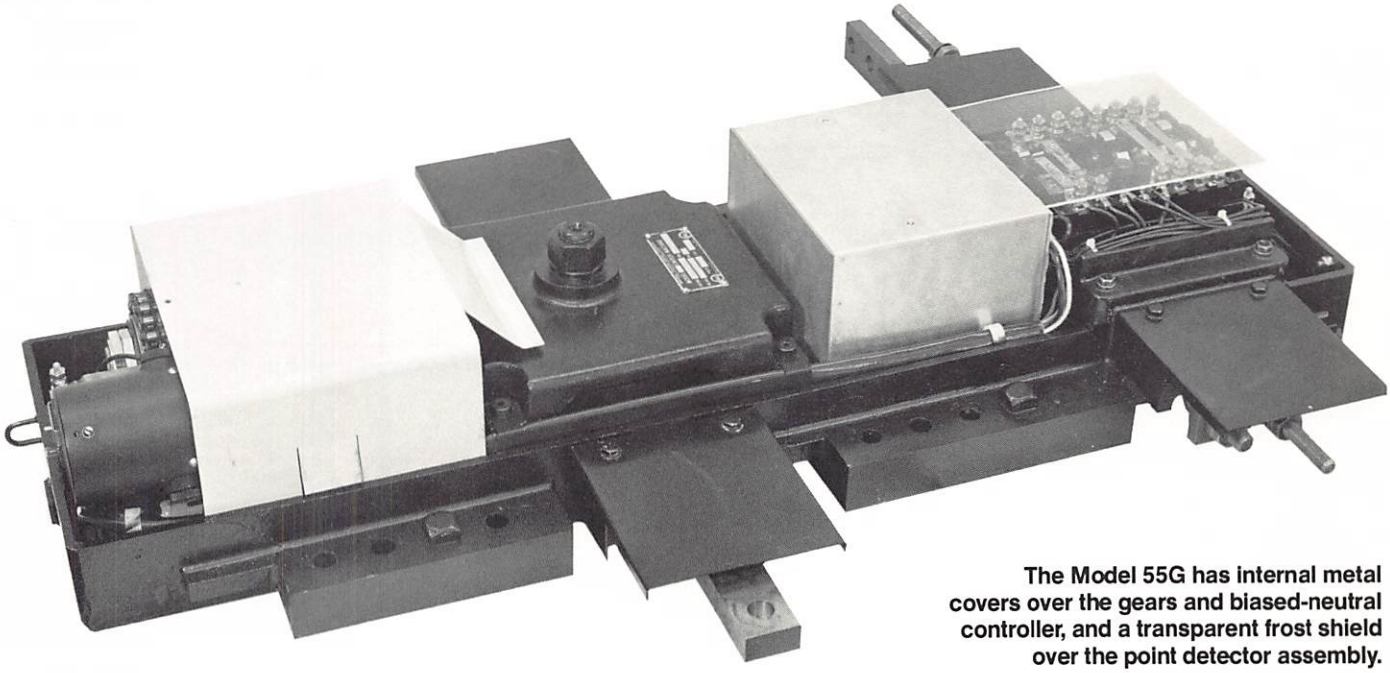
*Can be changed to left-hand layout in field; see page 6.

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MODEL 55G SWITCH MACHINE

The Model 55E DOES NOT INCLUDE the following; please order separately:

- **Accessories; see page 10.**
- **Lock and point detector connecting rods, throw rods, and junction boxes; see Assemblies Catalog Section 91.**



The Model 55G has internal metal covers over the gears and biased-neutral controller, and a transparent frost shield over the point detector assembly.

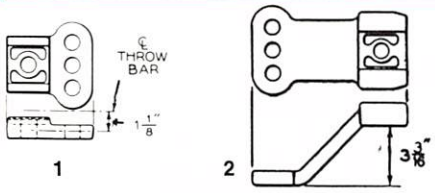
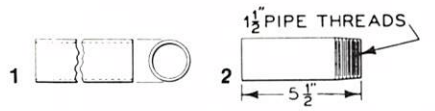
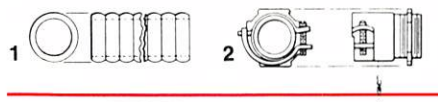
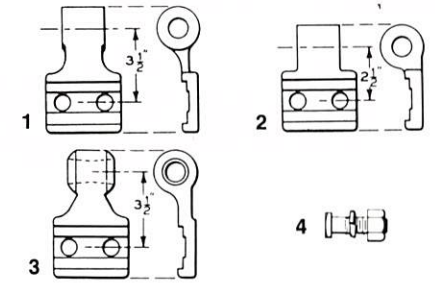
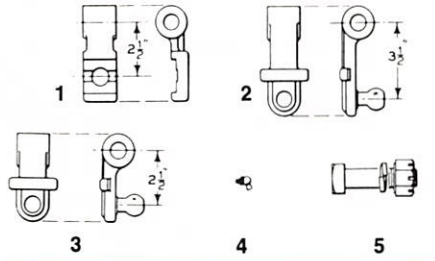
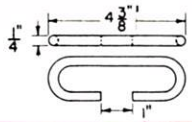
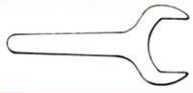
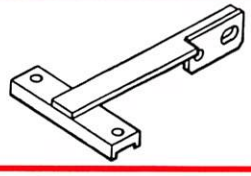
TO ORDER, SPECIFY "MODEL 55G SWITCH MACHINE" AND GIVE CATALOG NUMBER.

Operating Voltage D-c	Control Voltage D-c	Right or Left Hand	CATALOG NUMBER
110	10 or 24	Right Only*	**A85-905**
24	10 or 24	Right Only*	**A85-906**

*Can be changed to left-hand layout in field; see page 6.

ACCESSORIES

PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE

REFERENCE		CATALOG NUMBER
	**1. COUPLING,** throw-bar, fits layouts with dapped ties.	**P85-1009**
	2. COUPLING, throw-bar, fits layouts with non-dapped ties.	**P85-1214**
	BOLT, for fastening coupling to throw bar, includes nut, lock washer, and cotter pin.	**P85-1210**
	**1. CONDUIT,** 1⅞" I.D. solid rubber, specify length required for use with pipe nipple.	**A85-520**
	2. PIPE NIPPLE, 1½" pipe thread.	**P85-1003**
	**1. CONDUIT,** 1½" flexible metal, specify length required for use with coupling.	**A85-868**
	2. COUPLING, 1½" pipe thread.	**A85-866**
	**LUGS,** lock rod	
	1. LUG, 3½" spacing, for 1" diameter lock rod.	**A85-560**
	2. LUG, 2½" spacing, for 1" diameter lock rod.	**A85-561**
	3. LUG, 3½" spacing, swivel type, for 1" diameter lock rod, includes cup nuts.	**A85-562**
	3A. Same as Ref. 3, except with 2½" spacing.	**A85-568**
	4. BOLT, complete with nut and washer, for fastening lugs. Refs. 1, 2, 3 to lock connecting rod.	**P85-1211**
	**LUGS,** detector rods	
	1. LUG, 2½" spacing for ¾" diameter detector rod.	**A85-563**
	2. LUG, 3½" spacing, for ¾" diameter detector rod.	**A85-564**
	3. LUG, 2½" spacing, for ¾" diameter detector rod.	**A85-565**
	4. GREASE FITTING, for detector rod lug.	**P87-101**
	5. BOLT, complete with nut and washer, for fastening lugs. Refs. 1 and 2.	**P85-1213**
	**GAUGE,** for adjustment of point detector rod without releasing lock rod.	**P85-1216**
	**WRENCH,** for adjusting clutch, 2⅜" open end.	**P85-974**
	**TEST BAR,** provides means to check operation of machine and circuits before connecting machine to switch.	**P85-1215**

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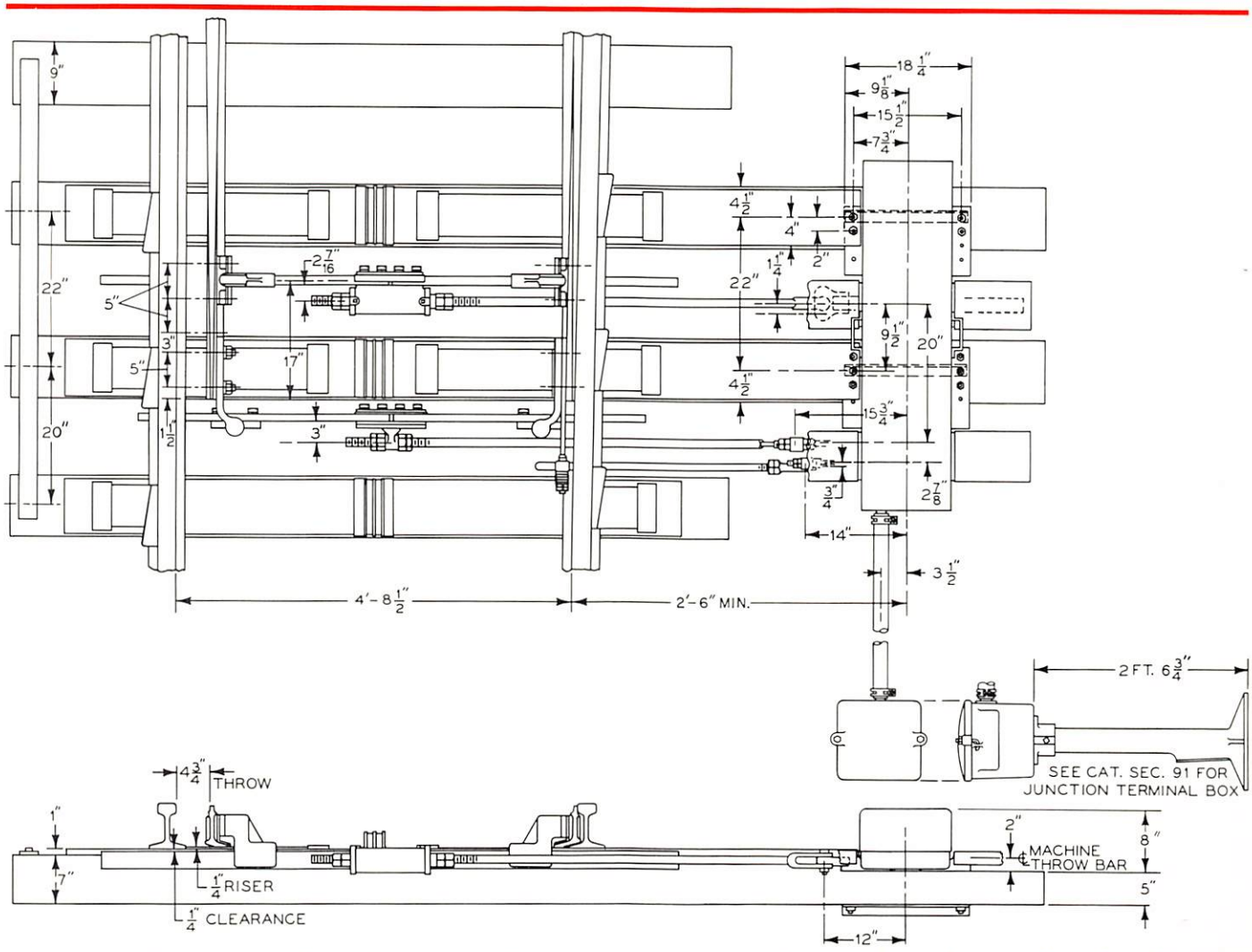
QUESTIONNAIRE

COMPLETE SWITCH LAYOUT

If you wish, GRS can select all parts for you to make up a complete layout as shown here (but not including: rails, rail fastenings, ties, tie straps, number one rod, or gauge plates). Bolts furnished will be for full length, one-inch thick gauge plates as shown. Also, the necessary connecting plate, bolts, insulation, etc., will be included to insulate your number one rod. Front rod and junction terminal box will not be included unless you specify same. If your switch fittings differ from the layout shown below, please state your dimensions. Please give us the following information:

1. Catalog number of Model 55 switch machine you want. Refer to pages 8 and 9. You need not specify conduit, lugs, etc., unless you have a particular preference, as we will select them for you.
2. Characteristics of your number one rod:
   Horizontal:_____ Vertical:_____ Inches thick:_____
3. Distance from centerline of switch machine to gauge of rail:_____
4. Weight of rail:_____
5. Do you wish to include:
   Junction Terminal Box A91-230?
   Yes:_____ No:_____

Front Rod? If so, please select from Catalog Section 91 and state catalog number:_____



GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL

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MAIN OFFICE AND PLANT
BOX 600 ROCHESTER NY 14692 Phone: 716 • 436-2020 Cable: GENRASIG (ROCHESTER NY)
Telex: 978317

ATLANTA OFFICE
3379 PEACHTREE ROAD NE ATLANTA GA 30326 Phone: 404 • 233-7373

CHICAGO OFFICE
SUITE 2120 PRUDENTIAL PLAZA CHICAGO IL 60601 Phone: 312 • 467-1221

MONTREAL OFFICE
POINTE-CLAIRE COMMERCE CENTER 6600 TRANSCANADA HIGHWAY POINTE-CLAIRE QUEBEC H9R 4S2
Phone: 514 • 694-7350

NEW YORK OFFICE
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FIRST INTERSTATE BANK OF CALIFORNIA BUILDING SUITE 1440 1330 BROADWAY OAKLAND CA 94612
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Phone: 314 • 621-4696

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GRS INTERNATIONAL

MAIN OFFICE:
BOX 600 ROCHESTER NEW YORK U.S.A. 14692 Phone: 716 • 436-2020
Cable: GENRASIG (ROCHESTER NY) Telex: 978317

G.R.S. TRADING CORPORATION:
BOX 600 ROCHESTER NEW YORK U.S.A. 14692 Phone: 716 • 436-2020
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GEC-GENERAL SIGNAL LIMITED
ELSTREE WAY BOREHAMWOOD HERTFORDSHIRE WD6 1RX ENGLAND Phone: 01-953-8211
Cable: RAILSIGKO BOREHAMWOOD (ENGLAND) Telex: 22777 GECBWD G BOREHAMWOOD (ENGLAND)

ALGEMENE SEIN INDUSTRIE B.V.
CROESELAAN 28 3521 CB UTRECHT NETHERLANDS Phone: (030) 94 26 46
Cable: GENRASIG UTRECHT (NETHERLANDS) Telex: 47455 GRASI NL UTRECHT (NETHERLANDS)

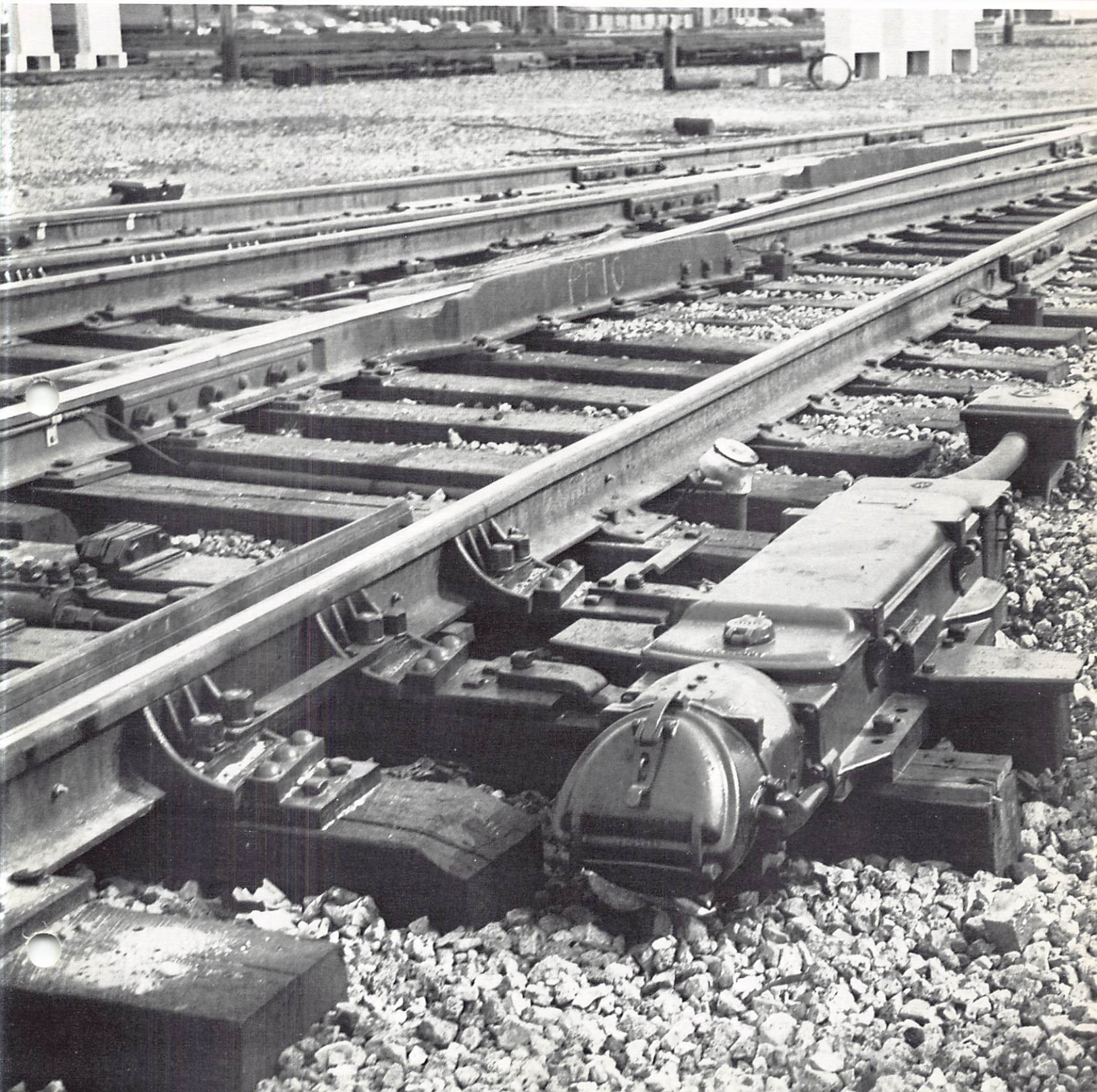
REPRESENTATIVES AND LICENSEES THROUGHOUT THE WORLD.

MODEL 6
ELECTRIC SWITCH MACHINES

FOR CLASSIFICATION YARD AND INDUSTRIAL SPUR APPLICATION

GRS CATALOG **85-3**

GRS



GENERAL INFORMATION

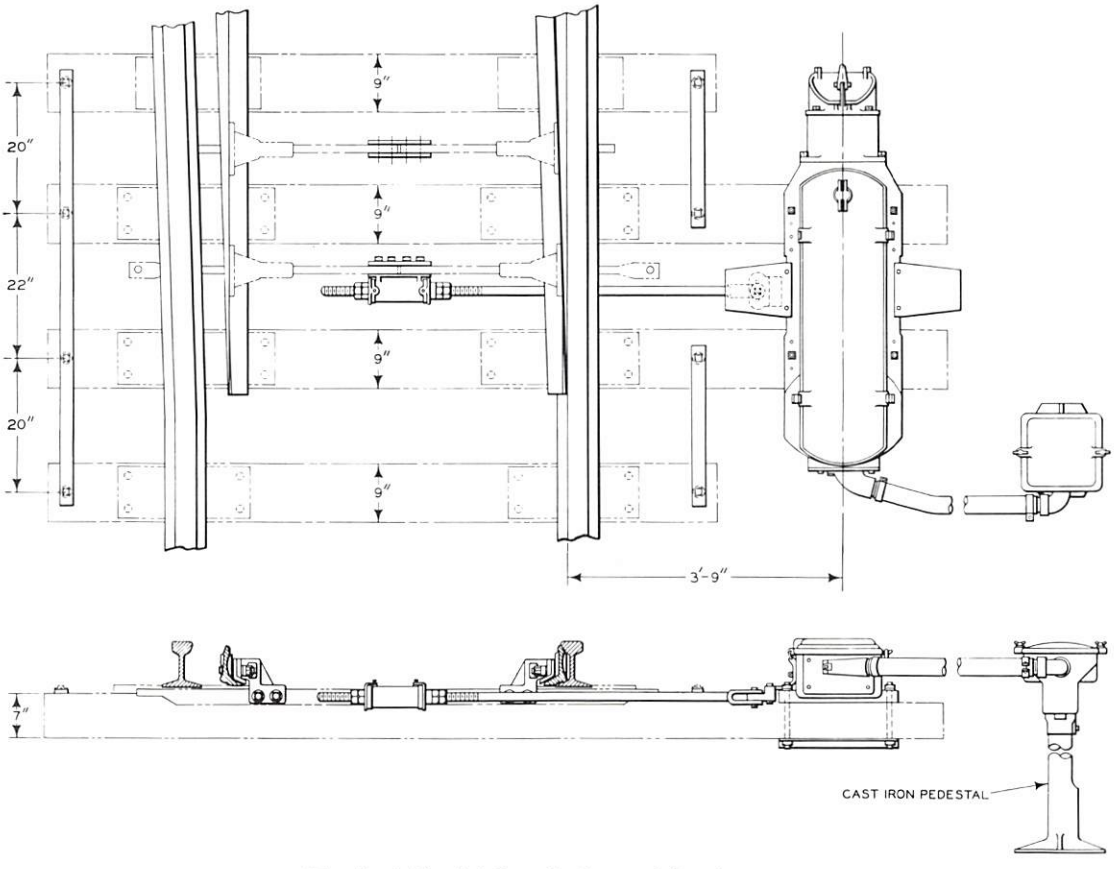
The GRS Model 6 switch machine is designed for use primarily in car classification yards and industrial spurs.

It has adequate power for throwing switches of large rail and is reliable under all weather conditions. The mechanism of the machine is so constructed that the switch can be trailed without damage to the machine, switch points, or fittings.

The Model 6 is designed for power operation only, no means other than hand cranking being provided for manual operation.

The Model 6 is furnished for 110-volt, d-c operation, regular or high speed. The regular-speed machine operates in 1.2 seconds; the high-speed machine in 0.6 second. It has two normal and two reverse motor control contacts; one normal and one reverse correspondence contact, and contacts for controlling signal and indication lamps.

All machines are supplied with heaters. They are in the motor and in the contact compartment, 12 watts each at 115 volts, parallel connected.



Typical Model 6 switch machine layout.

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Switch machines are listed below with or without transformer group, which, if required for clearance track circuit equipment, may be assembled in contact compartment in end of machine.

The transformer group includes the following:

1 — One Type K 1/2, 110 volt, 60Hz, .010 KVA transformer for supplying energy for clearance track circuits. The primary has taps at 6 and 98 volts. There are two secondaries, each 3 volts, with a tap at 2 volts.

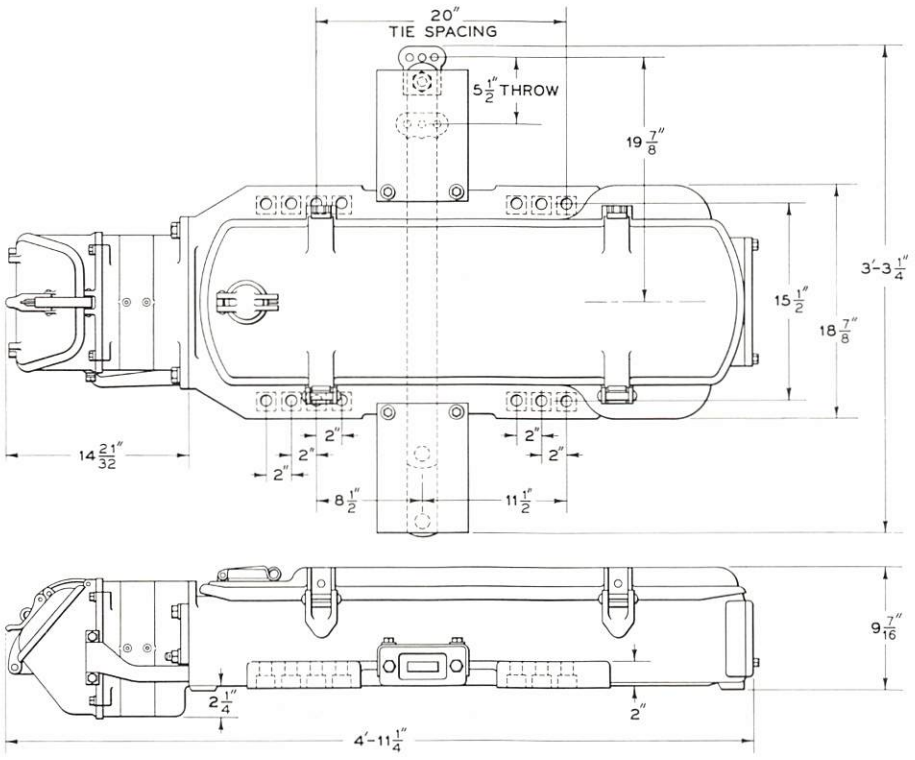
2 — Two Type S2, 1 volt, 60Hz, step-up transformers, one for each clearance track circuit. There is one 20-volt secondary.

3 — Two adjustable resistors for regulating the voltage of indication lights.

4 — Sixteen terminal posts.

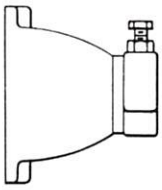
To order, specify "Model 6 Switch Machine" and give catalog number. Each machine requires one wire entrance coupling, Ref. 1, 2, 3 or 4, page 4 and one throw bar coupling, Ref. 7 or 8, page 4. Please order your choice of couplings separately by catalog numbers.

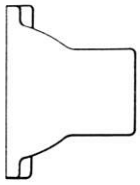
OPERATING VOLTAGE D-C	SPEED	CATALOG NUMBER With Transformer Group	CATALOG NUMBER Without Transformer Group
110	Regular	A85-701	A85-704
110	High	A85-706	A85-708

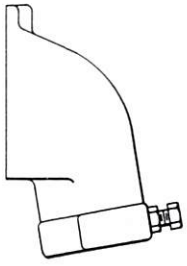


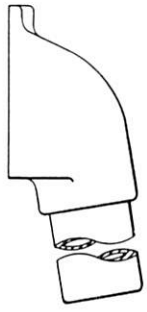
General dimensions.

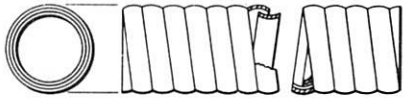
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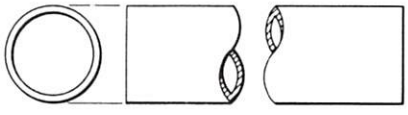

1

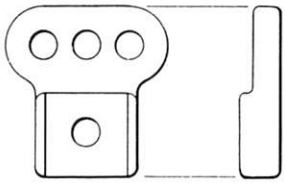

2

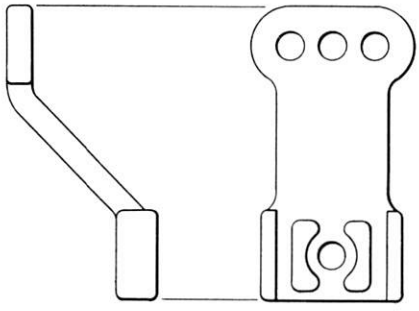

3


4


5


6


7


8

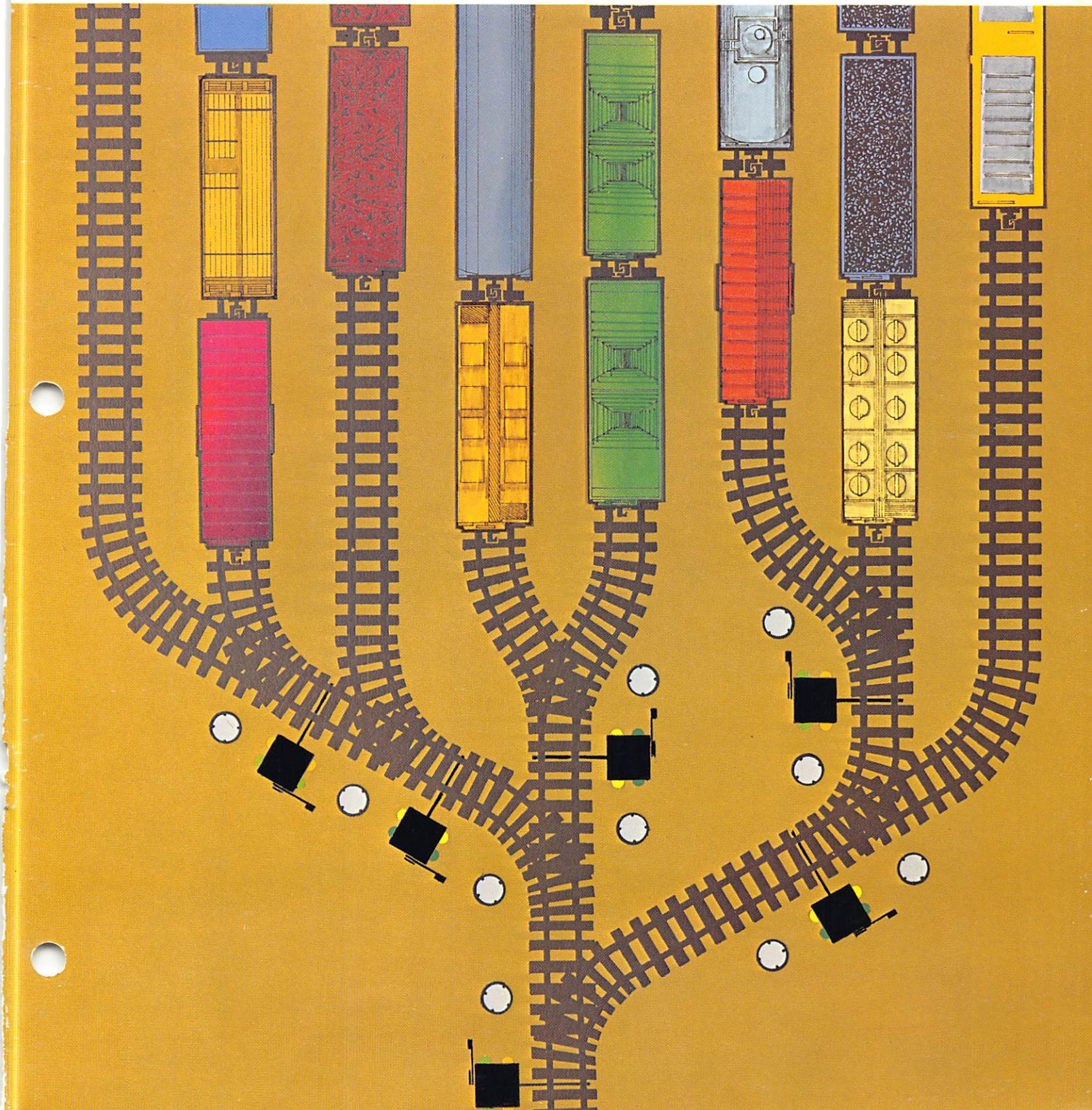
Please order by catalog number and name shown in bold type.

REF.	NAME	CATALOG NUMBER
1	**COUPLING,** straight, for 2" flexible conduit	A85-503
2	**COUPLING,** straight, for 2-3/8" I.D. rubber conduit	A85-500
3	**COUPLING,** offset, for 2" flexible conduit	A85-502
4	**COUPLING,** offset, for 2-3/8" I.D. rubber conduit	P85-932
5	**CONDUIT,** 2" flexible, recommended length 3' - specify no. ft. reqd.	A85-530
6	**CONDUIT,** 2-3/8" I.D. solid rubber, recommended length 3' - specify no. ft. reqd.	A85-535
7	**COUPLING,** for throw bar	P85-933
8	**COUPLING,** offset, for throw bar	P85-934

GRS
GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL
PO BOX 600
ROCHESTER NEW YORK 14692

SPEED-FRATER®
ELECTRIC SWITCH MACHINE

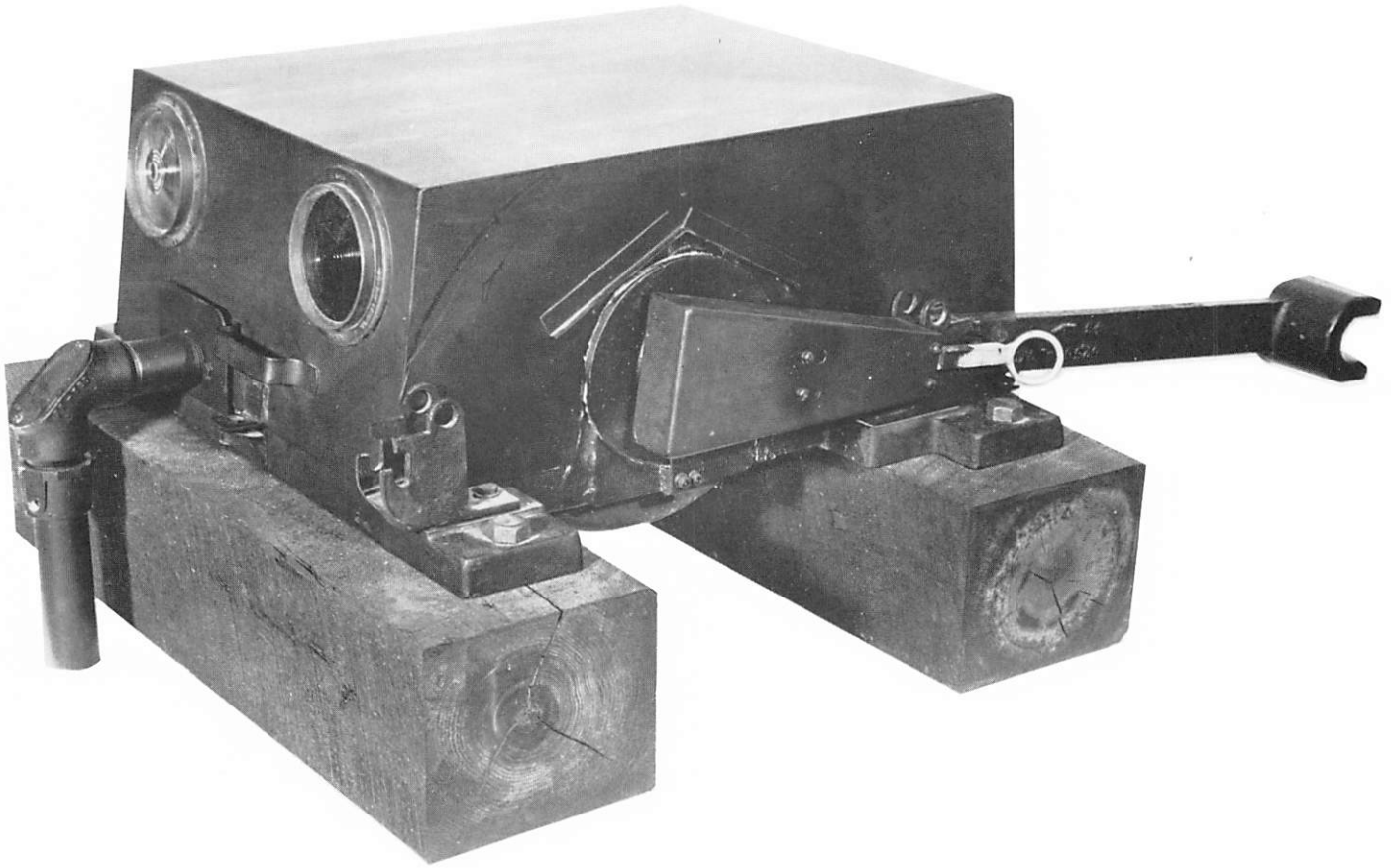
GRS CATALOG **85-4**



FEATURES

- Designed for receiving, departure, and industrial yards.
- Dual control built-in hand-throw lever, power operation with 115 or 230 volts a-c.
- Reversible in midstroke instantly, in either direction.
- Internal contacts to indicate position remotely.
- Fast operation well under one second.

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DESCRIPTION

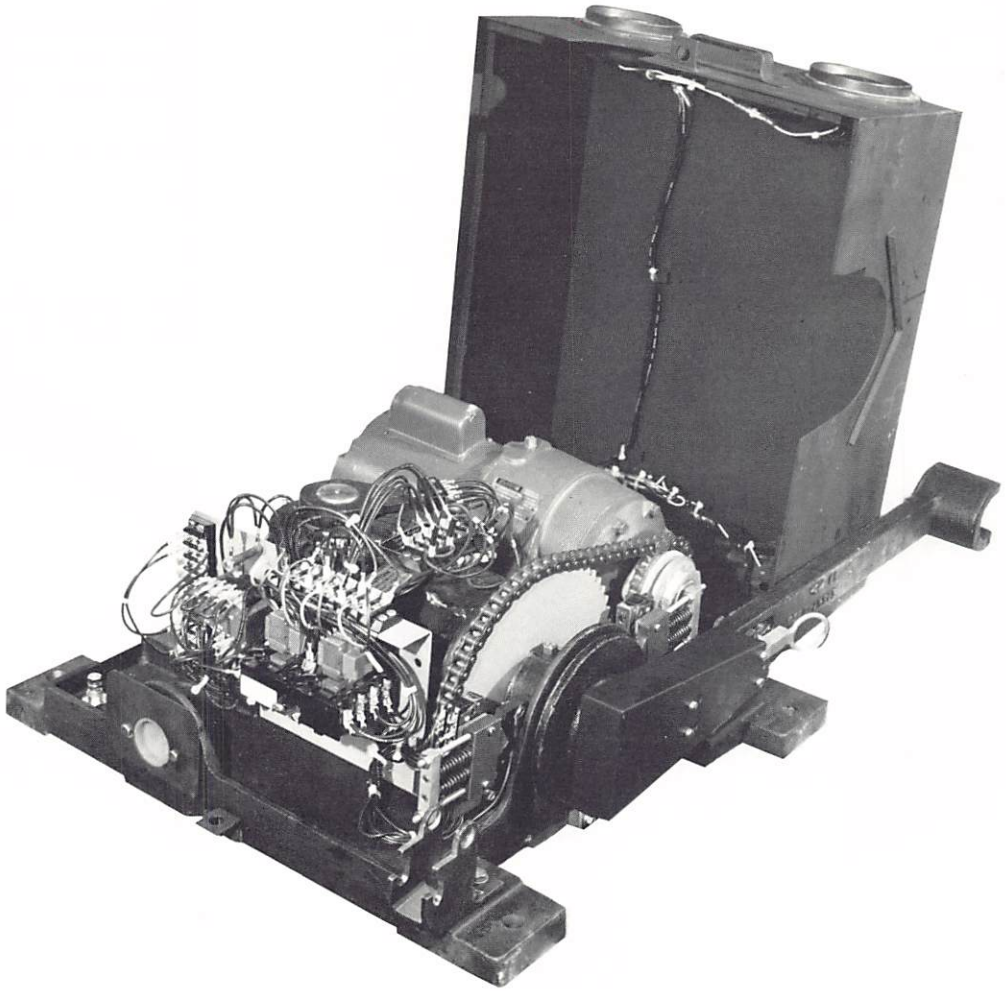
The GRS Speed-Frater is a simplified, compact electric switch machine—less than a foot above tie level. It has every feature needed to speed operations—and to cut costs—in switching areas, such as flat classification yards, receiving and departure yards, and industrial yards. It may also be used to operate derails and blue-flagging devices.

The Speed-Frater is fast—operating time is well under one second from the time of closing of the control circuit to the receipt of indication. Built to fit practically any yard switch, the machine has an easily adjustable throw, from 4½ inches up to a full 5½ inches.

The "open-access" design of the Speed-Frater makes inspection and maintenance quick and easy. With the cover off, all parts are easy to get at. Removing an interior cover, held by two bolts, exposes the throw rod connection for convenient adjustment.

The Speed-Frater is dual control—hand or power operation. It is reversible in midstroke (except when supplied with original automatic restoration) and, in an emergency, can be trailed in either direction.

The Speed-Frater is controlled and operates from a 115-volt, 60-Hz, single-phase power source, drawing approximately 12 amperes. By simple wire changes, which can be made in the field, the machine can be controlled and operated on 230 volts, a-c, at approximately 6 amperes.



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The machine has internal contacts for an independent circuit to repeat its position remotely. The indication contacts are electrically isolated from the control and operating circuits.

The Speed-Frater is available in four combinations: the basic machine, with indicator lights, with an automatic restoration feature, or with both. Ordering information is given on page 10.

Basic Speed-Frater

The basic Speed-Frater, as just described, is recommended for installations without track circuits, where debris or ballast is unlikely to block the switch points, and the switch will not be thrown with a train on or approaching it.

The basic Speed-Frater is used with the Generail™ remote control system described later in this catalog.

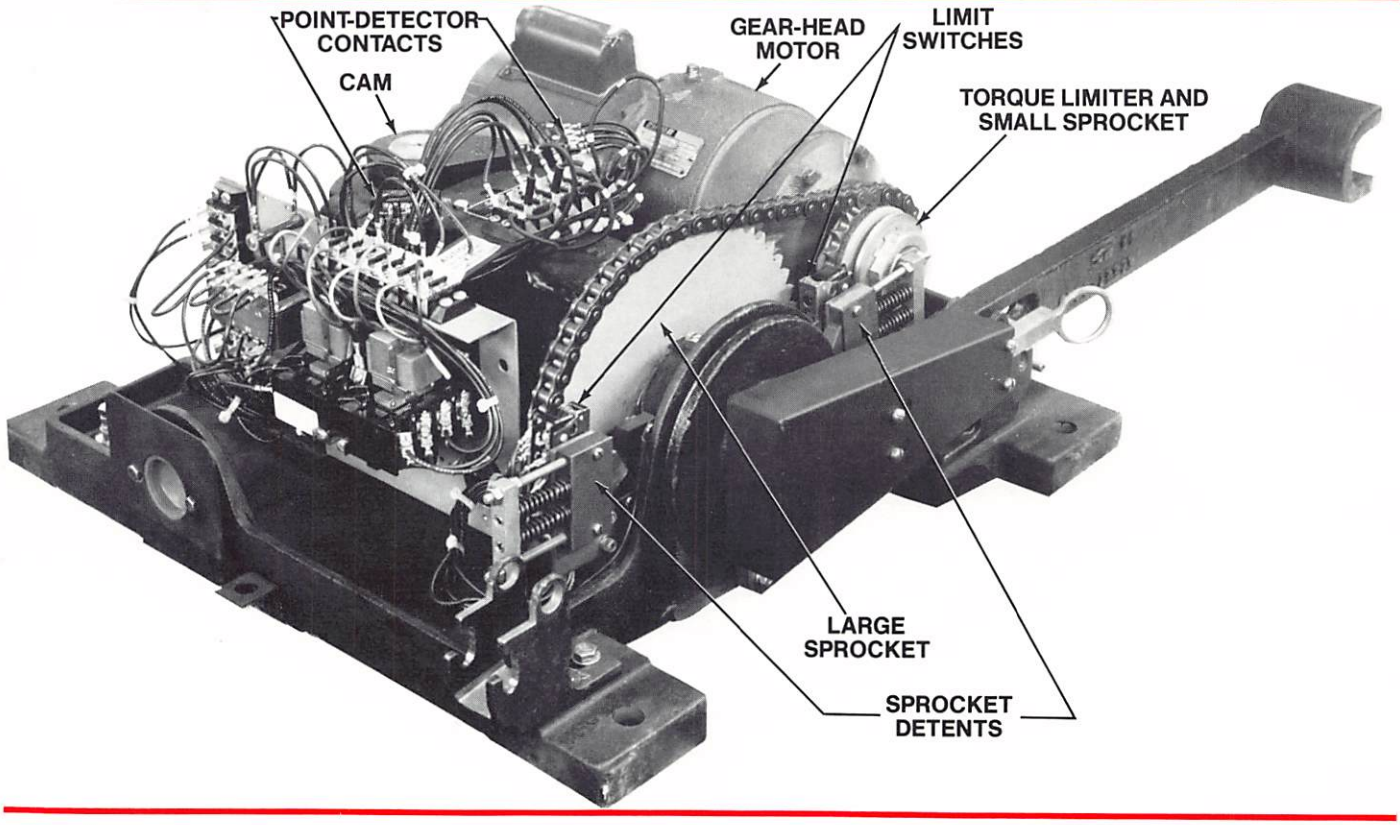
With Automatic Restoration

The Speed-Frater is available with automatic restoration, a feature which causes the machine to reverse should the switch points fail to close due to an obstruction. A neutral relay, with a resistor/capacitor timing network, restores the machine to its starting position if it does not complete its stroke in either direction before the relay has time to release. Machines equipped with optional automatic restoration are not reversible in midstroke.

Detector track circuits are recommended for installations using the Speed-Frater equipped with automatic restoration. A detector track circuit prevents throwing the switch under a train or locomotive—it should extend far enough in advance of the switch points to permit complete switch movement before the leading wheels of the train reach the points, and should be long enough to prevent equipment of the longest wheel base from spanning the circuit.

With Indicator Lights

The Speed-Frater is available with optional self-contained switch position indicator lights. Two indicators, one with a green lens and the other with a yellow lens, are built into each end of the deep-sided cover. The indicators have impact-resistant acrylic lenses which are angled slightly upward for good visibility.



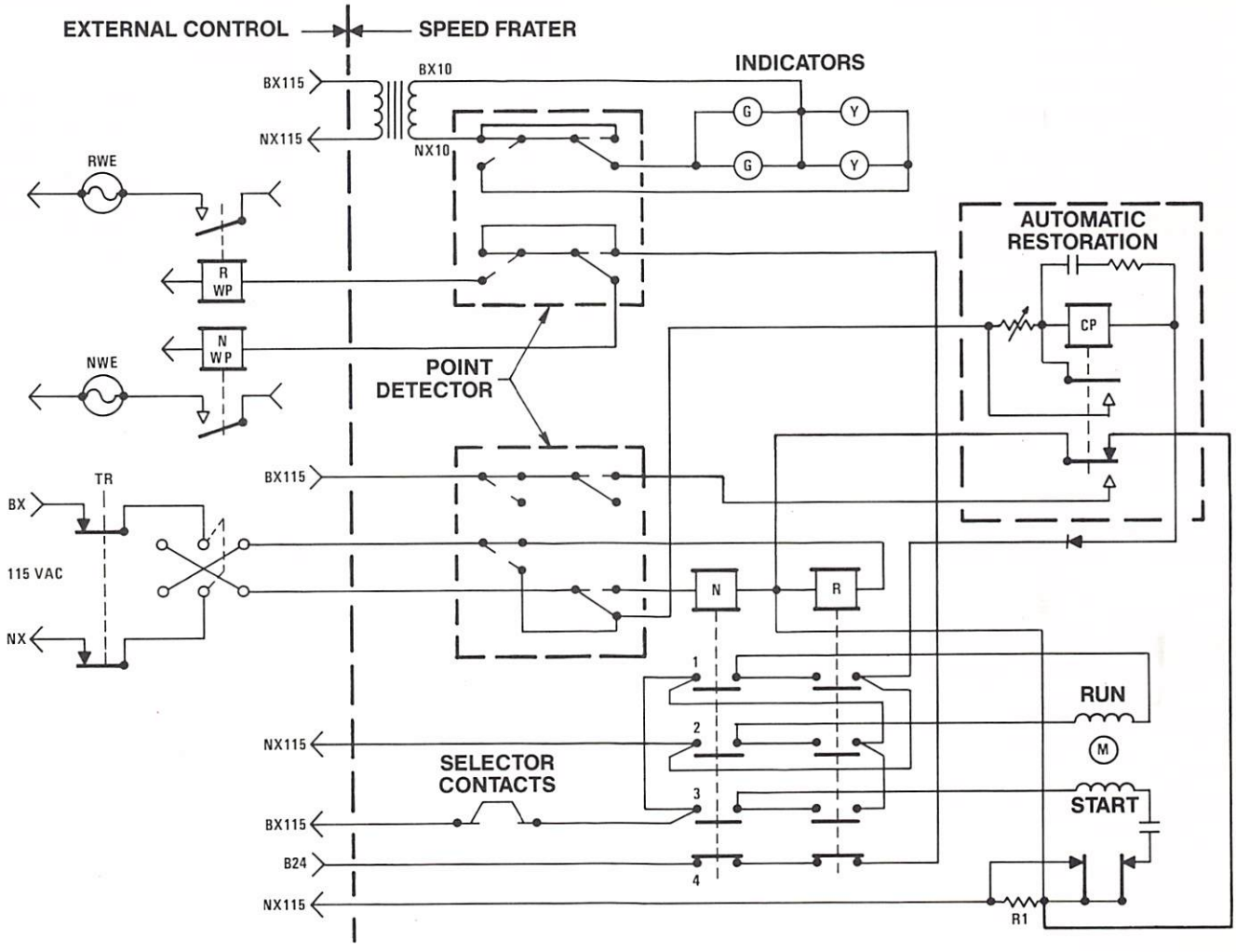
The simplified circuit shows the Speed-Frater controlled remotely by a reversing switch; the circuit also shows optional automatic restoration.

The single-phase motor has a start winding and a run winding. Both are energized for starting the motor to produce the required torque. A capacitor, connected in series with the start winding, produces the required phase shift to initiate armature rotation. When the motor reaches a predetermined speed, a built-in centrifugal switch opens the start winding, and the motor continues to operate on the run winding only.

An adjustable overload torque limiter and sprocket are fastened to the output shaft of the gear-head motor. A chain connects this smaller sprocket to a larger sprocket, which is spline-connected to the horizontal crank (see illustration on page 4).

Before the large sprocket reaches the end of its travel, a cross pin in the sprocket actuates a limit switch, which deenergizes the normal or reverse contactor.

Dropping of the contactor opens the motor circuit and applies energy to the point detector circuit. The cross pin then comes up against a positive stop, and the torque limiter slips slightly to allow the motor to come to a smooth stop.



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A cam, mounted on the upper end of the vertical shaft, actuates the adjustable point-detector contacts, which are used for indication purposes.

Whenever the hand-throw lever is below the horizontal in the lowest part of either lever stand, the hand-throw contacts are closed and the Speed-Frater can be operated by power controlled through two mechanically interlocked contactors R and N.

The initiation of a normal or reverse control, by positioning the control switch, applies energy to the corresponding contactor. The contactor picks up to energize the motor and remains up until opened by its sprocket contact during a normal operating cycle.

The point-detector contacts operate position repeater relays NWP and RWP to light the corresponding indication light on the control panel. These contacts also light the corresponding yellow or green indicator lights (optional) in the cover of the machine.

Reversal In Midstroke

The common side of each contactor and the motor circuit in machines without automatic restoration are connected to provide for reversal in midstroke.

When the motor is at rest, the common side of the contactor circuit is connected to energy through the motor start switch. When the motor is running, with the start switch open, resistor R1 is connected in series with the common side. The value of this resistor is such that the energized contactor receives enough energy to remain picked up, but the energy is too low to pick up either contactor once it is released. The contactors must receive initial energy through contacts of the motor start switch.

If the control lever is reversed, the contactor that was picked up releases, but the contactor called for does not pick up until the motor slows down enough to let the start switch close, at which time the motor receives energy to reverse its direction.

Automatic Restoration (Optional)

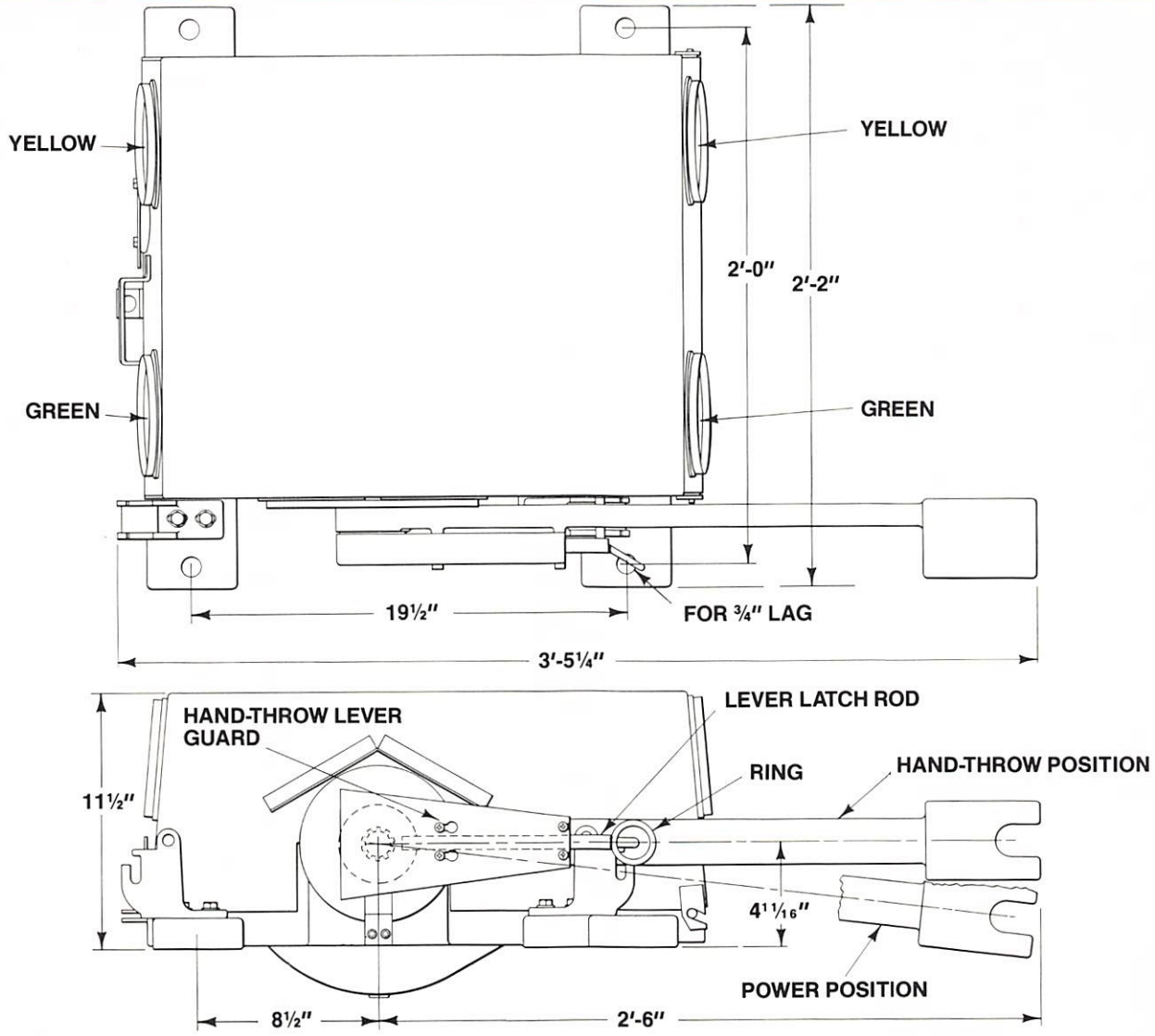
Restoration relay CP is normally energized through a contact on one of the sprocket switches. When the machine starts to operate, the relay stick circuit opens. If the machine operates in its normal time, CP remains held up through its slow-release network. If the machine takes too long to operate, CP releases and causes the opposite contactor to pick up and return the machine to the position from which it started.

In hand operation, the initial movement of raising the lever from either stand opens the motor circuit and prevents power operation.

The ring on the outside of the lever latch rod is then pulled toward the handle of the lever, while the lever is raised to a horizontal position. Releasing the ring allows the latch rod to engage in the bearing slot, and the switch may be thrown.

The Speed-Frater is returned to power operation by pulling the ring (when the hand-throw lever is horizontal) and allowing the lever to drop down in the stand. Releasing the ring lets the lever drop to its lowest point in the stand, closing the motor circuit.

The hand-throw lever release is designed to guard against the possibility of the switch operator restoring the lever into either stand when the switch is neither fully normal nor reverse.

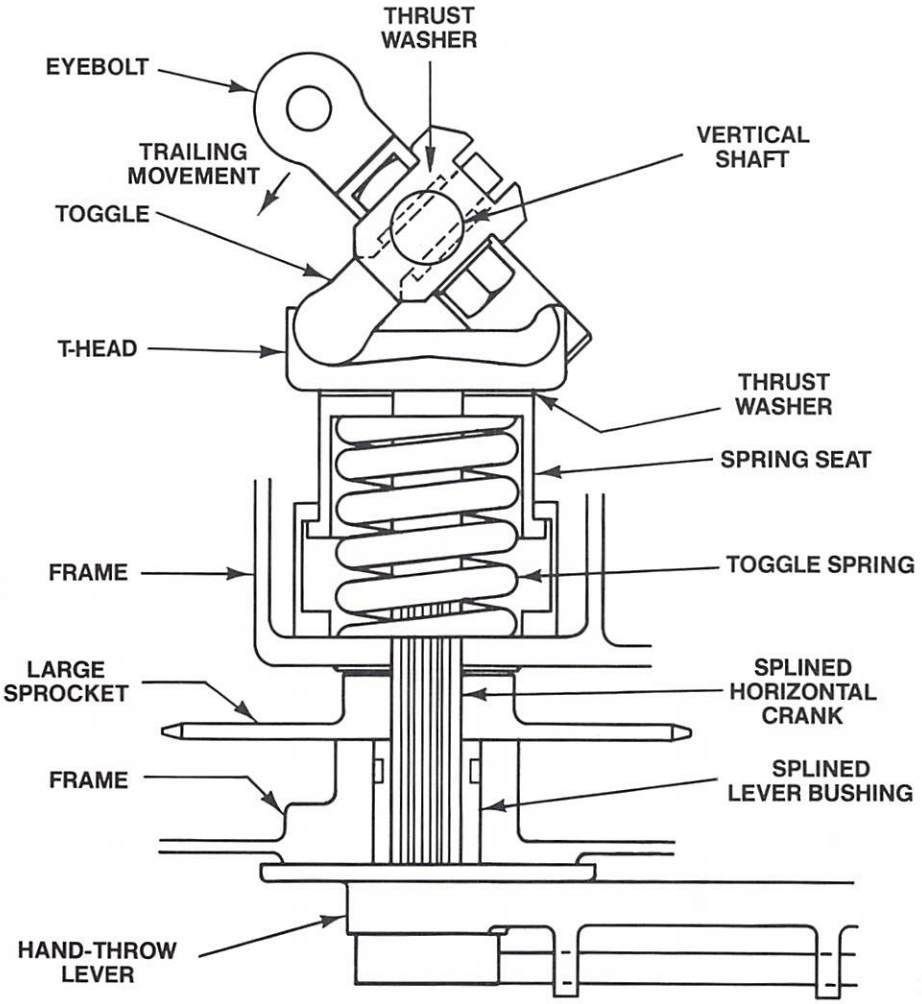


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The horizontal crank (see below) is splined to the large sprocket and hand-throw lever bushing. The toggle spring surrounding the crank exerts pressure against the spring seat which, in turn, presses against the T-head on the end of the crank. The oblong T-head has a cavity which engages with the toggle hinged to the vertical shaft. The toggle is held tightly in the cavity by the trapped toggle spring.

In a trailing move through the switch, the throw rod eyebolt and the toggle are moved in a counterclockwise direction. The toggle rides the cavity of the T-head, goes over the crest of the incline, and snaps to the other end of the cavity, thus completing the switch throw in the opposite direction. The T-head does not rotate in this operation, but simply moves under spring pressure as required without disturbing the position of any other part, due to the splined design of the horizontal crank. **NOTE: Trailing operation, except in an emergency, is not advisable; the resulting forces can cause excessive wear.**

In hand or power operation, the horizontal crank is turned 180° (½ turn) and the vertical shaft 90° (¼ turn). The toggle is held by spring pressure in one end of the T-head cavity and moves with the T-head as it turns to the opposite position, thus throwing the switch. The sprocket and lever bushing are splined to the horizontal movement. In hand operation, the latch rod on the hand-throw lever engages in a slot in the lever bushing.



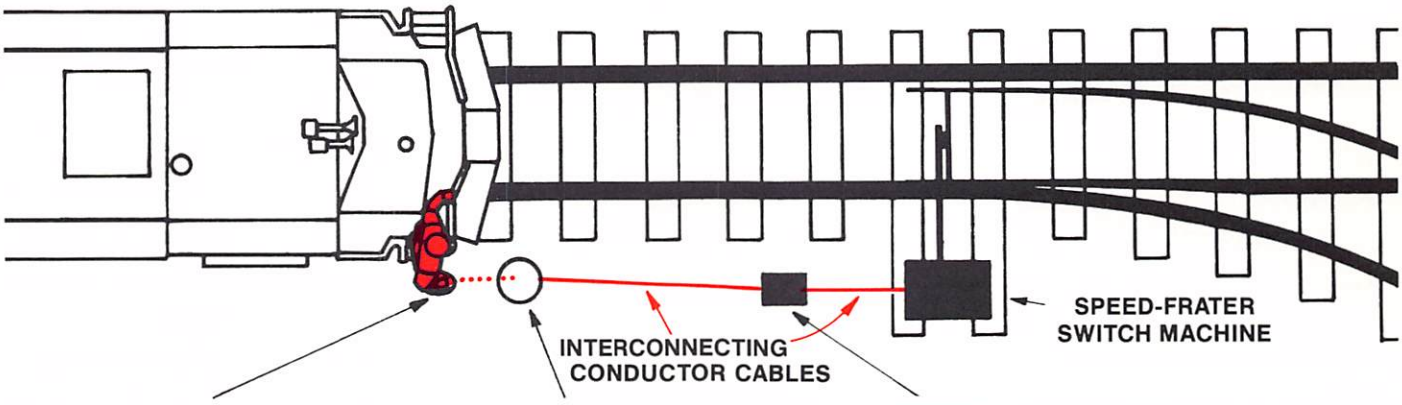
The Generail remote control system can greatly expand the usefulness and efficiency of the Speed-Frater electric switch machine. Also, Generail remote control is a simple, economical way to provide for remote operation of any two-position device (on-off, normal-reverse, etc.).

The Generail system consists of a battery-operated portable transmitter, an inert encapsulated wayside receiving coil, and a solid-state control box.

As a train approaches the switch location, the trainman operates the normal-reverse rocker switch on his belt-carried transmitter (which may also be hung outside the locomotive and operated via a cable and control box from within the cab). The resultant output signal, detected by the wayside receiving coil (located within 12 feet of the transmitter), is sent via cable to the control module associated with the Speed-Frater. The switch machine responds instantly to operate the switch to the called-for position.

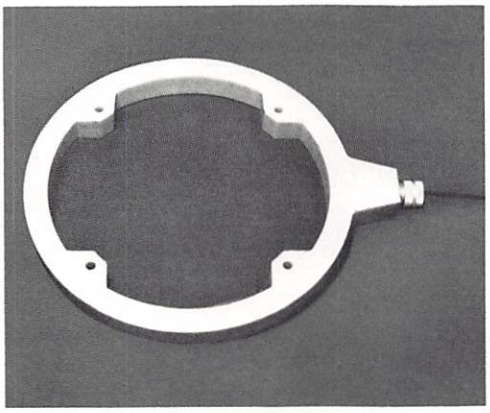
Features of Generail remote control of the Speed-Frater include:

- Substantial savings because of smaller crew requirements.
- Control of a switch machine from a moving train or from the ground.
- Speeds operations in the switching area.
- Choice of control module location—on the ties near the Speed-Frater, in a nearby wayside housing, or at a remote location.
- The receiving coil can be located up to 400 feet ahead of the track switch. It requires no maintenance. Additional coils may be used as required.
- No FCC licensing is required.

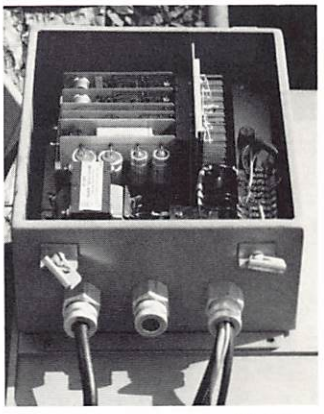




Portable transmitter.



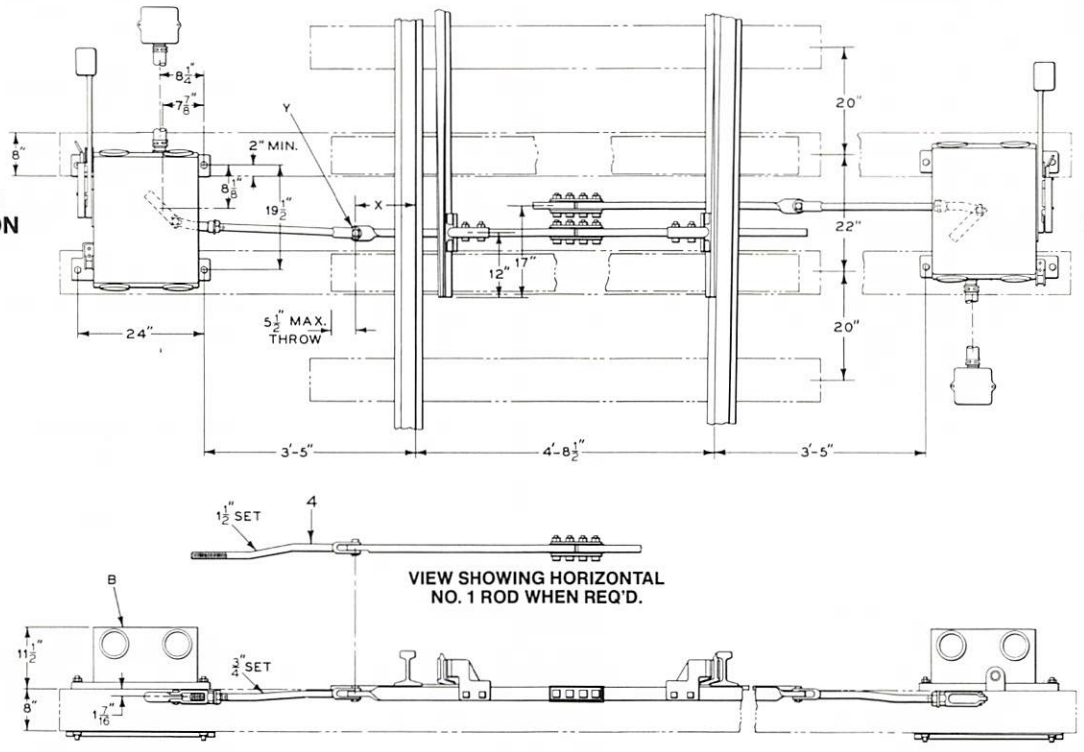
Receiving coil, 10¾" mounting centers.



Control box, cover off, 8" x 12¾" mounting centers.

SPEED-FRATER
ORDERING INFORMATION

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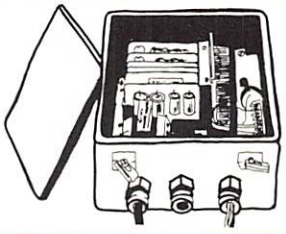


PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE.

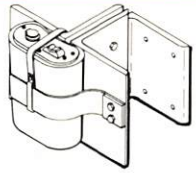
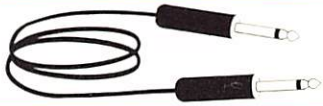
REFERENCE	NAME	CATALOG NUMBER	
		FOR VERTICAL NO. 1 ROD	FOR HORIZONTAL NO. 1 ROD
A	**SPEED-FRATER LAYOUT COMPLETE,** with basic machine, terminal box and necessary rods and fittings for connection to No. 1 rod (No. 1 rod not included) Order must specify dim. X and hole size Y	A85-980	A85-981
A1	As above, except plus automatic restoration	A85-982	A85-983
A2	Same as Ref. A, except plus indicator lights	A85-984	A85-985
A3	Same as Ref. A, except plus automatic restoration and indicator lights	A85-986	A85-987
B	**SPEED-FRATER,** only	A85-988	
B1	Same as Ref. B, except plus automatic restoration	A85-989	
B2	Same as Ref. B, except plus indicator lights	A85-990	
B3	Same as Ref. B, except plus automatic restoration and indicator lights	A85-991	

GENERAIL REMOTE CONTROL ORDERING INFORMATION

PLEASE ORDER BY CATALOG NUMBER AND NAME SHOWN IN BOLD TYPE.

	NAME	CATALOG NUMBER
	**CONTROL BOX COMPLETE**	A85-1000
	**RECEIVING COIL COMPLETE,** includes squeeze connector for cable from control box.	A85-1005
	CABLE, shielded, two-conductor No. 18, with heavy-duty neoprene jacket (Belden No. 8428 or equivalent), for use between receiving coil and control box. Specify number of feet required.	P85-1200
	CABLE, nonshielded, five-conductor No. 16, for use between control box and Speed-Frater. Specify number of feet required.	P85-1203
	**TRANSMITTER COMPLETE,** portable, includes belt and two batteries *(shipped separately).	A85-1003

The following items are for operating the Generail transmitter from the locomotive cab.

	**TRANSMITTER MOUNTING BRACKET,** for use where it is desired to fasten transmitter to side of locomotive so transmitter can be controlled from cab, using locomotive control box and cord complete, items listed below.	A85-1008
	**LOCOMOTIVE CONTROL BOX,** includes two batteries* (shipped separately).	A85-1007
	**CORD COMPLETE,** with two plug connectors, for connection between locomotive control box and transmitter; approximately 12 feet long.	P85-1205

*12.6-volt, mercury primary cells (Mallory TR 289, Burgess H289, or Eveready E289).



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MAIN OFFICE AND PLANT
BOX 600 ROCHESTER NY 14692 Phone: 716 • 436-2020 Cable: GENRASIG (ROCHESTER NY)
Telex: 978317

ATLANTA OFFICE
3379 PEACHTREE ROAD NE ATLANTA GA 30326 Phone: 404 • 233-7373

CHICAGO OFFICE
SUITE 2120 PRUDENTIAL PLAZA CHICAGO IL 60601 Phone: 312 • 467-1221

MONTREAL OFFICE
POINTE-CLAIRE COMMERCE CENTER 6600 TRANSCANADA HIGHWAY POINTE-CLAIRE QUEBEC H9R 4S2
Phone: 514 • 694-7350

NEW YORK OFFICE
ROOM 928 230 PARK AVENUE NEW YORK NY 10169 Phone: 212 • 697-3681

OAKLAND OFFICE
FIRST INTERSTATE BANK OF CALIFORNIA BUILDING SUITE 1440 1330 BROADWAY OAKLAND CA 94612
Phone: 415 • 893-3100

ST. LOUIS OFFICE
LACLEDE GAS BUILDING 720 OLIVE STREET ST. LOUIS MO 63101
Phone: 314 • 621-4696

ST. PAUL OFFICE
NORTHWESTERN NATIONAL BANK BUILDING SUITE 1380 55 E 5TH STREET ST. PAUL MN 55101
Phone: 612 • 277-9268

WASHINGTON OFFICE
MONTGOMERY CENTER SUITE 613 8630 FENTON STREET SILVER SPRING MD 20910
Phone: 301 • 587-4770

GRS INTERNATIONAL

MAIN OFFICE:
BOX 600 ROCHESTER NEW YORK U.S.A. 14692 Phone: 716 • 436-2020
Cable: GENRASIG (ROCHESTER NY) Telex: 978317

G.R.S. TRADING CORPORATION:
BOX 600 ROCHESTER NEW YORK U.S.A. 14692 Phone: 716 • 436-2020
Cable: GENRASIG (ROCHESTER NY) Telex: 978317

GEC-GENERAL SIGNAL LIMITED
ELSTREE WAY BOREHAMWOOD HERTFORDSHIRE WD6 1RX ENGLAND Phone: 01-953-8211
Cable: RAILSIGKO BOREHAMWOOD (ENGLAND) Telex: 22777 GECBWD G BOREHAMWOOD (ENGLAND)

ALGEMENE SEIN INDUSTRIE B.V.
CROESELAAN 28 3521 CB UTRECHT NETHERLANDS Phone: (030) 94 26 46
Cable: GENRASIG UTRECHT (NETHERLANDS) Telex: 47455 GRASI NL UTRECHT (NETHERLANDS)

REPRESENTATIVES AND LICENSEES THROUGHOUT THE WORLD.

CATALOG SECTION A85

CROSS - INDEX

ELECTRIC SWITCH MACHINES

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A85-100			5A SWITCH MACHINE 110V DC	10
	51350-15GR24		5A SWITCH MACHINE	
	54477-2GR1		CRANK	
A85-130			5A SWITCH MACHINE RH 110V DC	10
	51350-15GR77		5A SWITCH MACHINE	
	54477-2GR1		CRANK	
A85-140			5A SWITCH MACHINE LH 110V DC	10
	51350-15GR78		5A SWITCH MACHINE	
	54477-2GR1		CRANK	
A85-145			5A SWITCH MACHINE RH 110V DC	10
	51350-15GR83		5A SWITCH MACH	
	54477-2GR1		CRANK	
A85-146			5A SWITCH MACHINE LH 110V DC	10
	51350-15GR84		5A SWITCH MACH	
	54477-2GR1		CRANK	
A85-148			5A SWITCH MACHINE LH 110V DC	10
	51350-15GR89		5A SWITCH MACH	
	54477-2GR1		CRANK	
A85-151			5E SWITCH MACHINE RH 110V DC	11
	54519-15GR12		5E SWITCH MACHINE	
	54477-2GR1		CRANK	
A85-153			5E SWITCH MACHINE RH 24V DC	11
	54519-11GR8		5E SWITCH MACHINE	
	54477-2GR1		CRANK	
A85-201			5F SWITCH MACHINE RH 110V DC	12
	54529-15GR16		5F SWITCH MACHINE	
	54477-2GR1		CRANK	
A85-203			5F SWITCH MACHINE LH 110V DC	12
	54529-15GR17		5F SWITCH MACH	
	54477-2GR1		CRANK	
A85-206			5F SWITCH MACHINE RH 24V DC	12
	54529-11GR21		5F SWITCH MACHINE	
	54477-2GR1		CRANK	
A85-208			5F SWITCH MACHINE LH 24V DC	12
	54529-11GR22		5F SWITCH MACHINE	
	54477-2GR1		CRANK	
A85-247			5G SWITCH MACHINE RH 110V DC	13
	54504-15GR26		5G SWITCH MACH	
	54477-2GR1		CRANK	
A85-251			5G SWITCH MACHINE RH 24V DC	
	54504-11GR5		5G SWITCH MACH	
	54477-2GR1		CRANK	

CATALOG SECTION A85

CROSS - INDEX

ELECTRIC SWITCH MACHINES

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A85-302			5H SWITCH MACHINE RH 110V DC	14
	54505-15GR20		5H SWITCH MACHINE	
	54477-2GR1		CRANK	
A85-304			5H SWITCH MACHINE LH 110V DC	14
	54505-15GR21		5H SWITCH MACH	
	54477-2GR1		CRANK	
A85-312			5H SWITCH MACHINE RH 24V DC	14
	54505-11GR33		5H SWITCH MACH	
	54477-2GR1		CRANK	
A85-314			5H SWITCH MACHINE LH 24V DC	14
	54505-11GR34		5H SWITCH MACH	
	54477-2GR1		CRANK	
A85-500	45689-87		COUPLING	15
A85-501	45689-106		COUPLING	15
A85-502	45688-96GR1		COUPLING	15
A85-503	45688-97GR1		COUPLING	
A85-510	56215-5GR1		TELE JACK	16
A85-511			WIRE ENTRANCE COUPLING	16
	56215-5GR1		TELE JACK	
	40568-3		NIPPLE	
A85-512			WIRE ENTRANCE COUPLING	16
	56215-5GR1		TELE JACK	
	49034		NIPPLE	
	1439-23		REDUCER	
A85-513			WIRE ENTRANCE COUPLING	16
	56215-5GR1		TELE JACK	
	1439-23		REDUCER	
	45688-98GR1		COUPLING	
A85-520	55274-24		CONDUIT	17
A85-530	81088 GR1		CONDUIT	17
A85-535	55274-23		CONDUIT	17
A85-560	30908-5		LUG	15
A85-561	30908-14		LUG	15
A85-562			LUG	15
	30908-99		LUG	
	1047-17	2	CUP NUT	
A85-563	30908-4		LUG	16
A85-564	59534 GR3		LUG	16
A85-565	59534 GR1		LUG	16
A85-566	59534-2GR1		LUG	
A85-567	59534-2GR2		LUG	16
A85-701			6 SWITCH MACHINE REG 110V W/TRANSFORMER	
	52500-4GR18		SWITCH MACHINE	
	52506-3GR1		TRANSFORMER GROUP	
	54477-2GR1		CRANK	
A85-704			6 SWITCH MACHINE REG 110V W/O TRANSFORMER	
	52500-4GR18		6 SWITCH MACH	
	54477-2GR1		CRANK	
A85-706			6 SWITCH MACHINE HIGH 110V W/TRANSFORMER	
	52500-4GR8		6 SWITCH MACH	
	52506-3GR1		TRANSFORMER GROUP	
	54477-2GR1		CRANK	

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C A T A L O G S E C T I O N A85

C R O S S - I N D E X

ELECTRIC SWITCH MACHINES

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A85-708			6 SWITCH MACHINE HIGH 110V W/O TRANSFORMER	
	52500-4GR8		6 SWITCH MACH	
	54477-2GR1		CRANK	
A85-866	56353-33		COUPLING	
A85-868	81086-20GR1		CONDUIT	
A85-870			HEATER	
	56086-17		RESISTOR	
	46048-28GR2		TERM BLOCK	
	36019-238		PLATE	
	03610-124	2	SCREW	
	53029-69	2	WASHER	
	6471-2	2	NUT	
A85-900			55E SWITCH MACHINE 110V DC	
	30525-15GR12		55E SWITCH MACH	
	54477-10GR1		CRANK	
A85-901			55E SWITCH MACHINE 24V DC	
	30525-11GR6		55E SWITCH MACH	
	54477-10GR1		CRANK	
A85-906			55G SWITCH MACHINE 24V DC	
	30525-111GR4		55G SWITCH MACH	
	54477-10GR1		CRANK	
A85-980			SPEED FRATER LAYOUT FOR VERTICAL #1 ROD	
	51139-719GR2		LAYOUT	
	31455 GR2		SWITCH MACH	
A85-981			SPEED FRATER LAYOUT FOR HORIZONTAL #1 ROD	
	51139-719GR1		LAYOUT	
	31455 GR2		SWITCH MACH	
A85-982			SPEED FRATER LAYOUT FOR VERTICAL #1 ROD	
	51139-719GR2		LAYOUT	
	31455 GR11		SWITCH MACH	
A85-983			SPEED FRATER LAYOUT FOR HORIZONTAL #1 ROD	
	51139-719GR1		LAYOUT	
	31455 GR11		SWITCH MACH	
A85-984			SPEED FRATER LAYOUT FOR VERTICAL #1 ROD	
	51139-719GR2		LAYOUT	
	31455 GR4		SWITCH MACH	
A85-985			SPEED FRATER LAYOUT FOR HORIZONTAL #1 ROD	
	51139-719GR1		LAYOUT	
	31455 GR4		SWITCH MACH	

CATALOG SECTION A85

CROSS - INDEX

ELECTRIC SWITCH MACHINES

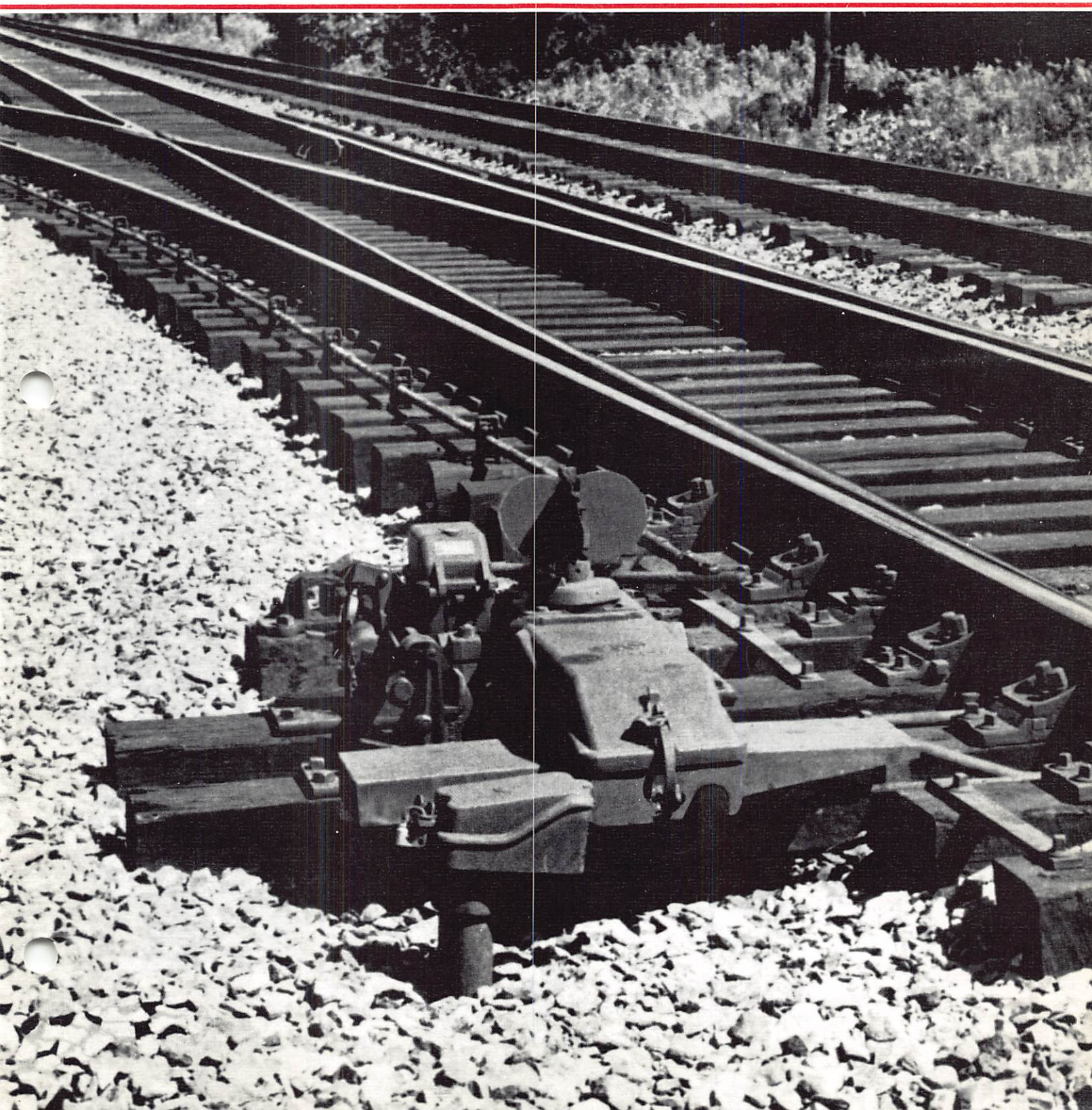
CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A85-986			SPEED FRATER LAYOUT FOR VERTICAL #! ROD	
	51139-719GR2		LAYOUT	
	31455 GR12		SWITCH MACH	
A85-987			SPEED FRATER LAYOUT FOR HORIZONTAL #1 ROD	
	51139-719GR1		LAYOUT	
	31455 GR12		SWITCH MACH	
A85-988			SPEED FRATER	
	31455 GR2		SPEED FRATER	
	36593-29		WRENCH	
A85-989			SPEED FRATER	
	31455 GR11		SPEED FRATER	
	36593-29		WRENCH	
A85-990			SPEED FRATER	
	31455 GR4		SPEED FRATER	
	36593-29		WRENCH	
A85-991			SPEED FRATER	
	31455 GR12		SPEED FRATER	
	36593-29		WRENCH	
A85-1003			TRANSMITTE R COMPLETE	
	29068-22GR2		TRANSMITTE R	
	01145		BELT	
	52397-9	2	BATTERY	
A85-1004	58901-14GR1		CONTROL BOX	
A85-1005	58291-9GR1		RECEIVER COIL	
A85-1007	56175-9GR1		REMOTE CONTROL BOX	
A85-1008	42560-71GR1		MTG ASSEM	
A85-1009	58901-14GR2		CONTROL BOX	

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MODEL 9
HAND-OPERATED SWITCH MACHINES

GRS CATALOG **87-1**

GRS



GENERAL DESCRIPTION

The GRS Model 9 hand-operated switch machine operation, installation, and maintenance is covered in Pamphlet 1246.

A Model 10 electric switch lock is easily applied to the machine. Order separately from Catalog Section 50-1.

Machines are furnished without target staff. A domed cap covers the upper end of the throw crank shaft. A collar is attached to this shaft by a pin. Either low or high target staff may be added to any machine by removing the cap, pin, and collar and replacing these with target staff assembly complete, which includes drive coupling and driven coupling for proper target alignment.

Wire entrance is through a 1-1/2" pipe-tapped hole on the circuit controller end of the machine.

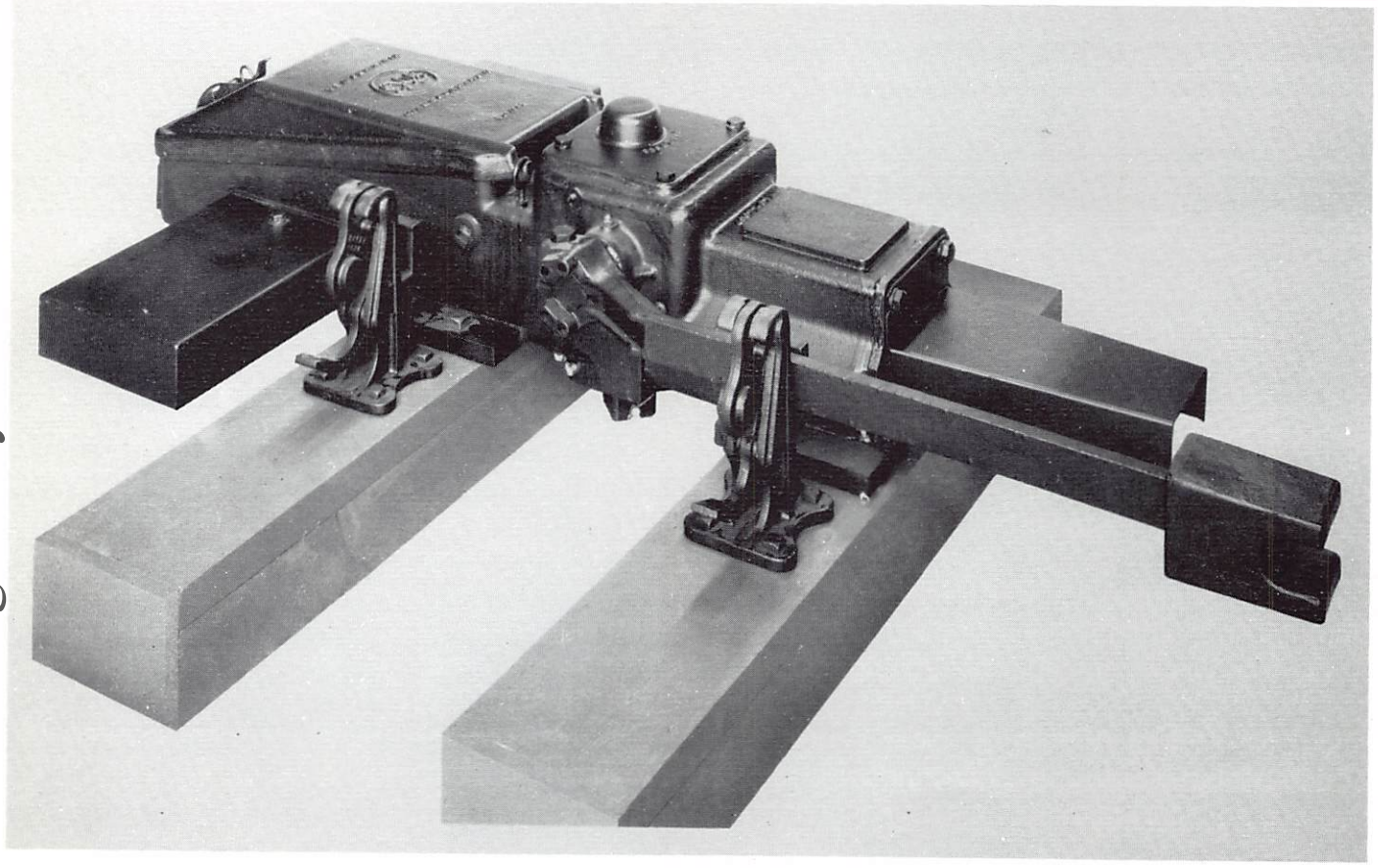
All circuit controllers leave the factory assembled with two normally open and two normally closed contacts. Any pair of contact fingers may be arranged open or closed in the "up" position of the rocker (or in the "down" position) as circuits require.

All the Model 9 switch machines listed in this catalog are arranged so that their internal locking plungers are driven directly by their hand-throw levers.

See Catalog Section 91 for lock- and point-detector connecting rods, throw rods, derail connecting rods and terminal junction boxes.

RIGHT-HAND OR LEFT-HAND MACHINES

Model 9 switch machines may be ordered for either right- or left-hand installation, on the open- or closed-point side. (A right-hand machine, for example, is one located on the right-hand side of the track when facing the switch points). Machines may also be altered in the field, but this may require different lock rods or detector bars (for details see Pamphlet 1246).



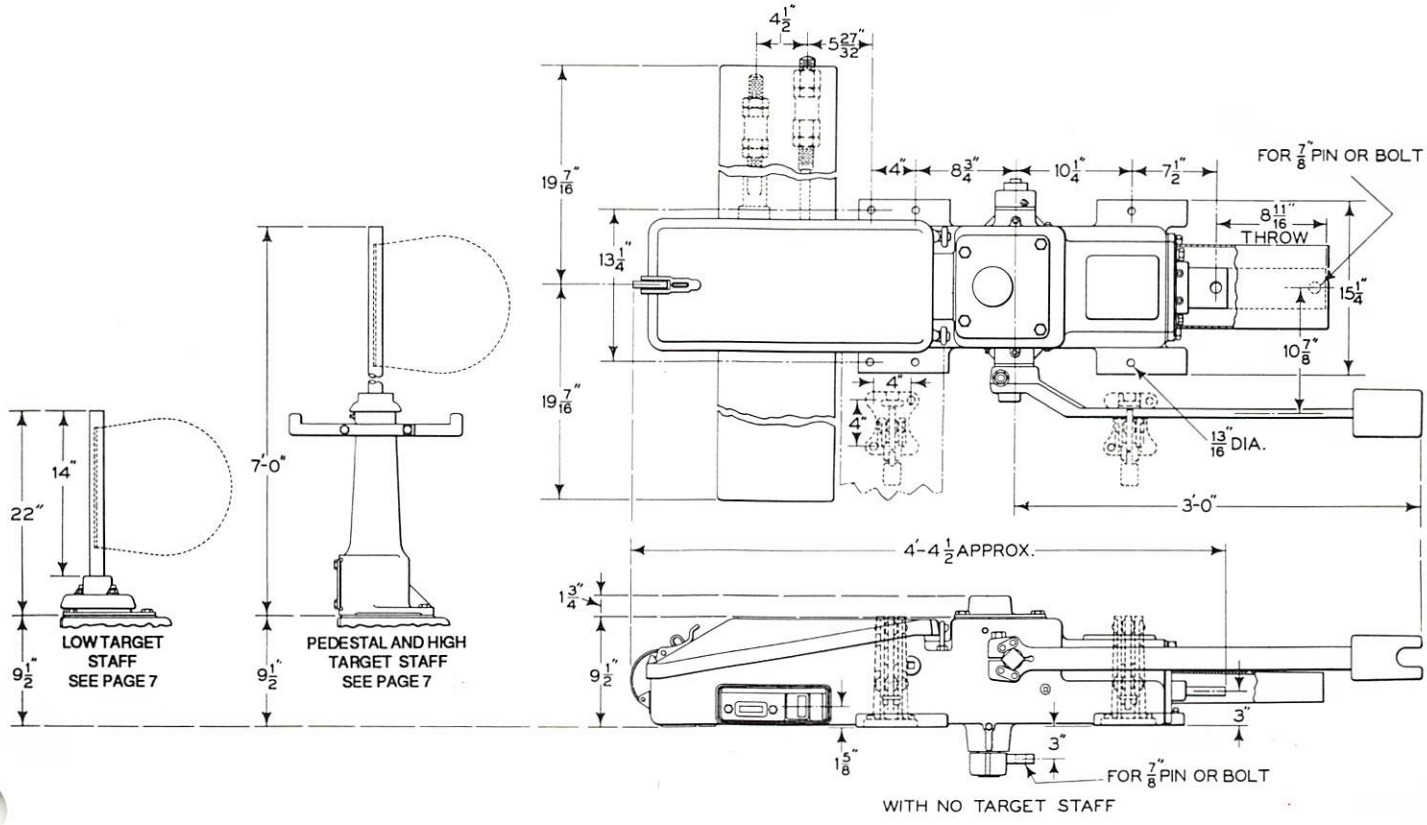
Model 9 Hand-Operated Switch Machine.

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Copyright General Signal Corporation 1986 ©

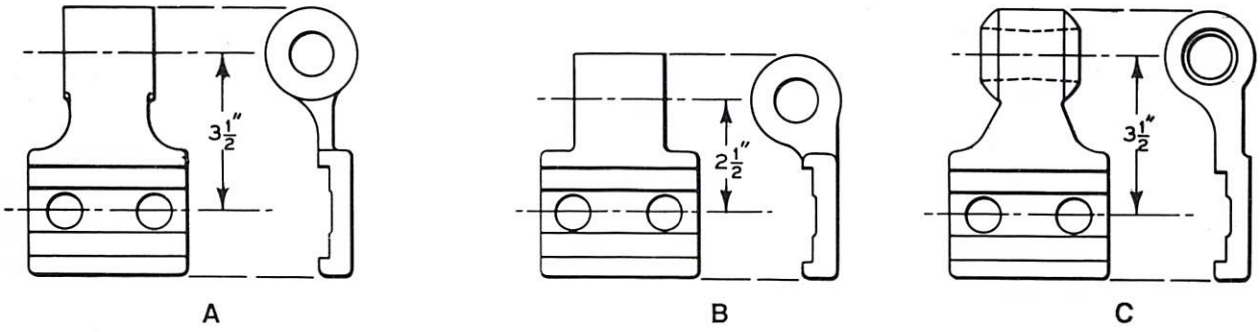
To order specify "Model 9 Switch Machine", giving catalog number. You must order lugs separately (see page 5) as well as latch stands, wire entrance couplings and conduit, target staffs, and lamp tip.

MACHINE LAYOUT	POINT POSITION	LOCKROD	CONTROLLER	CATALOG NUMBER
Right-hand	Closed	Single	Normal	A87-101
Left-hand	Open	Single	Normal	A87-102
Right-hand	Open	Single	Normal	A87-103
Left-hand	Closed	Single	Normal	A87-104
Right-hand	Closed	Double-adjustable	Normal and Reverse	A87-111
Left-hand	Open	Double-adjustable	Normal and Reverse	A87-112
Right-hand	Open	Double-adjustable	Normal and Reverse	A87-113
Left-hand	Closed	Double-adjustable	Normal and Reverse	A87-114

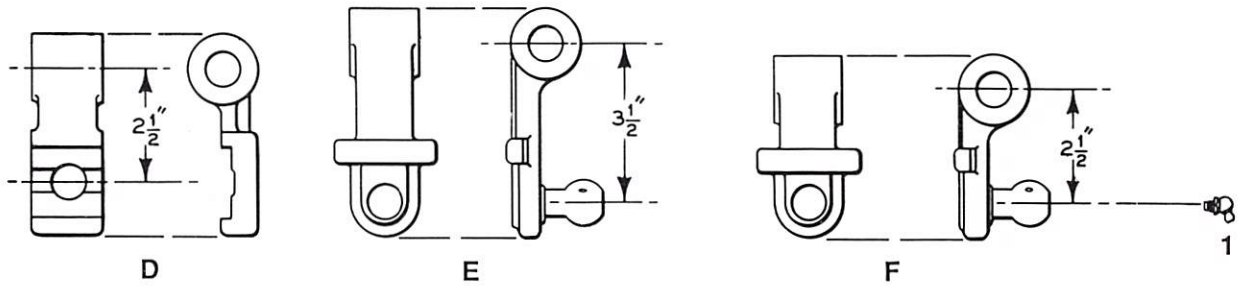


General dimensions.

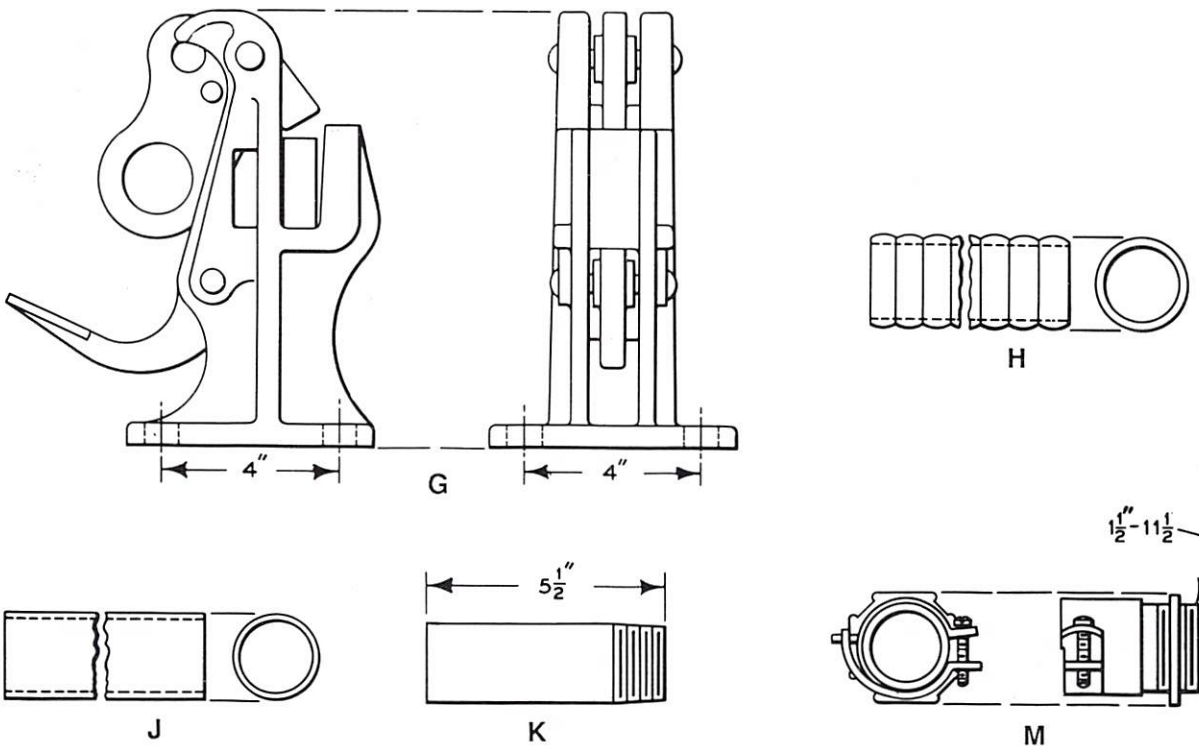
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LOCK ROD LUGS



DETECTOR BAR LUGS



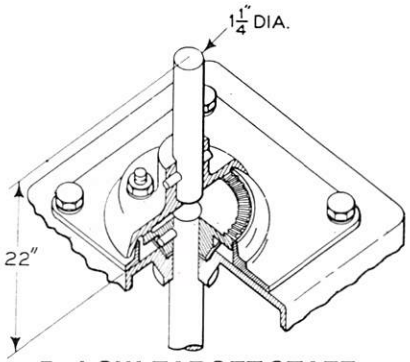
Accessories for Model 9 switch machines.

ACCESSORIES

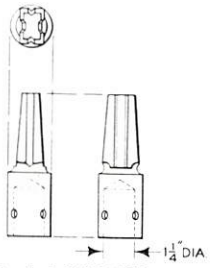
Please order by catalog number and name shown in bold type.

REF.	NAME	CATALOG NUMBER
A	**LUG,** 3-1/2" spacing, for 1" dia. lock rod	**A85-560**
B	**LUG,** 2-1/2" spacing, for 1" dia. lock rod	**A85-561**
C	**LUG,** 3-1/2" spacing, swivel type, for 1" dia. lock rod, includes cup nuts	**A85-562**
D	**LUG,** 2-1/2" spacing, for 1" dia. detector bar	**A87-179**
E	**LUG,** 3-1/2" spacing, for 1" dia. detector bar	**A87-181**
F	**LUG,** 2-1/2" spacing, for 1" dia. detector bar	**A87-185**
G	**LATCH STAND COMPLETE,** for hand-throw lever Two required for machines without electric locking. One required for machines having normal electric locking only.	**A87-191**
H	**CONDUIT,** 1-1/2" flexible, 3' recommended, specify no. ft.	**A85-868**
J	**CONDUIT,** 1-7/8" I.D., solid rubbber, 3' recommended, specify no. ft.	**A85-520**
K	**PIPE NIPPLE,** 1-1/2" pipe thread for 1-7/8" I.D. rubber conduit	**P85-1003**
M	**COUPLING,** 1-1/2" pipe thread for 1-1/2" flexible conduit	**A85-866**
1	**GREASE FITTING,** for detector lugs	**P87-101**

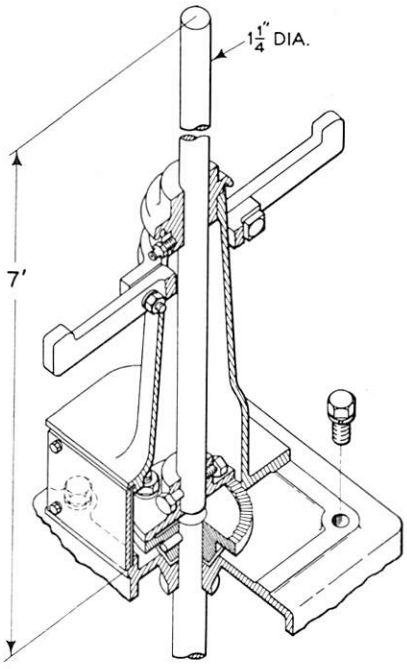
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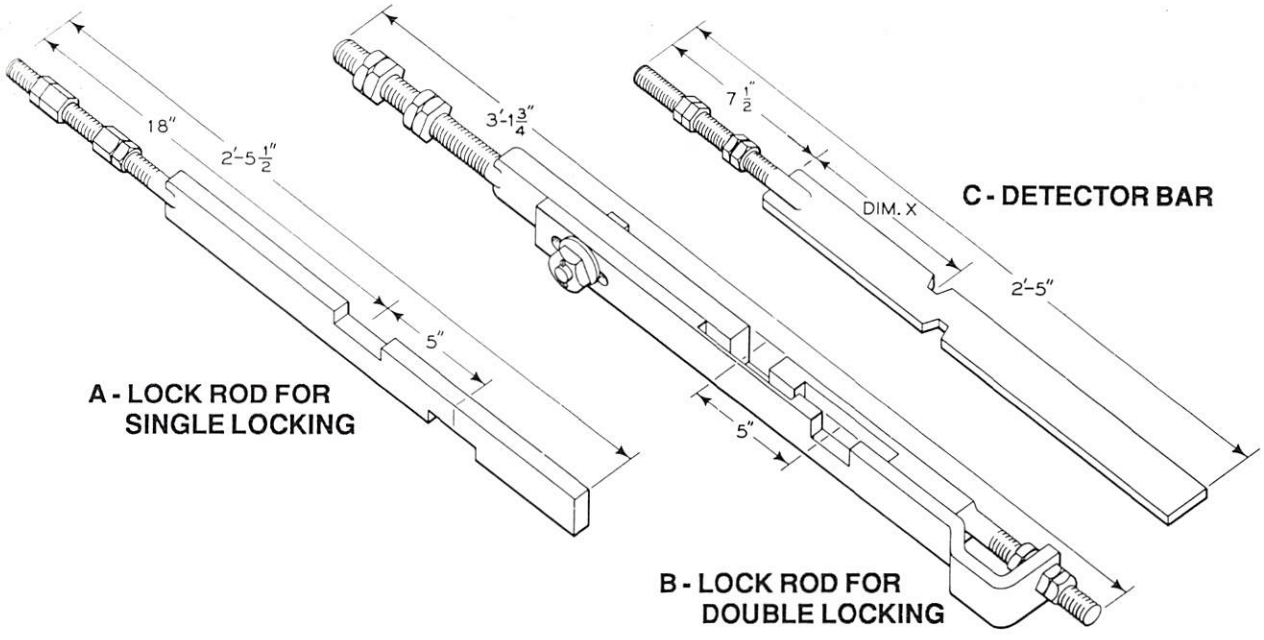
D - LOW TARGET STAFF



G - LAMP TIP



E - HIGH TARGET STAFF



A - LOCK ROD FOR SINGLE LOCKING

B - LOCK ROD FOR DOUBLE LOCKING

C - DETECTOR BAR

Target staffs, lamp tip, lock rods and detector bars.

TARGET STAFFS, LOCK RODS AND DETECTOR BARS

Please order by catalog number and name shown in bold type.

REF.	NAME	CATALOG NUMBER
	NOTE: LOCK RODS AND DETECTOR BARS ARE FURNISHED WITH MACHINES, BUT ARE SHOWN HERE FOR THE PURPOSE OF CONVERTING A MACHINE FROM RIGHT-HAND TO LEFT-HAND. IF A LUG IS REQUIRED SEE PAGE 5 FOR ORDERING.	
A	**LOCK ROD,** for single locking; reversible, for either open or closed point side.	**A87-230**
B	**LOCK ROD,** for double locking; for left-hand machine with left-hand point normally closed, has total adjustment of 4" to 6"	**A87-231**
B1	**LOCK ROD,** for double locking; as above, except for machine with left-hand point normally open.	**A87-232**
B2	**LOCK ROD,** for double locking; for right-hand machine with right-hand point normally closed; has total adjustment of 4" to 6"	**A87-233**
B3	**LOCK ROD,** for double locking; as above, except for machine with right-hand point normally open.	**A87-234**
C	**DETECTOR BAR,** for closed point side; for right- or left-hand layout. Dimension "X" = 9-1/2".	**A87-239**
C1	**DETECTOR BAR,** for open point side; for right- or left-hand layout. Dimension "X" = 14-1/2".	**A87-241**
	NOTE: THE FOLLOWING ITEMS ARE NOT FURNISHED WITH MACHINES AND SHOULD BE ORDERED SEPARATELY AS NEEDED.	
D	**LOW TARGET STAFF** complete, 1-1/4" dia., not drilled for target or lamp tip. Includes drive and driven couplings and all necessary hardware	**A87-250**
E	**HIGH TARGET STAFF** complete, 1-1/4" dia., not drilled for target or lamp tip. Includes drive and driven couplings, pedestal, and all necessary hardware. May be shortened in the field as desired.	**A87-253**
G	**LAMP TIP,** for low or high target staffs, complete with bolt, nut and washer	**A87-259**

GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL

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MAIN OFFICE AND PLANT
PO BOX 20600 ROCHESTER NY 14602-0600 Phone: 716 • 436-2020 Cable: GENRASIG (ROCHESTER NY)
Telex: 978317

ATLANTA OFFICE
3379 PEACHTREE ROAD NE ATLANTA GA 30326 Phone: 404 • 233-7373

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PRUDENTIAL PLAZA SUITE 2120 CHICAGO IL 60601 Phone: 312 • 467-1221

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REPRESENTATIVES AND LICENSEES THROUGHOUT THE WORLD

CATALOG SECTION A87

CROSS - INDEX

MODEL 9 SWITCH MACHINE

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A87-101			MODEL 9 SWITCH MACH RH A87-0101	5
	49600-101GR4		SWITCH MACH	
A87-102			MODEL 9 SWITCH MACH LH A87-102	5
	49600-101GR5		SWITCH MACH	
A87-103			MODEL 9 SWITCH MACH RH A87-103	5
	49600-101GR6		SWITCH MACH	
A87-104			MODEL 9 SWITCH MACH LH A87-104	5
	49600-101GR7		SWITCH MACH	
A87-111			MODEL 9 SWITCH MACH RH A87-111	5
	49600-202GR2		SWITCH MACH	
A87-112			MODEL 9 SWITCH MACH LH A87-112	5
	49600-202GR3		SWITCH MACH	
A87-113			MODEL 9 SWITCH MACH RH A87-113	5
	49600-202GR4		SWITCH MACH	
A87-114			MODEL 9 SWITCH MACH LH A87-114	5
	49600-202GR5		SWITCH MACH	
A87-179	30908-78		LUG	7
A87-181	59534 GR5		LUG	7
A87-185	59534 GR4		LUG	7
A87-191	52589-4GR1		LATCH STAND	7
A87-230			LOCK ROD	9
	50842-20		LOCK ROD	
	0477	4	NUT	
A87-231	50840-11GR1		LOCK ROD	9
A87-232	50840-19GR1		ROD	9
A87-233	50840-9GR1		LOCK ROD	9
A87-234	50840-17GR1		ROD	9
A87-239			DETECTOR ROD	9
	50465-3		BAR	
	0477	4	NUT	
A87-241			DETECTOR ROD	9
	50465-4		BAR	
	0477	4	NUT	
A87-250			LOW TARGET STAFF	9
	57375-44		STAFF	
	49628-14		PLATE	
	49527-20	2	BOLT	
	42333-50	2	NUT	
	01250-20	2	WASHER	
	17492-2	2	WASHER	
	49761		COUPLING	
	17188-11		ROLL PIN	
	49761-3		COUPLING	

CATALOG SECTION A87

CROSS - INDEX

MODEL 9 SWITCH MACHINE

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A87-253			HIGH TARGET STAFF	9
	50452-24GR1		STAFF	
	50844 GR1		PEDESTAL	
	6768-1	2	SCREW	
	01273-11	4	WASHER	
	42296	2	SCREW	
	49761		COUPLING	
	49761-1		COUPLING	
	49527-20	2	BOLT	
	42333-50	2	NUT	
	2472-17		SCREW	
	37539-1		NUT	
	01273-8		WASHER	
A87-259			LAMP TIP	9
	57380-6		LAMP TIP	
	43427-4		B/N	
	53029-77		WASHER	

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CATALOG SECTION 91

Switch and Pipeline Fittings

CONTENTS

	Page
Compensators, Cranks and Stands	2
Front Rods, hinged	14
Front Rods, rigid	16
Insulation Sets	4-6-10
Junction Terminal Box	13
Lug Bolts, Nuts and Washers	20
Pipe and Pipe Carriers	4
Plunger Lock	18
Rods, detector	10
Rods, insulated	4
Rods, lock rod connecting	6
Rods, screw jaw	4
Rods, solid jaw	4 & 6
Rods, switch circuit controller	10
Rods, tang end	4
Roller Bearings	19
Screw Jaws	4-10
Switch Adjustment Brackets	6
Switch Point Lugs	10

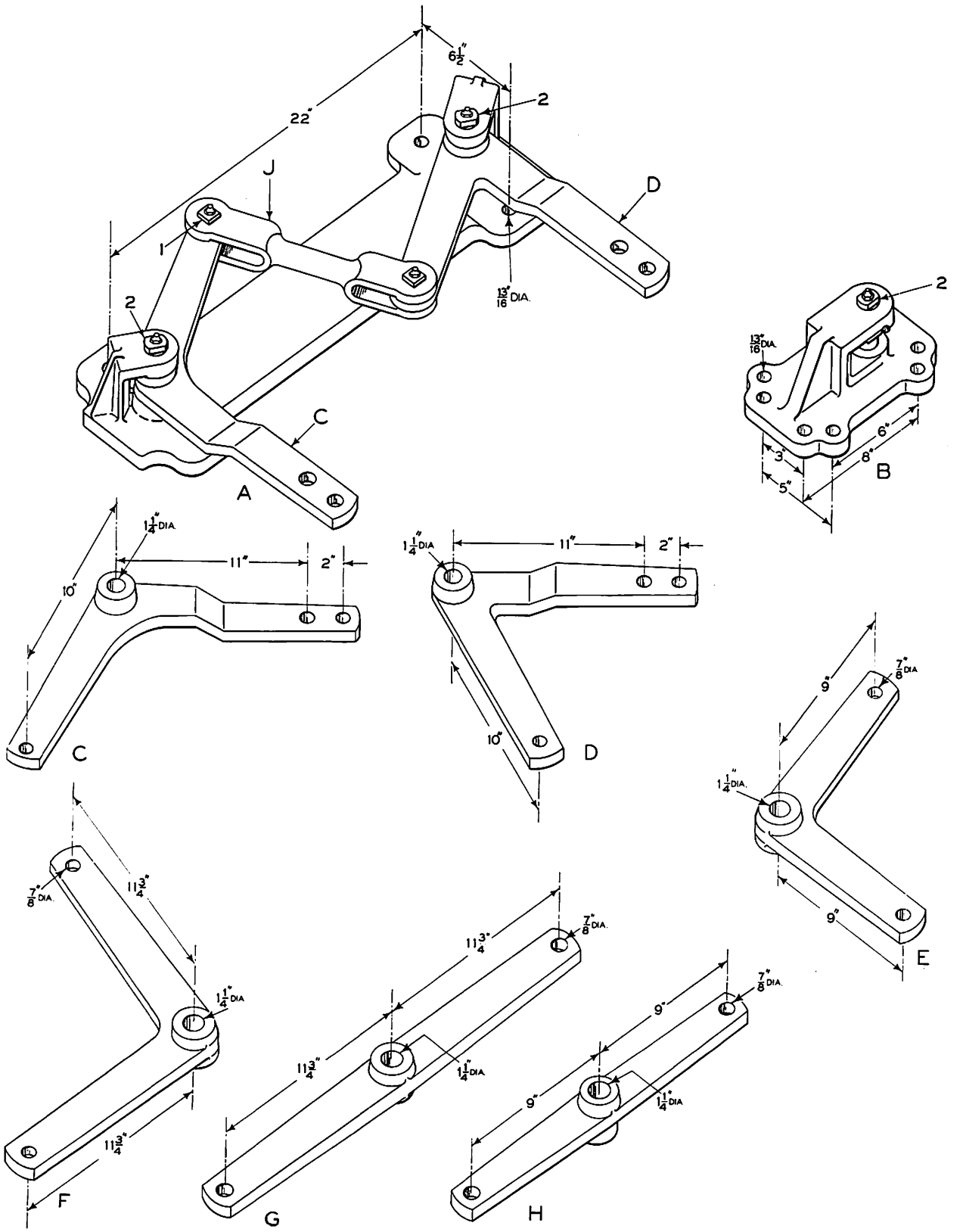
GENERAL RAILWAY SIGNAL COMPANY

ROCHESTER, NEW YORK

Printed in U. S. A.

August 1961

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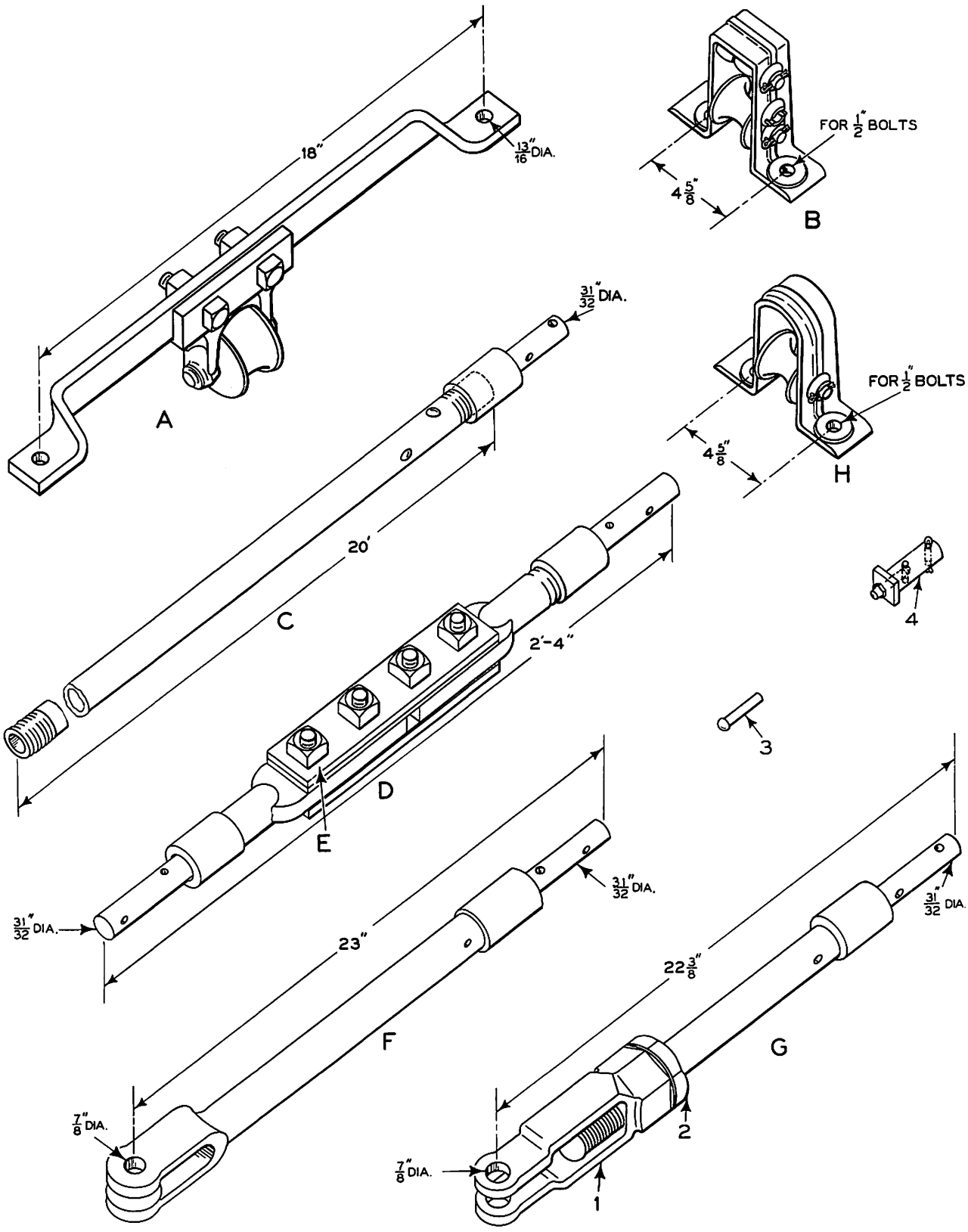
Pipeline fittings

PIPELINE FITTINGS

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
A	**Compensator, Pipe,** one way, with 10″ x 11″–13″ cranks	A91-100
B	**Crank Stand,** horizontal, with 1¼″ dia. pin	A91-101
C	**Crank,** obtuse angle, 10″ x 11″–13″	A91-102
D	**Crank,** acute angle, 10″ x 11″–13″	A91-103
E	**Crank,** right angle, 9″ x 9″	A91-104
F	**Crank,** right angle, 11¾″ x 11¾″	A91-105
G	**Compensator,** straight arm, 11¾″ x 11¾″	A91-106
H	**Compensator,** straight arm, 9″ x 9″	A91-107
J	**Link,** connecting, 11″ centers	A91-108
1	**Pin,** ⅞″ dia., x 2¼″ long, with cotter and grease fitting	P91-100
1A	**Pin** only	P91-101
2	**Pin,** 1¼″ dia., x 5″ long, with cotter and grease fitting	P91-102
2A	**Pin** only	P91-103

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Pipeline fittings

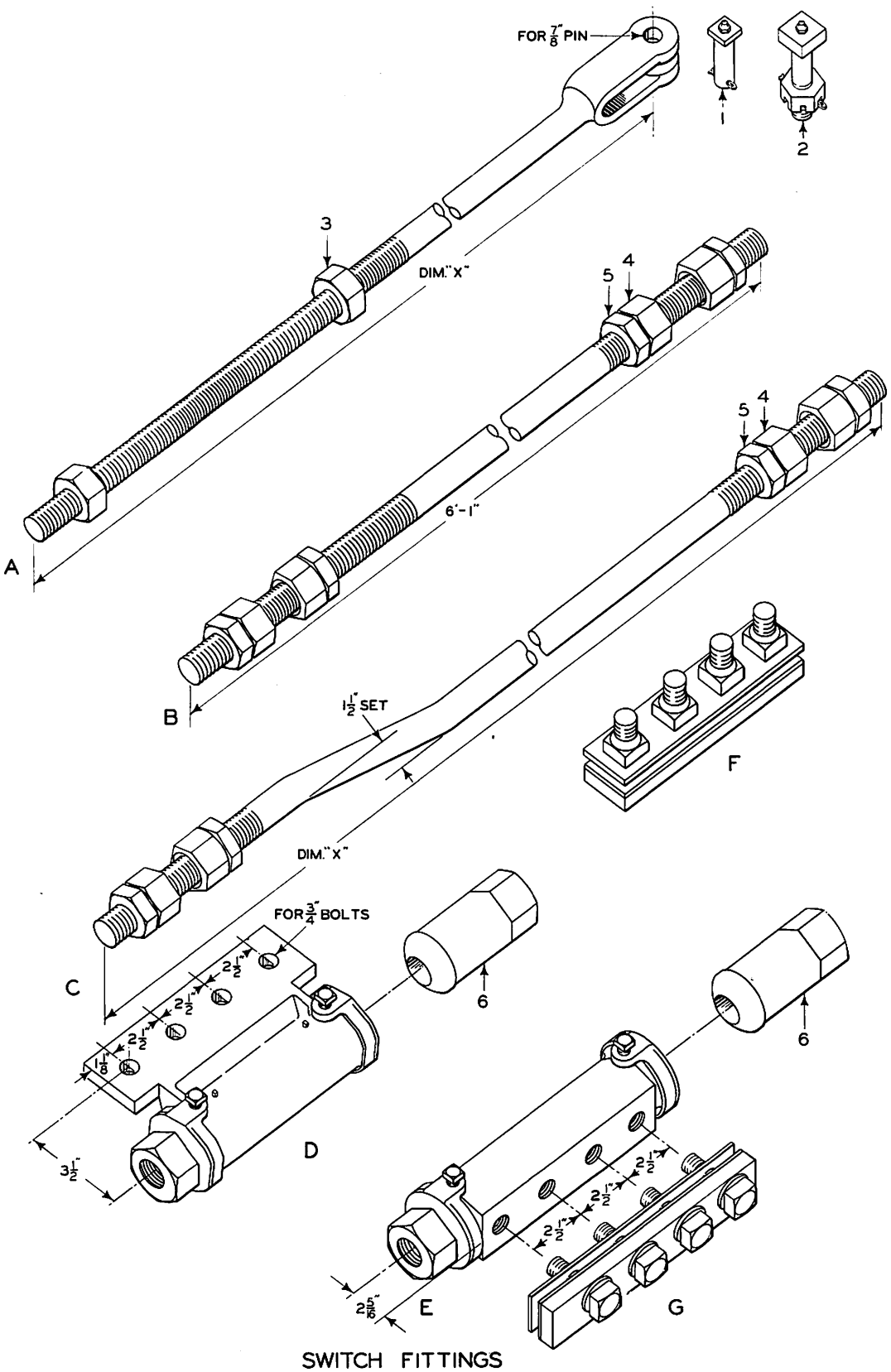
PIPELINE FITTINGS

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
A	**Pipe Carrier,** one way	A91-120
B	**Pipe Carrier,** one way, with double rollers	A91-121
C	**Pipe,** 1″ galvanized, 21′ long, with plug 10″ long, four holes, with rivets and coupling	A91-122
D	**Insulated Rod,** 1¼″, two tanged ends for 1″ pipe	A91-123
E	**Insulation Set,** includes top and bottom insulating and connecting plates, bushings, bolts, nuts and lock washers	A91-124
F	**Solid Jaw Rod,** 1¼″, tanged for 1″ pipe	A91-125
G	**Screw Jaw Rod,** tanged for 1″ pipe	A91-126
H	**Pipe Carrier,** one way, with single roller	A91-130
1	**Screw Jaw** only, 1¼″	P91-110
*2	**Nut,** 1¼″ – 7 x ¾″ thick, American std. heavy hex	P91-123
3	**Rivet,** ¼″ x 1 11/16″ rd. hd.	P91-112
4	**Pin,** ⅞″ dia., x 2¼″ long, with cotter and grease fitting	P91-100
4A	**Pin,** only	P91-101

* Commercial item.

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SWITCH FITTINGS

SWITCH FITTINGS

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
A	**Solid Jaw Rod,** 1¼", Dim. "X" = 3′ 6"	A91-135
A1	As above, except Dim. "X" = 6′ 0"	A91-136
A2	Same as Ref. A, except Dim. "X" = 9′ 9"	A91-137
A3	Same as Ref. A, except Dim. "X" = 12′ 0"	A91-138
B	**Lock Connecting Rod,** 1¼", straight, 6′ 1" overall	A91-139
C	**Lock Connecting Rod,** 1¼", 1½" offset, Dim. "X" = 5′ 7"	A91-140
C1	As above, except Dim. "X" = 6′ 0"	A91-141
D	**Switch Adjustment Bracket,** for horizontal rod connection 02-076105	A91-142
E	**Switch Adjustment Bracket,** for vertical rod connection	A91-143
F	**Insulation Set,** for horizontal bracket Ref. D, includes insulating plates and splice plate, bushings, bolts, nuts and lock washers, for ¾" thick transit rods	A91-144
F1	As above, except for 1" thick transit rods	A91-145
F2	Same as Ref. F, except for 1¼" thick transit rods	A91-146
G	**Insulation Set,** for vertical bracket Ref. E, includes insulating plates and splice plate, bushings, bolts and lock washers, for ¾" thick transit rods	A91-147
G1	As above, except for 1" thick transit rods	A91-148

(Continued on following page)

SWITCH FITTINGS

Order by catalog number and name shown in bold type

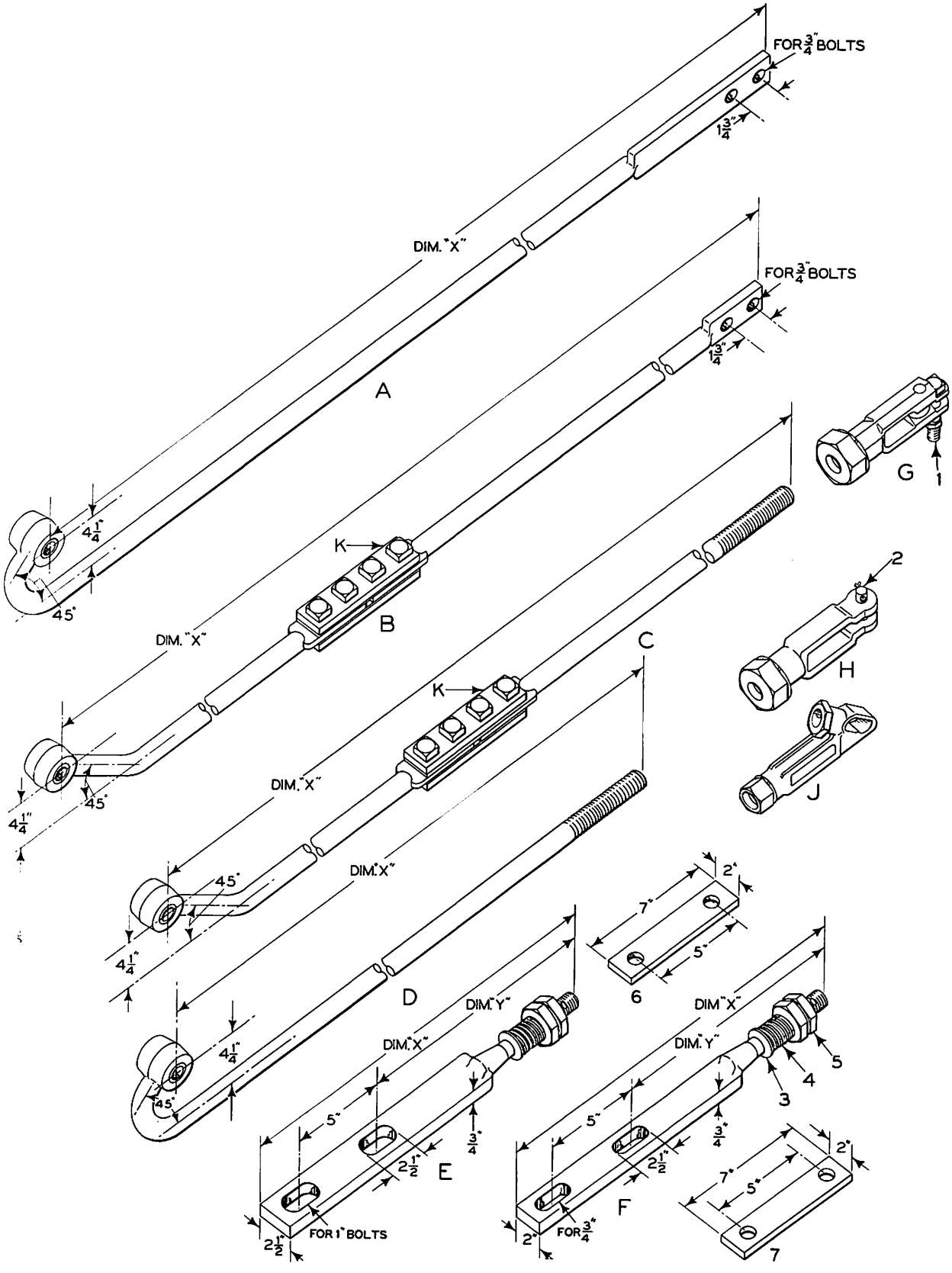
REF.	NAME	CATALOG NUMBER
G2	Same as Ref. G, except for 1¼″ thick transit rods	A91-149
1	**Pin,** ⅞″ dia. x 2¼″ long, with cotter and grease fitting	P91-100
1A	**Pin** only	P91-101
2	**Bolt,** ⅞″ – 9 x 2¾″ sq. hd., with hex. nut, cotter and grease fitting	P91-120
2A	**Bolt,** only, with hex. nut	P91-121
*3	**Nut,** 1¼″ – 7 x 1¼″ thick, American std., heavy hex.	P91-111
4	**Nut,** cup, 1¼″ – 7 x 1¼″ thick hex.	P91-122
*5	**Nut,** 1¼″ – 7 x ¾″ thick, American std., heavy hex., jam	P91-123
6	**Nut,** 1¼″ – 7, adjusting	P91-124

*Commercial items.

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Memoranda

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Point Detector Connecting Rods,
Switch Circuit Controller Rods and Jaws,
Point Lugs

POINT DETECTOR CONNECTING RODS, SWITCH CIRCUIT CONTROLLER RODS AND JAWS, POINT LUGS

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
A	POINT DETECTOR CONNECTING ROD, 1" dia., with tapered bushing, Dim. "X" = 3' 0"	A91-160
A1	As above, except Dim. "X" = 3' 8"	A91-161
A2	Same as Ref. A, except Dim. "X" = 3' 11"	A91-162
A3	Same as Ref. A, except Dim. "X" = 6' 1"	A91-163
A4	Same as Ref. A, except Dim. "X" = 6' 7"	A91-164
B	POINT DETECTOR CONNECTING ROD, 1" dia., insulated, with tapered bushing, Dim. "X" = 6' 4"	A91-170
B1	As above, except Dim. "X" = 6' 8 1/2"	A91-171
B2	Same as Ref. B, except Dim. "X" = 7' 0"	A91-172
B3	Same as Ref. B, except Dim. "X" = 7' 2 1/2"	A91-173
B4	Same as Ref. B, except Dim. "X" = 7' 8 1/2"	A91-174
B5	Same as Ref. B, except Dim. "X" = 7' 10"	A91-175
B6	Same as Ref. B, except Dim. "X" = 8' 9"	A91-176
C	SWITCH CIRCUIT CONTROLLER ROD, 1" dia., insulated, with tapered bushing, Dim. "X" = 7' 6"	A91-181
C1	As above, except Dim. "X" = 9' 6"	A91-182
D	SWITCH CIRCUIT CONTROLLER ROD, 1" dia., with tapered bushing, Dim. "X" = 2' 10"	A91-190
D1	As above, except Dim. "X" = 3' 4"	A91-191
D2	Same as Ref. D, except Dim. "X" = 3' 10"	A91-192
E	POINT LUG, 3/4" x 2 1/2" Dim. "X" = 15 3/4"; Dim. "Y" = 8 7/8", for rods having tapered bushings	A91-200
E1	As above, except Dim. "X" = 18 1/2" Dim. "Y" = 11 5/8"	A91-201
E2	Same as Ref. E except Dim. "X" = 21 1/4"; Dim. "Y" = 14 3/8"	A91-202
E3	Same as Ref. E, except Dim. "X" = 24 1/4"; Dim. "Y" = 17 3/8"	A91-203
E4	Same as Ref. E except Dim. "X" = 17 1/8"; Dim. "Y" = 10 1/4"	A91-450
E5	Same as Ref. E except Dim. "X" = 19 7/8"; Dim. "Y" = 13"	A91-451
E6	Same as Ref. E except Dim. "X" = 22 3/4"; Dim. "Y" = 15 7/8"	A91-452
E7	Same as Ref. E except Dim. "X" = 20 1/2"; Dim. "Y" = 13 5/8"	A91-453

(Continued on following page)

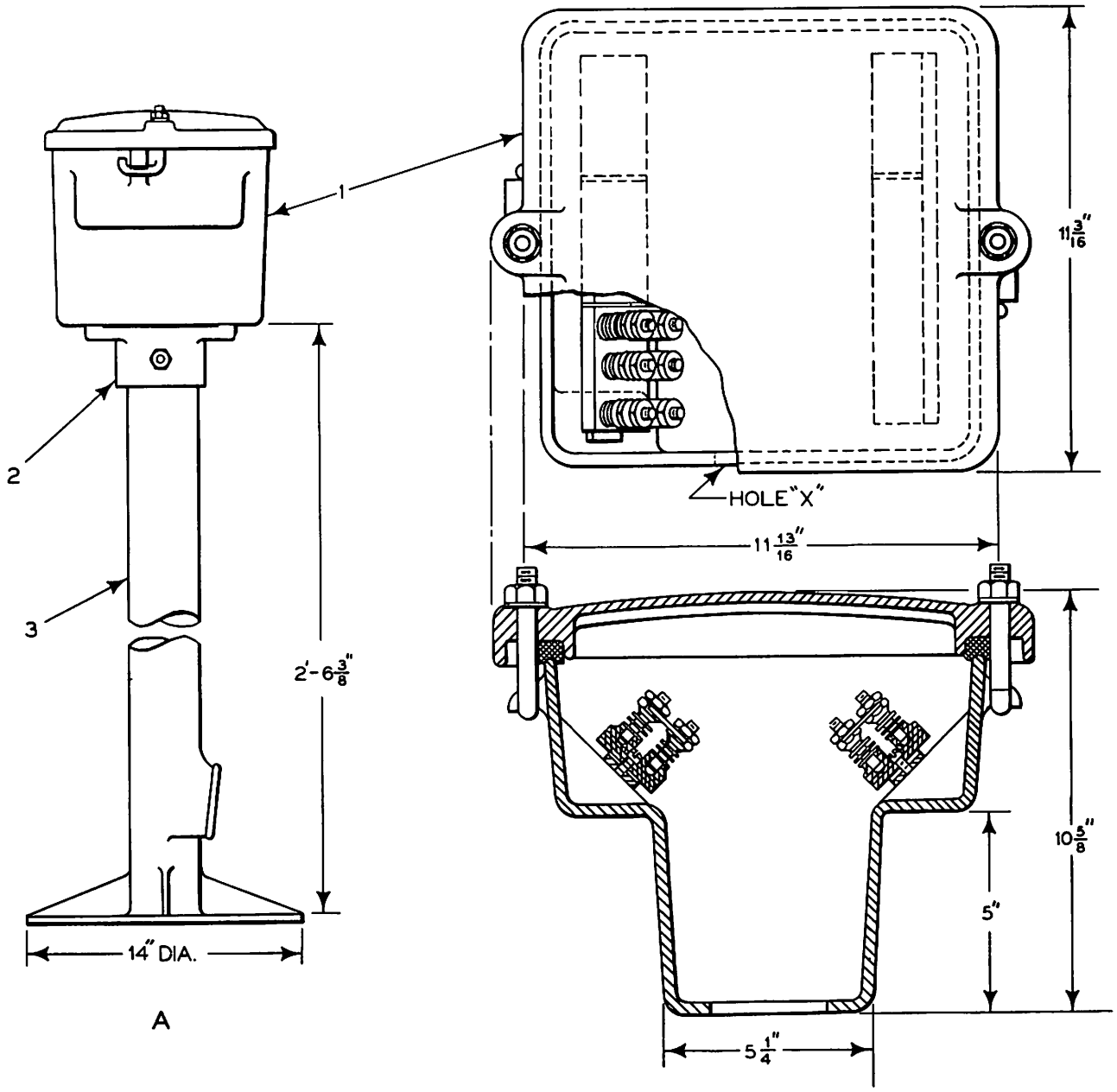
POINT DETECTOR CONNECTING RODS, SWITCH CIRCUIT CONTROLLER RODS AND JAWS, POINT LUGS

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
F	POINT LUG, 3/4" x 2", for rods having tapered bushings, Dim. "X" 15 3/4"; Dim. "Y" = 8 7/8"	A91-207
F1	As above, except Dim. "X" = 18 1/2"; Dim. "Y" = 11 5/8"	A91-208
F2	Same as Ref. F, except Dim. "X" = 21 1/4"; Dim. "Y" = 14 3/8" . .	A91-209
F3	Same as Ref. F, except Dim. "X" = 24 1/4"; Dim. "Y" = 17 3/8" . .	A91-210
F4	Same as Ref. F, except Dim. "X" = 17 1/8"; Dim. "Y" = 10 1/4" . .	A91-460
F5	Same as Ref. F, except Dim. "X" = 19 7/8"; Dim. "Y" = 13"	A91-461
F6	Same as Ref. F, except Dim. "X" = 22 3/4"; Dim. "Y" = 15 7/8" . . .	A91-462
F7	Same as Ref. F, except Dim. "X" = 20 1/2"; Dim. "Y" = 13 5/8" . . .	A91-463
G	SCREW JAW, 1", with jam nut and lock washer, for ball pin	A91-215
H	SCREW JAW, 1", with jam nut, lock washer and pin	A91-216
J	SOCKET, 1" with jam nut and lock washer	A91-217
K	INSULATION SET, includes insulating and splice plates, bushings, 1/2" x 2 1/4" bolts, nuts and washers	A91-220
1	BOLT, 1/2" - 13 x 2 1/4" sq. hd., with hex. nut, lock washer and cotter	P91-140
2	PIN, 5/8" dia., x 1 13/16" sq. hd., with cotter	P91-141
3	WASHER, for spring	P91-142
4	SPRING	P91-143
*5	NUT, 1" -8 x 9/16" thick, American std., heavy hex., jam	P91-144
6	PLATE WASHER, A.A.R. dwg. 125511, 5" spacing for 1" bolts . . .	P91-145
7	PLATE WASHER, A.A.R. dwg. 125512, 5" spacing for 3/4" bolts . .	P91-146

* Commercial item.

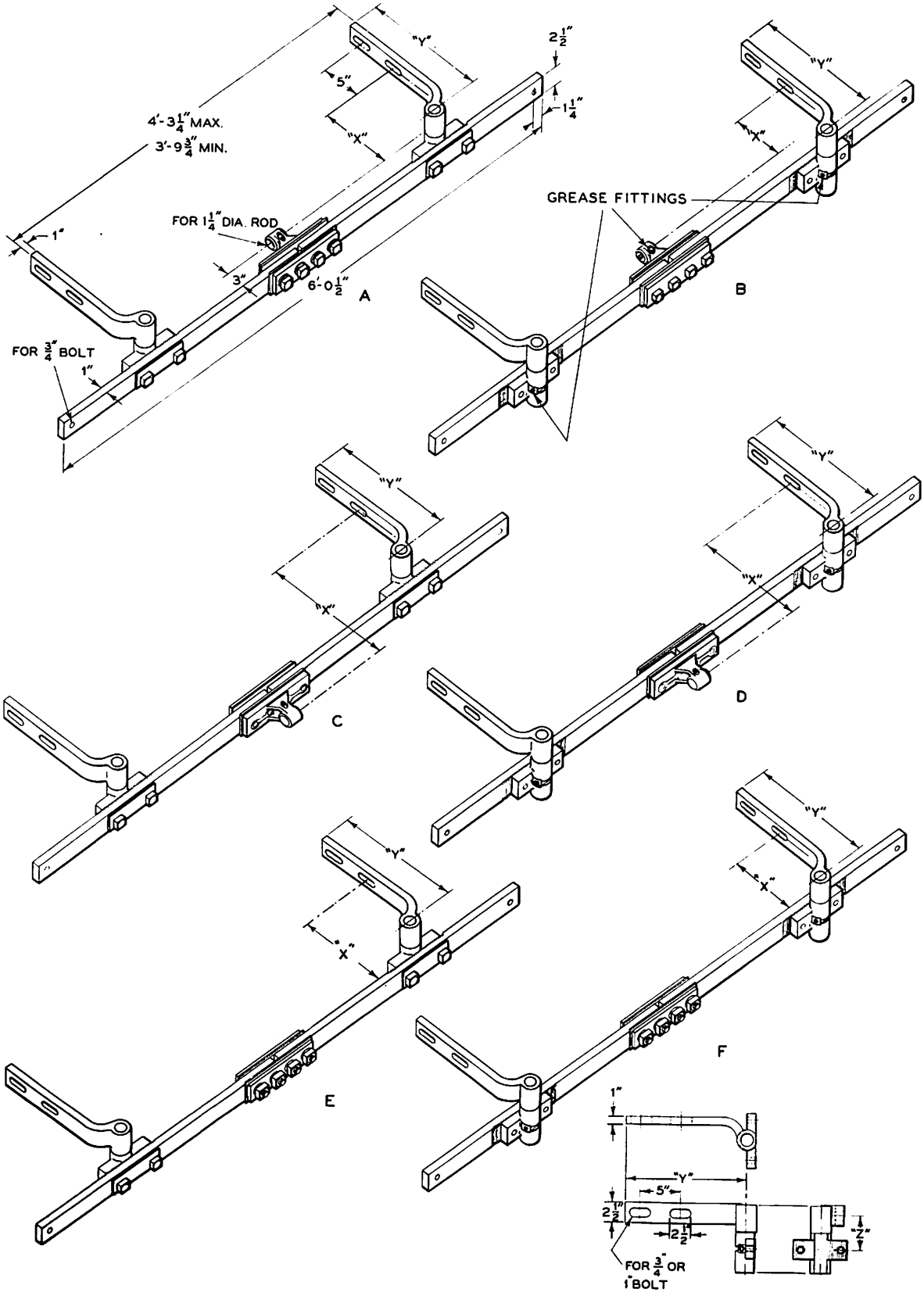
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JUNCTION TERMINAL BOX

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
A	**Junction Terminal Box,** with pedestal, has 36 terminal posts, hole "X" for 2" conduit	A91-230
1	**Junction Terminal Box** only, has 36 terminal posts, hole "X" for 2" conduit	A91-231
2	**Adapter,** for 3½" pipe	A91-232
3	**Pedestal,** 3½" pipe, with base	A91-233



Front rods—hinged type

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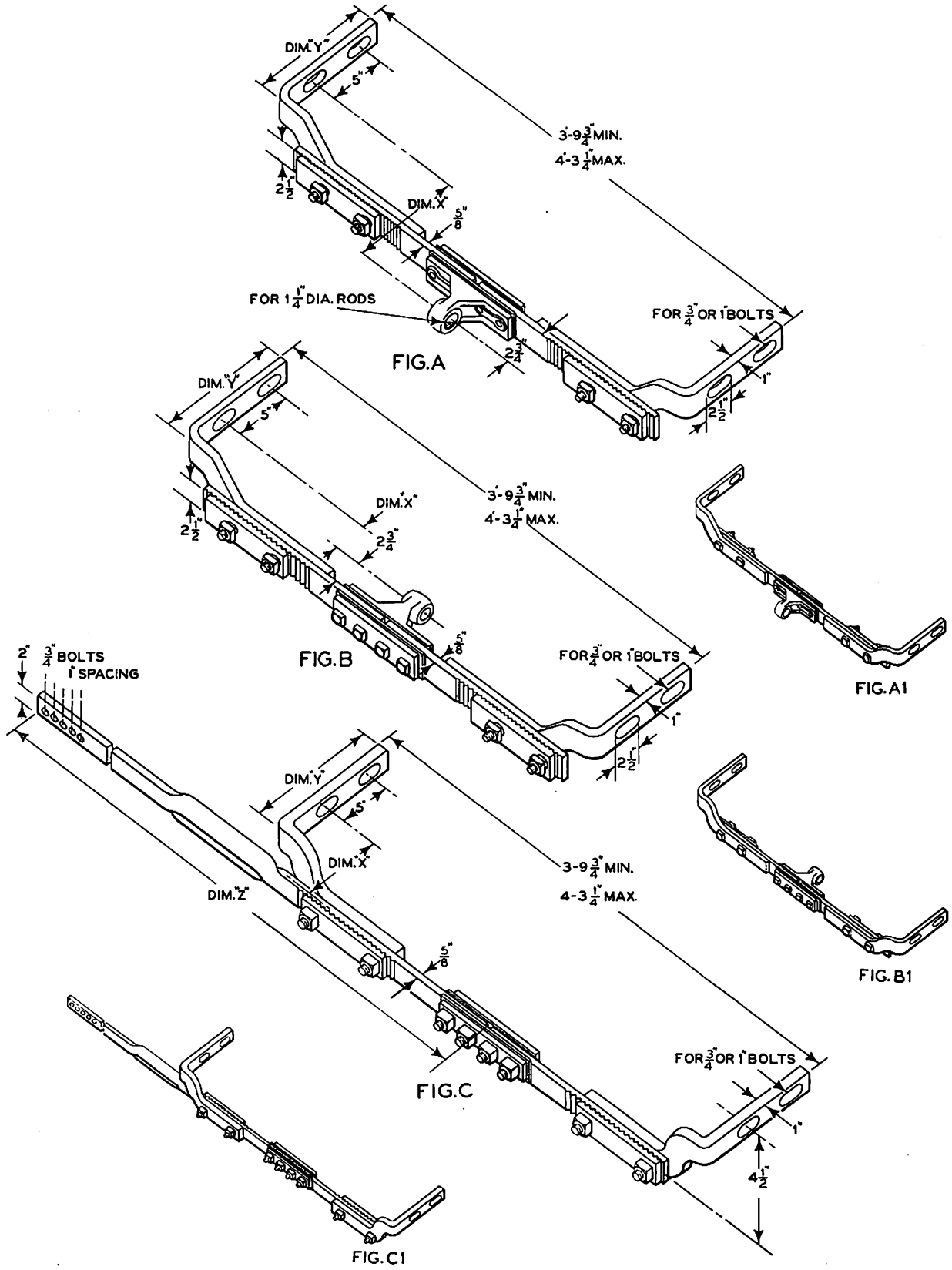
FRONT RODS—HINGED TYPE

Insulated, Adjustable

Order by catalog number and name

REF.	DIM. "Y"	DIM. "X"	DIM. "Z"	CATALOG NUMBER FOR 1" MOUNTING BOLTS	CATALOG NUMBER FOR 3/4" MOUNTING BOLTS
A	13-1/8"	3-1/2" to 5"	4-1/4"	A91-330	A91-340
A1	13-1/8"	3-1/2" to 5"	5-3/16"	A91-331	A91-341
A2	15-1/8"	5-1/2" to 7"	4-1/4"	A91-332	A91-342
A3	15-1/8"	5-1/2" to 7"	5-3/16"	A91-333	A91-343
B	13-1/8"	1/2" to 2"	4-1/4"	A91-350	A91-360
B1	13-1/8"	1/2" to 2"	5-3/16"	A91-351	A91-361
B2	15-1/8"	2-1/2" to 4"	4-1/4"	A91-352	A91-362
B3	15-1/8"	2-1/2" to 4"	5-3/16"	A91-353	A91-363
C	13-1/8"	10-1/2" to 12"	4-1/4"	A91-370	A91-380
C1	13-1/8"	10-1/2" to 12"	5-3/16"	A91-371	A91-381
C2	15-1/8"	12-1/2" to 14"	4-1/4"	A91-372	A91-382
C3	15-1/8"	12-1/2" to 14"	5-3/16"	A91-373	A91-383
D	13-1/8"	7-1/2" to 9"	4-1/4"	A91-390	A91-400
D1	13-1/8"	7-1/2" to 9"	5-3/16"	A91-391	A91-401
D2	15-1/8"	9-1/2" to 11"	4-1/4"	A91-392	A91-402
D3	15-1/8"	9-1/2" to 11"	5-3/16"	A91-393	A91-403
E	13-1/8"	6-1/2" to 8"	4-1/4"	A91-410	A91-420
E1	13-1/8"	6-1/2" to 8"	5-3/16"	A91-411	A91-421
E2	15-1/8"	8-1/2" to 10"	4-1/4"	A91-412	A91-422
E3	15-1/8"	8-1/2" to 10"	5-3/16"	A91-413	A91-423
F	13-1/8"	3-1/2" to 5"	4-1/4"	A91-430	A91-440
F1	13-1/8"	3-1/2" to 5"	5-3/16"	A91-431	A91-441
F2	15-1/8"	5-1/2" to 7"	4-1/4"	A91-432	A91-442
F3	15-1/8"	5-1/2" to 7"	5-3/16"	A91-433	A91-443

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Front rods—rigid type

FRONT RODS–RIGID TYPE

Insulated, Adjustable

Order by catalog number and name

ASSEMBLED AS PER FIG. A

DIM. "Y"	DIMENSION "X"		CATALOG NUMBER	
	As Shipped	Reassembled in Field as Per Fig. A1	For 1" Mounting Bolts	For ¾" Mounting Bolts
11½"	7⅛" to 8⅝"	5½" to 7"	A91-260	A91-262
13½"	9⅛" to 10⅝"	7½" to 9"	A91-261	A91-263

ASSEMBLED AS PER FIG. B

DIM. "Y"	DIMENSION "X"		CATALOG NUMBER	
	As Shipped	Reassembled in Field as Per Fig. B1	For 1" Mounting Bolts	For ¾" Mounting Bolts
11½"	1" to 2½"	¾"	A91-270	A91-272
13½"	3" to 4½"	1⅜" to 2⅞"	A91-271	A91-273

FRONT RODS–RIGID TYPE

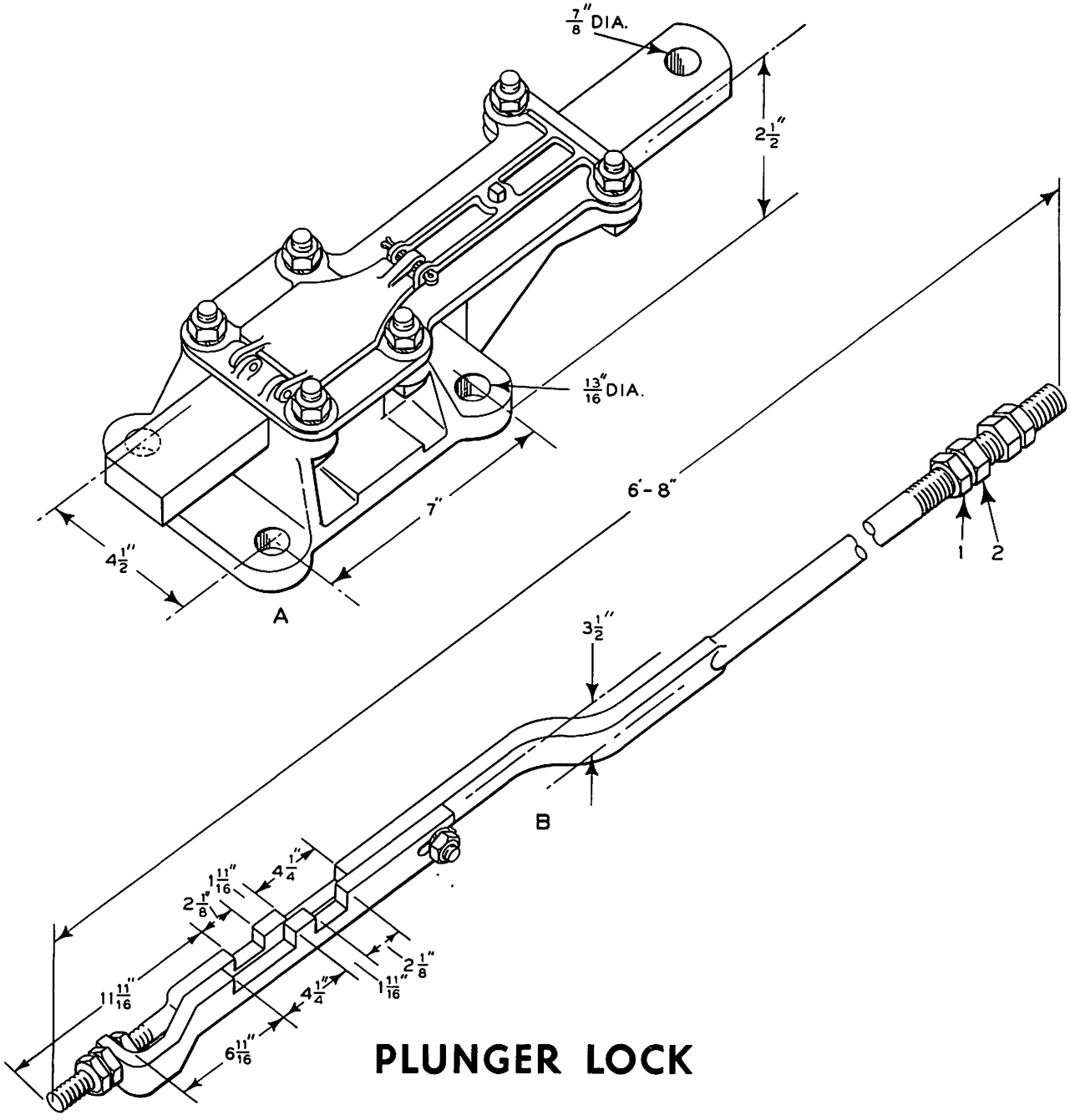
Insulated, Adjustable

With Continuous Lock Rod Connection

ASSEMBLED AS PER FIG. C

DIM. "Z"	DIM. "Y"	DIMENSION "X"		CATALOG NUMBER	
		As Shipped	Reassembled in Field as Per Fig. C1	For 1" Mounting Bolts	For ¾" Mounting Bolts
5'-3"	13½"	6 1/16"-7 9/16"	4 7/16"-5 15/16"	A91-280	A91-284
"	11½"	4 1/16"-5 9/16"	2 7/16"-3 15/16"	A91-281	A91-285
3'-11"	13½"	6 1/16"-7 9/16"	4 7/16"-5 15/16"	A91-282	A91-286
"	11½"	4 1/16"-5 9/16"	2 7/16"-3 15/16"	A91-283	A91-287

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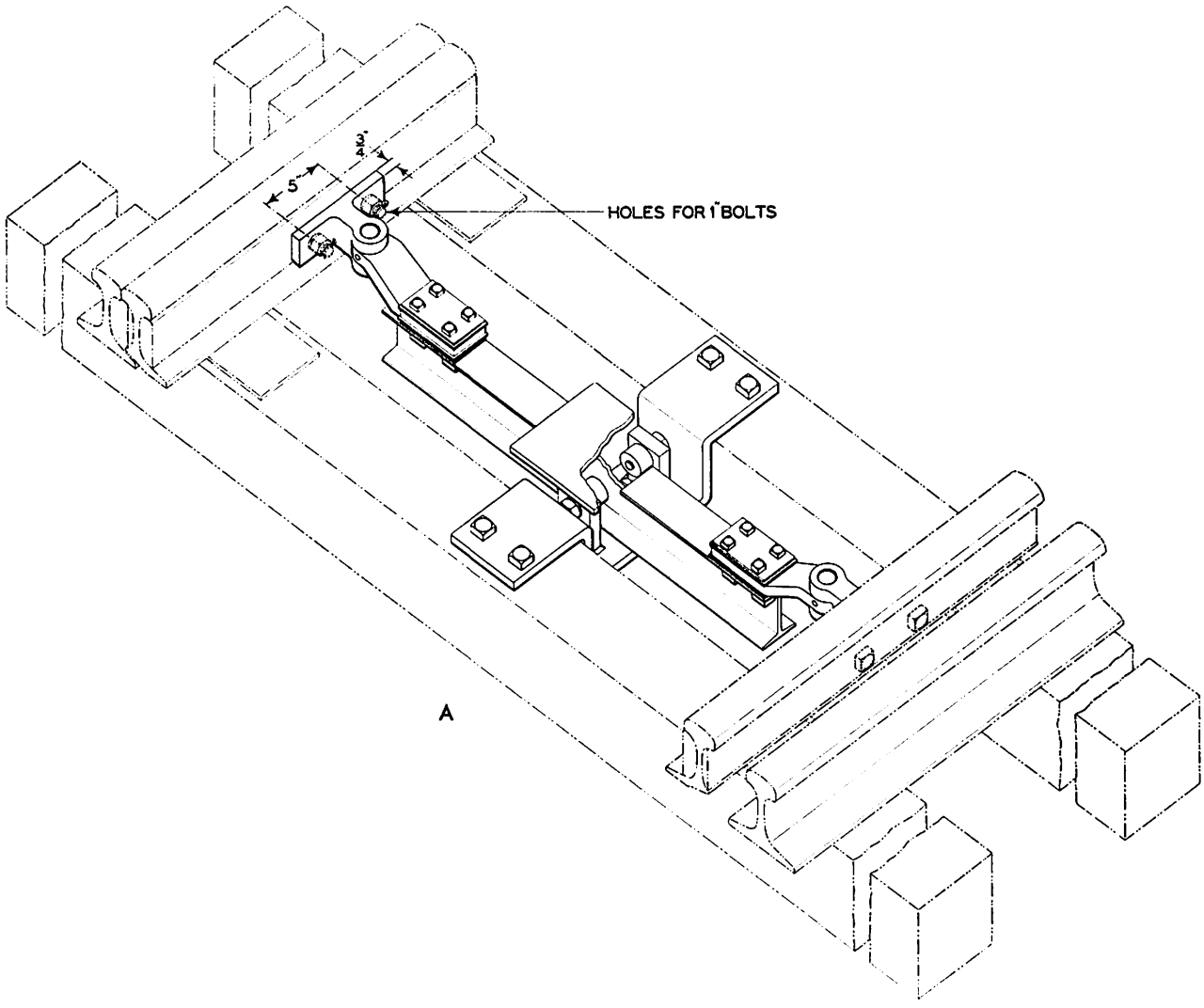


PLUNGER LOCK

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
A	**Plunger-Lock,** for use with rod Ref. B	A91-300
B	**Lock Rod,** 1¼" dia., adjustable	A91-301
*1	**Nut,** 1¼"—7 x ¾" thick, American std., heavy hex	P91-123
2	**Nut,** cup, 1¼"—7 x 1¼" thick, hex.	P91-122

*Commercial item

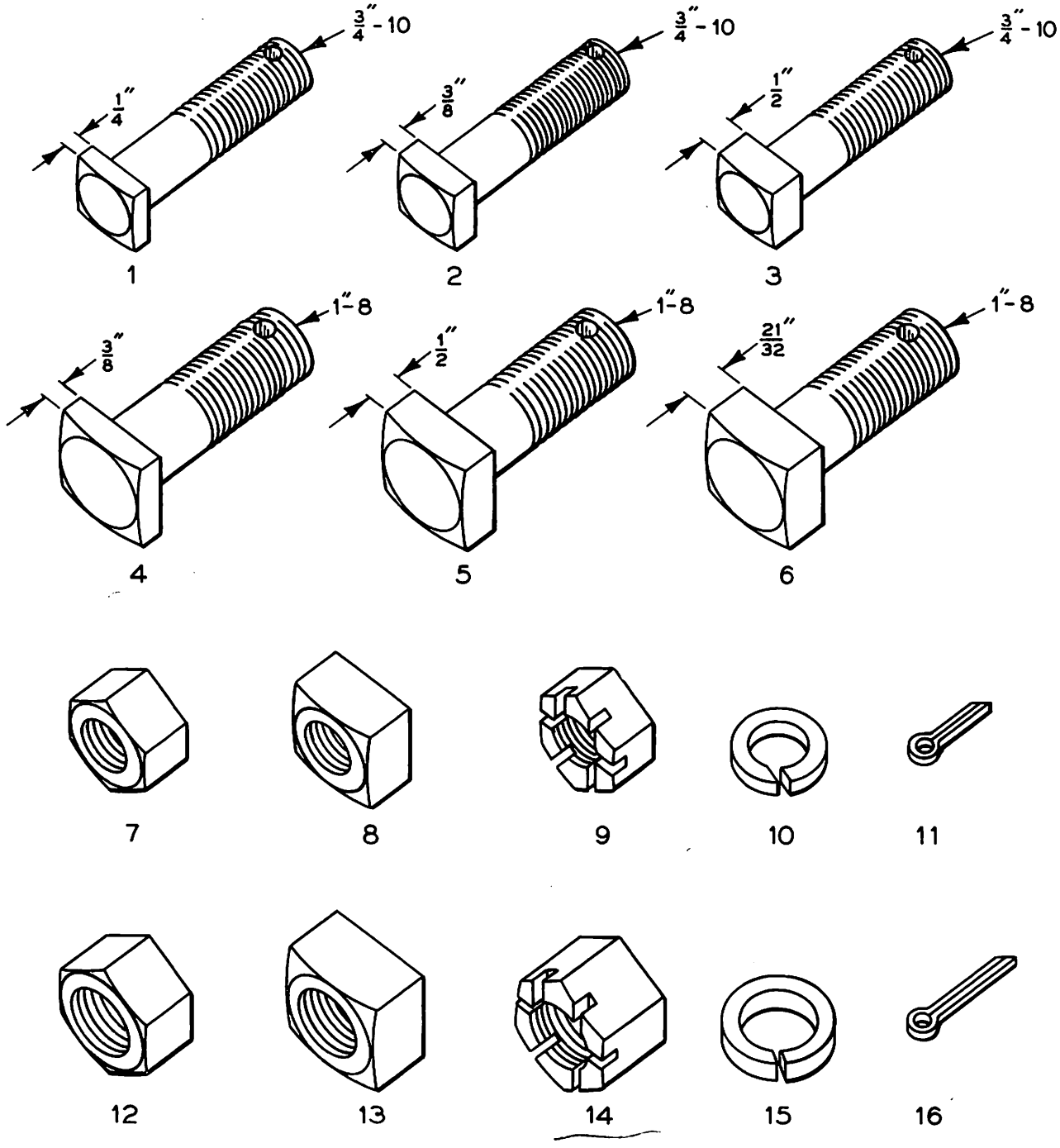


ROLLER BEARINGS

For Application to Switch Points

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
A	**Roller Bearing,** articulated, fits any size rail, does not include bolts for attaching to rails.....	A91-320



Lug bolts, nuts and washers

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LUG BOLTS, NUTS AND WASHERS

Order by catalog number and name

REF.	SIZE	THICKNESS OF HEAD	LENGTH UNDER HEAD	CATALOG NUMBER
1	¾"-10	¼"	3½"	P91-160
1a	"	"	4"	P91-161
1b	"	"	4½"	P91-162
1c	"	"	5"	P91-163
1d	"	"	5½"	P91-164
2	"	⅜"	3½"	P91-170
2a	"	"	4"	P91-171
2b	"	"	4½"	P91-172
2c	"	"	5"	P91-173
2d	"	"	5½"	P91-174
3	"	½"	3½"	P91-180
3a	"	"	4"	P91-181
3b	"	"	4½"	P91-182
3c	"	"	5"	P91-183
3d	"	"	5½"	P91-184
4	1"-8	⅜"	3½"	P91-190
4a	"	"	4"	P91-191
4b	"	"	4½"	P91-192
4c	"	"	5"	P91-193
4d	"	"	5½"	P91-194
5	"	½"	3½"	P91-200
5a	"	"	4"	P91-201
5b	"	"	4½"	P91-202
5c	"	"	5"	P91-203
5d	"	"	5½"	P91-204
6	"	21/32"	3½"	P91-210
6a	"	"	4"	P91-211
6b	"	"	4½"	P91-212
6c	"	"	5"	P91-213
6d	"	"	5½"	P91-214

(Continued on following page)

LUG BOLTS, NUTS AND WASHERS

Order by catalog number and name shown in bold type

REF.	NAME	CATALOG NUMBER
* 7	**Nut,** ¾″—10, American std., heavy hex.	P91-220
* 8	**Nut,** ¾″—10, American std., heavy square	P91-221
* 9	**Nut,** ¾″—10, American std., semi-finished, regular hex., slotted	P91-222
*10	**Lock Washer,** ¾″	P91-223
*11	**Cotter,** for ¾″ sq. and hex. nuts Refs. 7 and 8	P91-224
*11a	As above, except for ¾″ slotted nut Ref. 9	P91-225
*12	**Nut,** 1″—8, American std., heavy hex.	P91-226
*13	**Nut,** 1″—8, American std., heavy square	P91-227
*14	**Nut,** 1″—8, American std., semi-finished, heavy hex., slotted	P91-228
*15	**Lock Washer,** 1″	P91-229
*15a	As above, except 1¼″	P91-230
*16	**Cotter,** for 1″ sq. and hex. nuts Refs. 12 and 13	P91-231
*16a	As above, except for 1″ slotted nut Ref. 14	P91-232

*Commercial items.

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CATALOG SECTION A91

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SWITCH AND PIPELINE FITTINGS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A91-100			COMPENSATR	3
	30395 GR3		COMPENSATR	
	34232-31	4	FITTING	
A91-101			CRANK	3
			STAND	
	8206-1GR5		STAND	
	34232-31		FITTING	
A91-102	8573-4		CRANK	3
A91-103	8577-4		CRANK	3
A91-104	28717		CRANK	3
A91-105	637-131		CRANK	3
A91-106	27621		COMPENSATR	3
A91-107	30256		COMPENSATR	
A91-108	8359-2		LINK	
A91-120	8727 GR11		PIPE CARR	5
A91-121			PIPE	5
			CARRIER	
	2694-2		STAND	
	2928-1	2	ROLLER	
	2695-7		ROLLER	
	2696-2	2	PIN	
	044	4	COTTER	
A91-122			PIPE 1 IN	5
			GALV (20	
			FT LGTH)	
	33526 GR1		PIPE	
	39554	2	RIVET	
A91-123	39000 GR1		ROD	5
A91-124			INSULATION	5
			SET	
	39004	2	PLATE	
	39006	2	PLATE	
	0149	4	B&N	
	01273-11	4	WASHER	
	39008	4	BUSHING	
A91-125	109-5		ROD	5
A91-126			ROD 30584	5
			GR 1	
	30585		ROD	
	545-7		NUT	
	959		JAW	
A91-130			PIPE	5
			CARRIER	
	2694-3		STAND	
	2695-7		ROLLER	
	2696-2		PIN	
	044	2	COTTER	
A91-135			SOLID JAW	7
			ROD	
	120-12		ROD	
	545-7	2	NUT	
A91-136			SOLID JAW	7
			ROD	
	120-197		ROD	
	545-7	2	NUT	
A91-137			SOLID JAW	7
			ROD	
	120-79		ROD	
	545-7	2	NUT	
A91-138			SOLID JAW	7
			ROD	
	120-110		ROD	
	545-7	2	NUT	
A91-139			LOCK ROD	7
	4172-36		ROD	
	545-11	4	NUT	
	2813	4	NUT	
A91-140			LOCK ROD	7
	4172-38		ROD	
	545-11	4	NUT	
	2813	4	NUT	
A91-141			LOCK ROD	7
	4172-42		ROD	
	545-11	4	NUT	
	2813	4	NUT	
A91-142			SW.ADJUSTM	7
			ENT	
			BRACKET	
	46948-16GR1		BRACKET	
	44921-2	2	NUT	
A91-143			SW	7
			ADJUSTMENT	
			BRACKET	
	46948-15GR1		BRACKET	
	44921-2	2	NUT	
A91-144			INSULATION	7
			SET	
	47409	2	PLATE	
	40640		PLATE	
	40639	4	BUSHING	
	020-1	4	B&N	
	01273-13	4	WASHER	

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SWITCH AND PIPELINE FITTINGS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A91-145			INSULATION SET	7
	47409	2	PLATE	
	40640		PLATE	
	46983	4	BUSHING	
	0314	4	B&N	
	01273-13	4	WASHER	
A91-146			INSULATION SET	7
	47409	2	PLATE	
	40640		PLATE	
	7350-185	4	BUSHING	
	0276	4	B&N	
	01273-13	4	WASHER	
A91-147			INSULATION SET	7
	47409	2	PLATE	
	40640		PLATE	
	40639	4	BUSHING	
	542-55	4	BOLT	
	01273-13	4	WASHER	
A91-148			INSULATION SET	7
	47409	2	PLATE	
	40640		PLATE	
	46983	4	BUSHING	
	6013-21	4	BOLT	
	01273-13	4	WASHER	
A91-149			INSULATION SET	8
	47409	2	PLATE	
	40640		PLATE	
	7350-185	4	BUSHING	
	6013-2	4	BOLT	
	01273-13	4	WASHER	
A91-160	43050-116GR8		ROD	11
A91-161	43050-116GR5		ROD	11
A91-162	43050-116GR1		ROD	11
A91-163	43050-116 GR13		ROD	11
A91-164	43050-116GR7		ROD	11
A91-170	46930-130GR6		ROD	11
A91-171	46930-130GR3		ROD	11
A91-172	46930-130GR7		ROD	11
A91-173	46930-130GR4		ROD	11
A91-174	46930-130GR5		ROD	11
A91-175	46930-130GR2		ROD	11
A91-176	46930-130GR1		ROD	11
A91-181	46930-166GR2		ROD	11
A91-182	46930-166GR1		ROD	11
A91-190	43050-149GR3		ROD	11
A91-191	43050-149GR1		ROD	11
A91-192	43050-149GR4		ROD	11
A91-200			POINT LUG	11
	43053-287		LUG	
	626-59		WASHER	
	586-102		SPRING	
	0477	2	NUT	
	048		COTTER	
A91-201			POINT LUG	11
	43053-288		LUG	
	626-59		WASHER	
	586-102		SPRING	
	0477	2	NUT	
	048		COTTER	
A91-202			POINT LUG	11
	43053-289		LUG	
	626-59		WASHER	
	586-102		SPRING	
	0477	2	NUT	
	048		COTTER	
A91-203			POINT LUG	11
	43053-290		LUG	
	626-59		WASHER	
	586-102		SPRING	
	0477	2	NUT	
	048		COTTER	
A91-207			POINT LUG	12
	43053-279		LUG	
	626-59		WASHER	
	586-102		SPRING	
	0477	2	NUT	
	048		COTTER	
A91-208			POINT LUG	12
	43053-280		LUG	
	626-59		WASHER	
	586-102		SPRING	
	0477	2	NUT	
	048		COTTER	

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SWITCH AND PIPELINE FITTINGS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A91-209			POINT LUG	12
	43053-281		LUG	
	626-59		WASHER	
	586-102		SPRING	
	0477	2	NUT	
	048		COTTER	
A91-210			POINT LUG	12
	43053-282		LUG	
	626-59		WASHER	
	586-102		SPRING	
	0477	2	NUT	
	048		COTTER	
A91-215			SCREW JAW	12
	43054-1		JAW	
	0290-1		NUT	
	01273-15		WASHER	
	49527-6		BOLT	
	38931-2		NUT	
	041		COTTER	
	01273-10		WASHER	
A91-216			SCREW JAW	12
	9281		JAW	
	0290-1		NUT	
	8237-1		PIN	
	01273-15		WASHER	
	042		COTTER	
A91-217	55011-3		SOCKET	12
A91-220			INSULATION SET	12
	46886	2	PLATE	
	46936	2	PLATE	
	16779	4	BUSHING	
	0136	4	BOLT&NUT	
	01273-10	4	WASHER	
A91-230			JUNCTION TERMINAL BOX	13
	52918-9GR1		JCT BOX	
	57452 GR1		ADAPTER	
	18006-1		PEDESTAL	
A91-231	52918-9GR1		JCT BOX	13
A91-232	57452 GR1		ADAPTER	13
A91-233	18006-1		PEDESTAL	13
A91-260	22870-194GR2		FRONT ROD	17
A91-261	22870-194GR3		FRONT ROD	17
A91-262			FRONT ROD	17
	22870-194GR2		FRONT ROD	
	8104-1	4	BUSHING	
A91-263			FRONT ROD	17
	22870-194GR3		FRONT ROD	
	8104-1	4	BUSHING	
A91-266	22870-196GR1		FRONT ROD	17
A91-267	22870-196GR2		FRONT ROD	17
A91-268			FRONT ROD	17
	22870-196GR1		FRONT ROD	
	8104-1	4	BUSHING	
A91-269			FRONT ROD	17
	22870-196GR2		FRONT ROD	
	8104-1	4	BUSHING	
A91-270	22870-194GR4		FRONT ROD	17
A91-271	22870-194GR1		FRONT ROD	17
A91-272			FRONT ROD	17
	22870-194GR4		FRONT ROD	
	8104-1	4	BUSHING	
A91-273			FRONT ROD	17
	22870-194GR1		FRONT ROD	
	8104-1	4	BUSHING	
A91-276	22870-196GR3		FRONT ROD	17
A91-277	22870-196GR4		FRONT ROD	17
A91-278			FRONT ROD	17
	22870-196GR3		FRONT ROD	
	8104-1	4	BUSHING	
A91-279			FRONT ROD	17
	22870-196GR4		FRONT ROD	
	8104-1	4	BUSHING	
A91-280	34593-97GR1		FRONT ROD	17
A91-281	34593-97GR2		FRONT ROD	18
A91-282	34593-97GR3		FRONT ROD	18
A91-283	34593-97GR4		FRONT ROD	18
A91-284			FRONT ROD	18
	34593-97GR1		FRONT ROD	
	8104-1	4	BUSHING	
A91-285			FRONT ROD	18
	34593-97GR2		FRONT ROD	
	8104-1	4	BUSHING	
A91-286			FRONT ROD	18
	34593-97GR3		FRONT ROD	
	8104-1	4	BUSHING	
A91-287			FRONT ROD	18
	34593-97GR4		FRONT ROD	
	8104-1	4	BUSHING	
A91-300	43441-3GR1		LOCK	19

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SWITCH AND PIPELINE FITTINGS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A91-301	21900-32GR3		LOCK ROD	19
A91-320			ROLLER BEARING	20
	57514-1GR1		ROLLER	
	22154-1GR2		BEAM	
	067-1	4	SCREW	
	53879-27	12	SHIM	
	1403-14	4	PLATE	
	7350-290	8	BUSHING	
	49527-7	8	BOLT	
	1048-6	8	NUT	
	01273-10	8	WASHER	
	36797-15	8	WASHER	
	5375 GR1	2	LUG	
	6714-276	4	BUSHING	
			PRINT	
			57513-5	
			ROLLER BEARING	
			PRINT	
			57513-5 GR 1	
A91-330	36333-54GR3		FRONT ROD	15
A91-331	36333-55GR3		FRONT ROD	15
A91-332	36333-54GR1		FRONT ROD	15
A91-333	36333-55GR1		FRONT ROD	15
A91-340			FRONT ROD	15
	36333-54GR3		FRONT ROD	
	8104-1	4	BUSHING	
A91-341			FRONT ROD	15
	36333-55GR3		FRONT ROD	
	8104-1	4	BUSHING	
A91-342			FRONT ROD	15
	36333-54GR1		FRONT ROD	
	8104-1	4	BUSHING	
A91-343			FRONT ROD	15
	36333-55GR1		FRONT ROD	
	8104-1	4	BUSHING	
A91-350	36333-56GR3		FRONT ROD	15
A91-351	36333-57GR3		FRONT ROD	15
A91-352	36333-56GR1		FRONT ROD	15
A91-353	36333-57GR1		FRONT ROD	15
A91-360			FRONT ROD	15
	36333-56GR3		FRONT ROD	
	8104-1	4	BUSHING	
A91-361			FRONT ROD	15
	36333-57GR3		FRONT ROD	
	8104-1	4	BUSHING	
A91-362			FRONT ROD	15
	36333-56GR1		FRONT ROD	
	8104-1	4	BUSHING	
A91-363			FRONT ROD	15
	36333-57GR1		FRONT ROD	
	8104-1	4	BUSHING	
A91-370	36333-54GR2		FRONT ROD	15
A91-371	36333-55GR2		FRONT ROD	15
A91-372	36333-54GR4		FRONT ROD	15
A91-373	36333-55GR4		FRONT ROD	15
A91-380			FRONT ROD	15
	36333-54GR2		FRONT ROD	
	8104-1	4	BUSHING	
A91-381			FRONT ROD	15
	36333-55GR2		FRONT ROD	
	8104-1	4	BUSHING	
A91-382			FRONT ROD	15
	36333-54GR4		FRONT ROD	
	8104-1	4	BUSHING	
A91-383			FRONT ROD	15
	36333-55GR4		FRONT ROD	
	8104-1	4	BUSHING	
A91-390	36333-56GR2		FRONT ROD	15
A91-391	36333-57GR2		FRONT ROD	15
A91-392	36333-56GR4		FRONT ROD	15
A91-393	36333-57GR4		FRONT ROD	15
A91-400			FRONT ROD	15
	36333-56GR2		FRONT ROD	
	8104-1	4	BUSHING	
A91-401			FRONT ROD	15
	36333-57GR2		FRONT ROD	
	8104-1	4	BUSHING	
A91-402			FRONT ROD	15
	36333-56GR4		FRONT ROD	
	8104-1	4	BUSHING	
A91-403			FRONT ROD	15
	36333-57GR4		FRONT ROD	
	8104-1	4	BUSHING	
A91-410	36333-60GR3		FRONT ROD	
A91-413	36333-60GR1		FRONT ROD	15
A91-420			FRONT ROD	15
	36333-60GR3		ROD	
	8104-1	4	BUSHINGS	
A91-421	36333-60GR2		FRONT ROD	15

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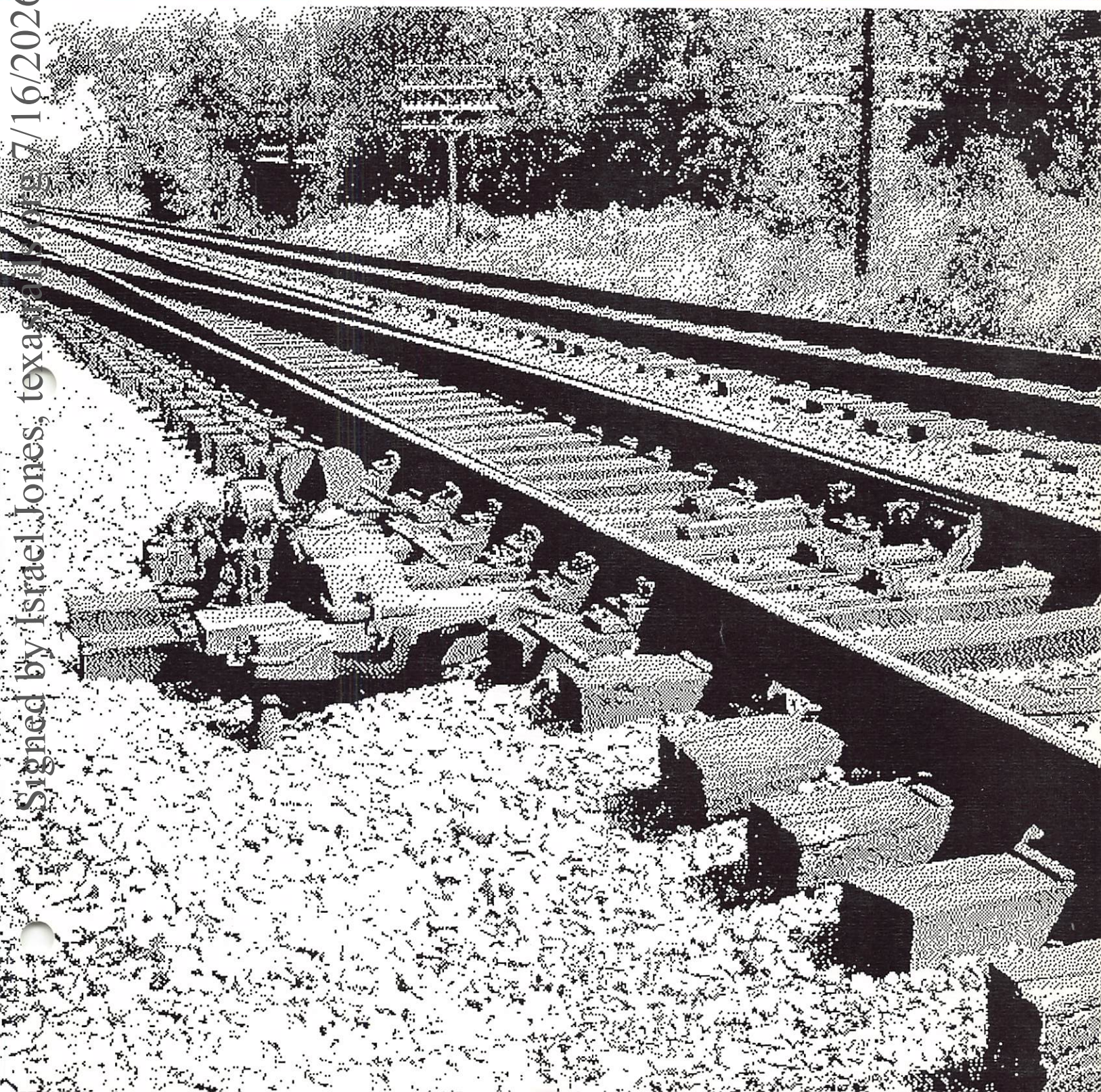
SWITCH AND PIPELINE FITTINGS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A91-423			FRONT ROD	15
	36333-60GR1		FRONT ROD	
	8104-1	4	BUSHING	
A91-430	36333-62GR2		FRONT ROD	15
A91-431	36333-63GR2		FRONT ROD	15
A91-432	36333-62GR1		FRONT ROD	15
A91-433	36333-63GR1		FRONT ROD	15
A91-440			FRONT ROD	15
	36333-62GR2		FRONT ROD	
	8104-1	4	BUSHING	
A91-441			FRONT ROD	15
	36333-63GR2		FRONT ROD	
	8104-1	4	BUSHING	
A91-442			FRONT ROD	15
	36333-62GR1		FRONT ROD	
	8104-1	4	BUSHING	
A91-443			FRONT ROD	15
	36333-63GR1		FRONT ROD	
	8104-1	4	BUSHING	
A91-450			POINT LUG	11
	43053-315		LUG	
	626-59		WASHER	
	586-102		SPRING	
	0477	2	NUT	
	048		COTTER	
A91-451			POINT LUG	11
	43053-316		LUG	
	626-59		WASHER	
	586-102		SPRING	
	0477	2	NUT	
	048		COTTER	
A91-452			POINT LUG	11
	43053-317		LUG	
	626-59		WASHER	
	586-102		SPRING	
	0477	2	NUT	
	048		COTTER	
A91-453			POINT LUG	11
	43053-338		LUG	
	626-59		WASHER	
	586-102		SPRING	
	0477	2	NUT	
	048		COTTER	
A91-460			POINT LUG	12
	43053-321		LUG	
	626-59		WASHER	
	586-102		SPRING	
	0477	2	NUT	
	048		COTTER	
A91-461			POINT LUG	12
	43053-322		LUG	
	626-59		WASHER	
	586-102		SPRING	
	0477	2	NUT	
	048		COTTER	
A91-462			POINT LUG	12
	43053-323		LUG	
	626-59		WASHER	
	586-102		SPRING	
	0477	2	NUT	
	048		COTTER	
A91-463			POINT LUG	12
	43053-337		LUG	
	626-59		WASHER	
	586-102		SPRING	
	0477	2	NUT	
	048		COTTER	

SERIES
FREQUENCY SHIFT OVERLAY TRACK CIRCUITS
FOR RELEASE OF OUTLYING ELECTRIC SWITCH LOCKS

GRS CATALOG **92-1**

GRS



Signed by Israel Jones, texas on 7/16/2026

INTRODUCTION

GRS Series Frequency Shift Overlay (FSO) track circuits provide an effective means of obtaining the release of an outlying electric switch lock when the main line is occupied in the vicinity of a switch. No insulated joints are necessary. Narrow band width minimizes interference from harmonics of power lines and other FSO equipment. The high impedance of the rails to the modulated carrier restricts the track circuit to a limited section of track.

Three Operating Frequencies - - All Mutually Compatible

Three operating frequency channels are available: 13.8 KHz (channel 25), 17.0 KHz (channel 26), and 20.9 KHz (channel 27). The three channels are mutually compatible -- adjacent channels can be used in the same area without insulated joints and without interfering with each other.

Variable Track Circuit Lengths

Track circuit length is a function of transceiver voltage, operating frequency and ballast resistance. Depending upon these factors, switch lock release can be obtained over a range of 15 to 50 feet ahead of the track connections.

Modular Construction, Plug-in Frequency Units Simplify Maintenance

The transceiver consists of modular, printed circuit boards that plug into a cabinet the approximate size of three B1 relay spaces. The boards are keyed to ensure that the correct board is plugged into the correct coupler in the cabinet. All tuning elements are on two of these boards. The operating frequency can be changed simply by replacing these boards and corresponding keys with boards and keys for a different frequency.

Surge Protection

Protection against high-voltage surges is built into the transceiver.

Five-Way Mounting

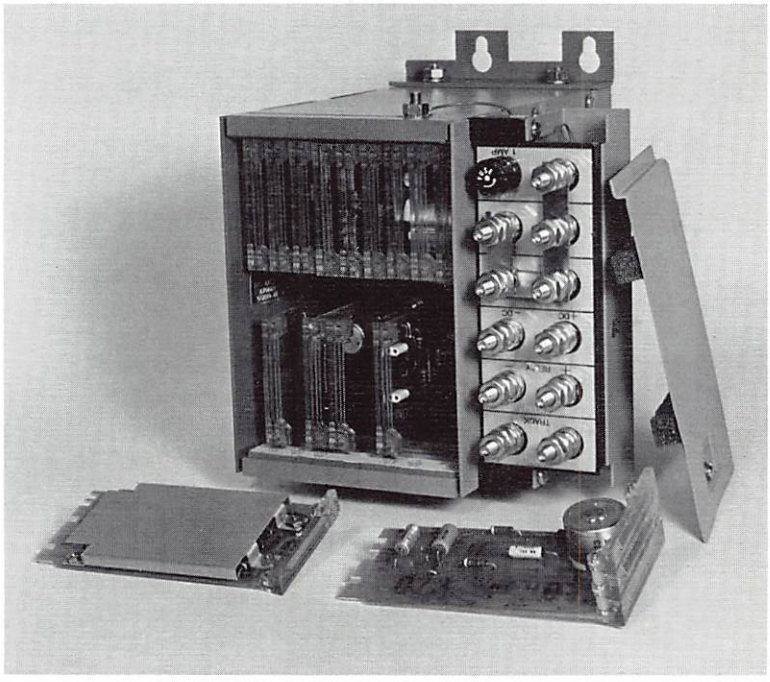
The transceiver can be shelf-mounted, wall mounted any of three ways, or rack mounted in three B1 relay spaces.

Easily Accessible Connections

A reversible AAR terminal strip provides ready access to the track, battery, relay and tuning connections.

SPECIFICATIONS

Power Input:	0.25 ampere
Battery Supply:	9 to 12 volts d-c
Minimum Ballast Resistance:	2 ohms in 1000 feet
Temperature Range:	-40° to +160° F



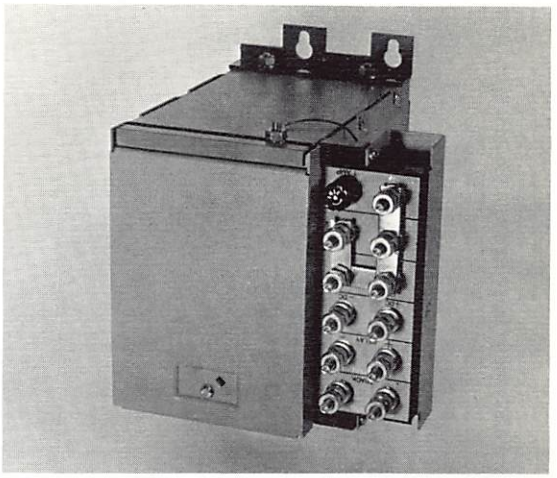
Series FSO transceiver, with cover removed to show plug-in, modular design. To alter frequency, only the detector and oscillator printed circuit boards (shown unplugged above) and their corresponding keys need be changed.

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ORDERING INFORMATION

A series FSO track circuit consists of a transceiver, track relay, and optional line filter unit and reactors. Please refer to GRS Pamphlet 1495, "GRS Series Frequency Shift Overlay Track Circuits, Operation, Installation and Maintenance," for details.

NOTE: Transceivers of the same frequency can be used in the same area, provided the track connections are 200 or more feet apart.



TRANSCEIVERS

Please order by catalog number and name shown in bold type.

NAME	CHANNEL	FREQUENCY	CATALOG NO.
TRANSCEIVER	25	13.8KHz	**A92-1050**
TRANSCEIVER	26	17.0KHz	**A92-1051**
TRANSCEIVER	27	20.9 KHz	**A92-1052**

ACCESSORIES

Please order by catalog number and name shown in bold type.

NAME	CATALOG NO.
TYPE B RELAY, 6FB, neutral, 500 ohm	**A62-262**
TYPE B RELAY, 4FB, 2F, 1B, neutral, 500 ohm	**A62-277**
TYPE K2 RELAY, 2FB, neutral, 500 ohm	**A65-305**
TYPE K4 RELAY, 4FB, neutral, 500 ohm	**A65-315**
TYPE K6 RELAY, 6FB, neutral, 500 ohm	**A65-325**
PLUGBOARD KIT, for Type B relay above	**A62-506**
PLUGBOARD KIT, for Type B relay above, with crimp terminals	**A62-586**
FILTER, for use in areas with severe lightning conditions	**A92-393**
REACTOR, for use at feed end of existing d-c track circuit where same is within 75' of FSO circuit. Prevents battery shunt of FSO circuit.	**A92-621**
REACTOR, same as above, but for existing a-c or coded track circuits	**A92-636**
KEY EXTRACTOR, for removing keys when changing operating frequency boards	**P3-317**

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PRINTED CIRCUIT BOARDS

To order replacement printed circuit boards, please list catalog number and name shown in bold type.

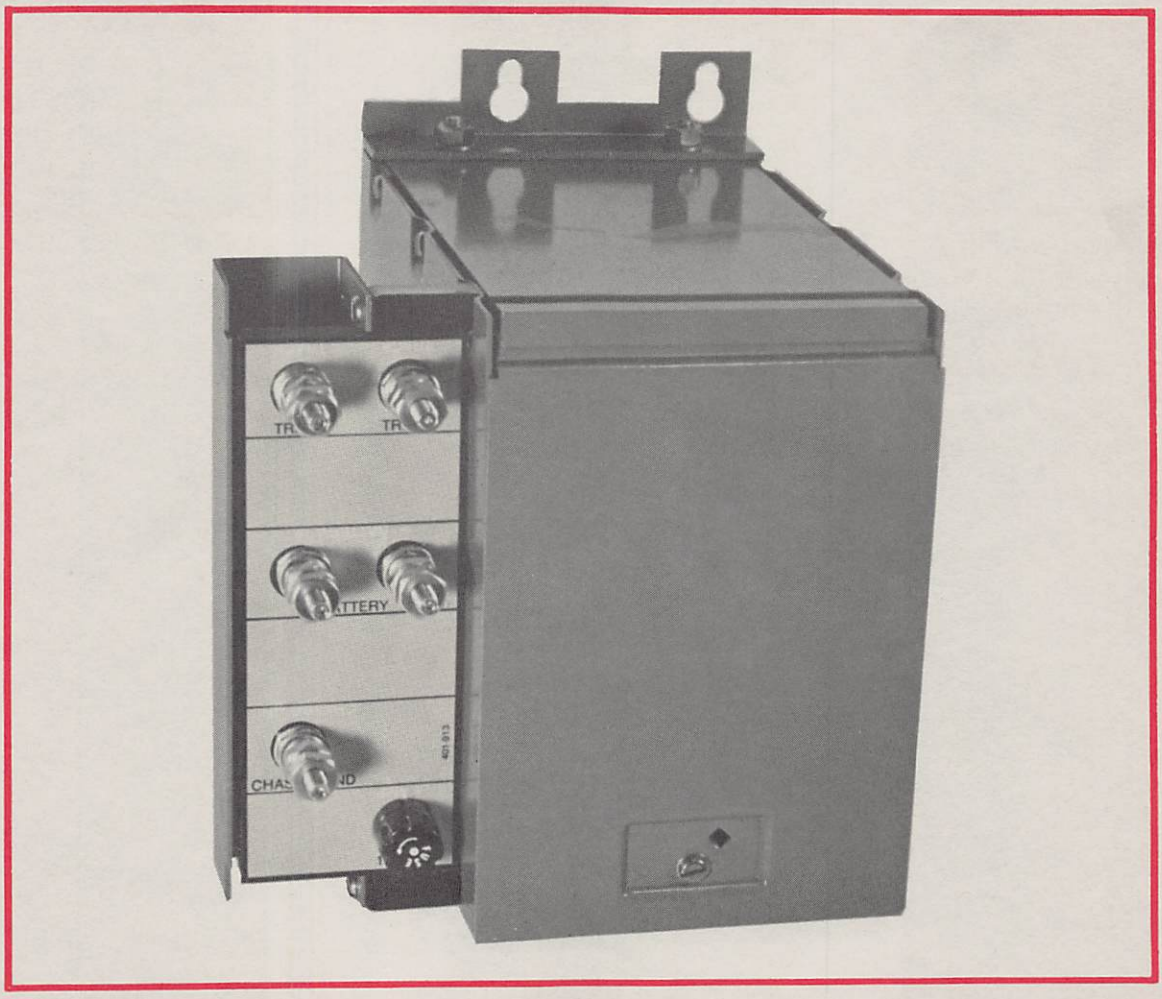
NAME	REFERENCE NO.	CATALOG NO.
DETECTOR, channel 25	31049-402 Gr. 25	**P92-855**
DETECTOR, channel 26	31049-402 Gr. 26	**P92-856**
DETECTOR, channel 27	31049-402 Gr. 27	**P92-857**
OSCILLATOR, channel 25	31049-95 Gr. 25	**P92-1001**
OSCILLATOR, channel 26	31049-95 Gr. 26	**P92-1002**
OSCILLATOR, channel 27	31049-95 Gr. 27	**P92-1003**
MODULATOR	31049-97 Gr. 2	**P92-748**
RECEIVER AMPLIFIER	31049-79 Gr. 5	**P92-704**
RECEIVER INPUT	31049-241 Gr. 1	**P92-766**
RELAY DRIVER	31049-233 Gr. 1	**P92-706**
SUPPRESSOR	31049-73 Gr. 2	**P92-700**
TRANSMITTER AMPLIFIER	31049-235 Gr. 1	**P92-786**

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GRS CATALOG 92-2

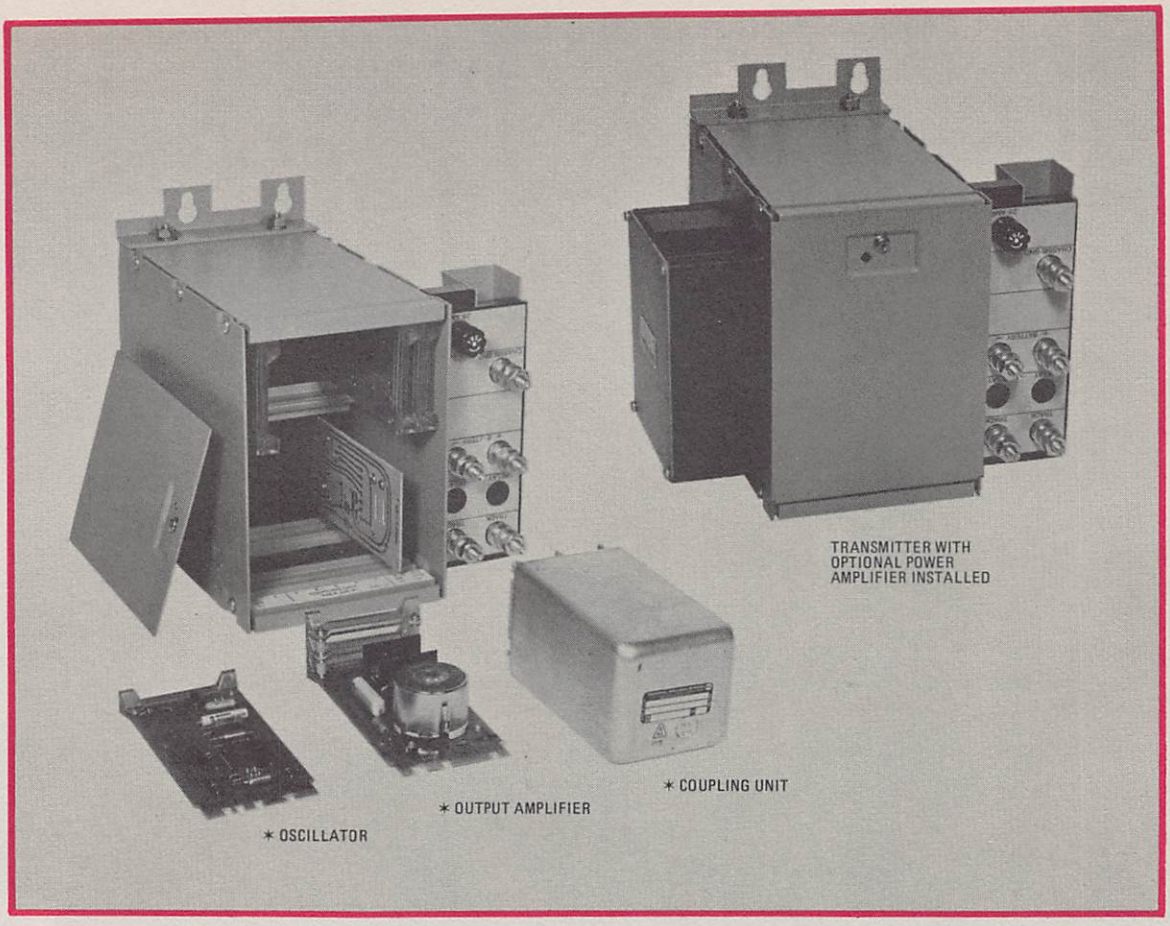
Frequency Shift
OVERLAY TRACK CIRCUITS
Approach and Island

Solid-state control for rail-highway crossing protection

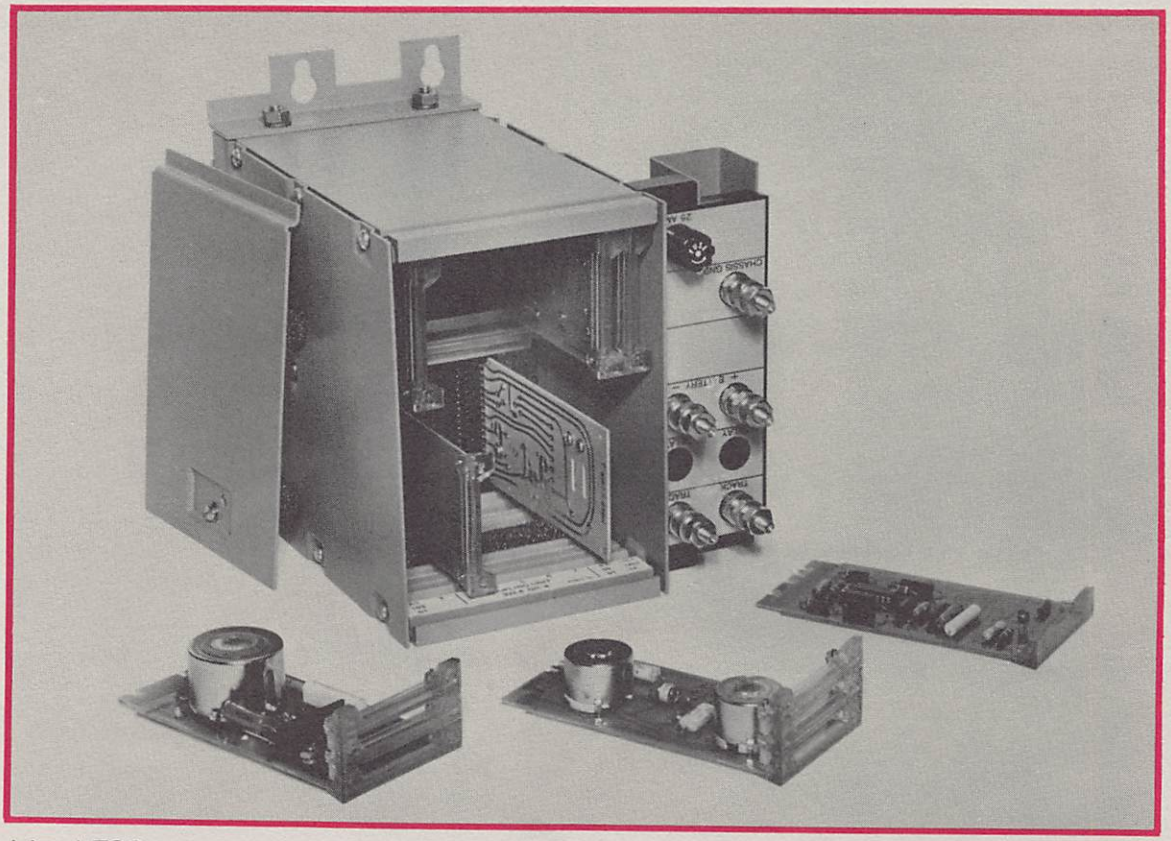


GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL
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Approach FSO transmitter, with cover removed to show plug-in, modular design. To alter frequency, only the three starred items are changed. The power amplifier, an option, is shown on the right attached to a transmitter.



Island FSO transmitter, with cover removed and frequency selective circuit boards removed.

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GRS approach and island Frequency Shift Overlay (FSO) track circuits provide a level of performance never before achieved for controlling rail-highway crossing protection devices without requiring the use of insulated joints. Frequency-shift modulated signals and unique receiver circuits combine to permit reliable operation under formerly impossible noise conditions.

18 Operating Frequencies — All mutually Compatible

A choice of 18 mutually compatible frequency channels ensures flexibility of application. Frequencies ranging from 618 to 11,430 Hz are for approach track circuits; frequencies 13,800, 17,000 and 20, 900 Hz are for island track circuits. Exclusive, highly selective tuning circuits reject unwanted signals, and respond only to the proper FSO transmitter.

Approach FSO Track Circuit Lengths to 6000 Feet

Transmitter and receiver characteristics are matched to track characteristics so that low frequency channels provide a track circuit length of 6000 feet under normal ballast conditions (5 ohms minimum).

Surge Protection

Protection against high-voltage surges is built into each FSO unit.

Modular Construction, Plug-In Keyed Units Simplify Maintenance

The transmitter and receiver for the approach frequencies consist of modular printed circuit boards and a tuned coupling unit that plug into an enclosure the approximate size of a Type B Size 2 relay. The transmitter and receiver for the island frequencies are the same, except that the tuned coupling unit is replaced with a tuned printed circuit board. All printed circuit boards and the tuning unit are keyed to ensure that the correct board or tuning unit is plugged into the correct coupler in the enclosure.

Plug-In Frequency Units

All tuning elements are on separate plug-in units. The operating frequency of a transmitter or receiver can be changed simply by replacing the tuning elements and corresponding keys with tuning elements and keys for a different frequency.

Selection of Output Power Level

The transmitter is preset at the factory for 600 milliwatts output. If lower power is desired, internal connections provide outputs of 400 and 200 milliwatts.

Plug-In High Power Unit

An optional power amplifier is available to increase the output of the approach FSO transmitter to 4 watts.

Meterless Adjustment

The in-service adjustment of an FSO track circuit having a stable ballast condition requires no meter. The receiver gain control setting is basically determined by observing the point at which the safety relay picks up.

Centralized Equipment Location Option

The receiver and transmitter can both be mounted in the same wayside case and use the same power supply. The active portion of an approach FSO transmitter can be as far as 3000 feet from its track connection; an approach FSO receiver can be 6000 feet from its track connection.

Five-Way Mounting

Each unit — transmitter or receiver — can be shelf-mounted, wall-mounted any of three ways, or rack mounted in three B1 relay spaces.

Easily Accessible Connections

A reversable AAR terminal strip on each receiver and transmitter provides ready access to the track, battery, and relay connections.

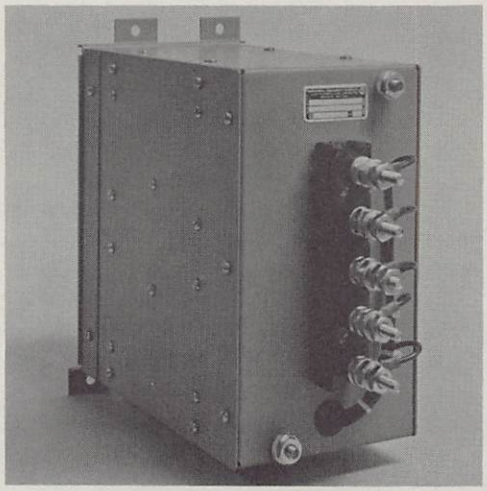
Certain types of electrical interference may degrade performance, just as foreign currents can affect the operation of conventional track circuits. If you plan to use FSO equipment in areas where there is electrical interference (for example, electric traction, cab signals, a-c track circuits, high voltage d-c track circuits), first consult with your GRS sales engineer.

IMPORTANT: The FSO receiver is specifically designed for use with a GRS Type B or Type K biased-neutral relay as listed in this catalog. Do not use with any other relays.

Insulated Joint Bypass

An optional insulated joint bypass unit effectively passes approach FSO frequencies around insulated joints, with a small reduction (typically 20%) in track circuit length. The unit can operate in areas with a minimum track ballast as low as 2 ohms in 1000 feet, and a temperature range of -40°F to +160°F . It has a minimum attenuation of 20 db at 100 Hz.

The unit can be rack-mounted in a Type B2 relay space or wall mounted using the brackets supplied with the unit. Easily accessible AAR terminals provide the necessary track and ground connections.



SPECIFICATIONS

TRANSMITTER		
Nominal Load		2 ohms
Battery Supply		9 to 16 volts d-c
Tolerable D-c Ripple		1 volt pp. full-wave
Operating Temperature Range		-40°F to +160°F
Power Output:	Low Power	200, 400 or 600 mw. (12 volts d-c input)
	High Power (Approach FSO only)	4 watts (12 volts d-c input) with optional power amplifier
Power Input		0.15 ampere at 12 volts; 200 mw output 0.35 ampere at 12 volts; 600 mw output 1.8 amperes maximum at 12 volts; 4 watt output (approach FSO only)
RECEIVER		
Battery Supply		9 to 16 volts
Tolerable D-c Ripple		1 volt pp. full-wave
Temperature Range		-40°F to +160°F
Power Input		0.06 ampere at 12 volts including relay

ORDERING INFORMATION

An approach or island FSO track circuit consists of a transmitter, receiver and track relay, and optional equipment as listed on page 6 under ACCESSORIES. Please refer to GRS Pamphlet 1416, "Approach Frequency Shift Overlay Track Circuits" or GRS Pamphlet 1503, "Island Frequency Shift Overlay Track Circuits", for details.

TRANSMITTERS AND RECEIVERS

Please order by catalog number and name and specify channel.

NAME	CHANNEL	FREQUENCY HZ	CATALOG NUMBER
Transmitter Receiver	10 △	618	A92-1110 A92-1010
Transmitter Receiver	11 △	760	A92-1111 A92-1011
Transmitter Receiver	12 △	936	A92-1112 A92-1012
Transmitter Receiver	13	1150	A92-1113 A92-1013
Transmitter Receiver	14	1430	A92-1114 A92-1014
Transmitter Receiver	15	1740	A92-1115 A92-1015
Transmitter Receiver	16	2140	A92-1116 A92-1016
Transmitter Receiver	17	2630	A92-1117 A92-1017
Transmitter Receiver	18	3240	A92-1118 A92-1018
Transmitter Receiver	19	3980	A92-1119 A92-1019
Transmitter Receiver	20	4900	A92-1120 A92-1020
Transmitter Receiver	21	6030	A92-1121 A92-1021
Transmitter Receiver	22*	7410	A92-1122 A92-1022
Transmitter Receiver	23*	9120	A92-1123 A92-1023
Transmitter Receiver	24*	11430	A92-1124 A92-1024

FOR ISLAND USE

NAME	CHANNEL	FREQUENCY HZ	CATALOG NUMBER
Transmitter Receiver	25	13800	A92-1125 A92-1025
Transmitter Receiver	26	17000	A92-1126 A92-1026
Transmitter Receiver	27	20900	A92-1127 A92-1027

IMPORTANT – PLEASE NOTE: Circuits of the same frequency on the same track must be at least 20,000 feet apart, except channels marked *, which must be at least 10,000 feet apart, and channels, marked △, which must be at least 25,000 feet apart.

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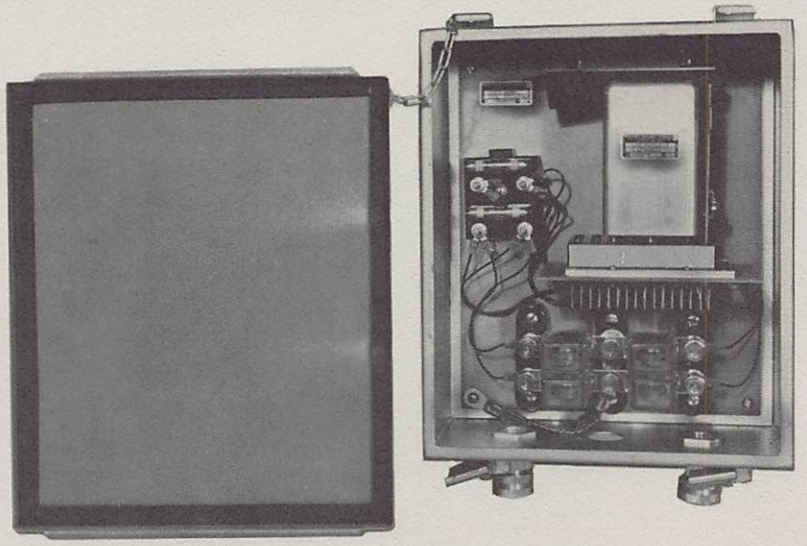
ACCESSORIES

Please order by catalog number and name shown in bold type.

NAME	CATALOG NUMBER
***TYPE B RELAY**, 4FB, 2F, 1B, biased-neutral	A62-126
PLUGBOARD KIT, for Type B relay above	A62-506
PLUGBOARD KIT, for Type B relay above, with crimp terminals	A62-586
***TYPE K RELAY**, 4FB, biased-neutral	A65-128
ADAPTOR PLATE, to mount Transmitter or Receiver in a B2 relay space	P92-850
CASE (see illustration below) for use where Coupling Unit is housed separately from approach FSO Transmitter, wired complete with lightning and surge protection equipment, for fastening to any plane surface	A92-750
MOUNTING KIT, to mount above case on metal poles 4", 6" and 8" dia. and on wood poles any diameter	A92-755
POWER AMPLIFIER, for 4-watt operation of approach FSO Transmitter	A92-850
CAPACITOR BOARD, for use with approach FSO Transmitter or Receiver to overcome inductive effect of impedance bonds, multiple receivers, etc. (Ref. No. 31049-103 Gr 1)	P92-787
REACTOR, for use at feed end of existing track circuit where same is within, or less than 500 feet from, an FSO circuit. Prevents existing track circuit from shunting FSO circuit. For d-c circuits	A92-621
REACTOR, same as above, but for coded track circuits, a-c track circuits, or Type SVA half-wave rectified track circuits	A92-636
INSULATED JOINT BYPASS UNIT, to pass an approach FSO Transmitter output signal around one insulated joint	A92-614
FILTER, for lightning protection	A92-393
KEY EXTRACTOR, for removing keys when changing operating frequency boards	P3-317

*To ensure integrity of operation of GRS Frequency Shift Overlay Track system, use either of these relays, but do not substitute any other relay.

Case A92-750, shown here with weathertight cover removed, comes wired complete with lightning and surge protection equipment (Coupling Unit shown is not included). Mounting flanges, at top and bottom, have 5/16" holes on 8" by 12 3/4" mounting centers. Mounting Kit A92-755 for pole mounting is optional.



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FOR BASIC TRANSMITTER AND RECEIVER

Please order by catalog number and by name shown in bold type.

NAME	REFERENCE NUMBER	CATALOG NUMBER
RECEIVER AMPLIFIER	31049-79 Gr 1	**P92-703**
RECEIVER RELAY DRIVER	31049-80 Gr 1	**P92-705**
TRANSMITTER MODULATOR	31049-97 Gr 1	**P92-747**
INPUT/OUTPUT, used in both Receiver and Transmitter - not the same as Receiver Input or Transmitter Output listed below.	31049-99 Gr 1	**P92-767**
SUPPRESSOR, used in both Receiver and Transmitter	31049-73 Gr 2	**P92-700**
JUMPER (island FSO only)	31049-239 Gr 1	**P92-789**

FOR FREQUENCY SETS

Frequency sets, used to change a transmitter or receiver to another frequency, consist of:

SET FOR TRANSMITTER

- 1 OSCILLATOR BOARD
- 1 OUTPUT AMPLIFIER BOARD
- 1 TUNED COUPLING UNIT OR BOARD
- 2 LABELS

SET FOR RECEIVER

- 1 RECEIVER INPUT BOARD
- 1 DETECTOR BOARD
- 1 TUNED COUPLING UNIT OR BOARD
- 2 LABELS

Please order by catalog number and specify Transmitter Set or Receiver Set and channel. To order individual units, see following page.

CHANNEL	FREQ (HZ)	XMTR SET CAT. NO.	REC. SET CAT. NO.	CHANNEL	FREQ (HZ)	XMTR SET CAT. NO.	REC. SET CAT. NO.
10	618	P92-810	P92-710	19	3980	P92-819	P92-719
11	760	P92-811	P92-711	20	4900	P92-820	P92-720
12	936	P92-812	P92-712	21	6030	P92-821	P92-721
13	1150	P92-813	P92-713	22	7410	P92-822	P92-722
14	1430	P92-814	P92-714	23	9120	P92-823	P92-723
15	1740	P92-815	P92-715	24	11430	P92-824	P92-724
16	2140	P92-816	P92-716	25	13800	P92-825	P92-725
17	2630	P92-817	P92-717	26	17000	P92-826	P92-726
18	3240	P92-818	P92-718	27	20900	P92-827	P92-727

PRINTED CIRCUIT BOARDS FOR FREQUENCY SETS

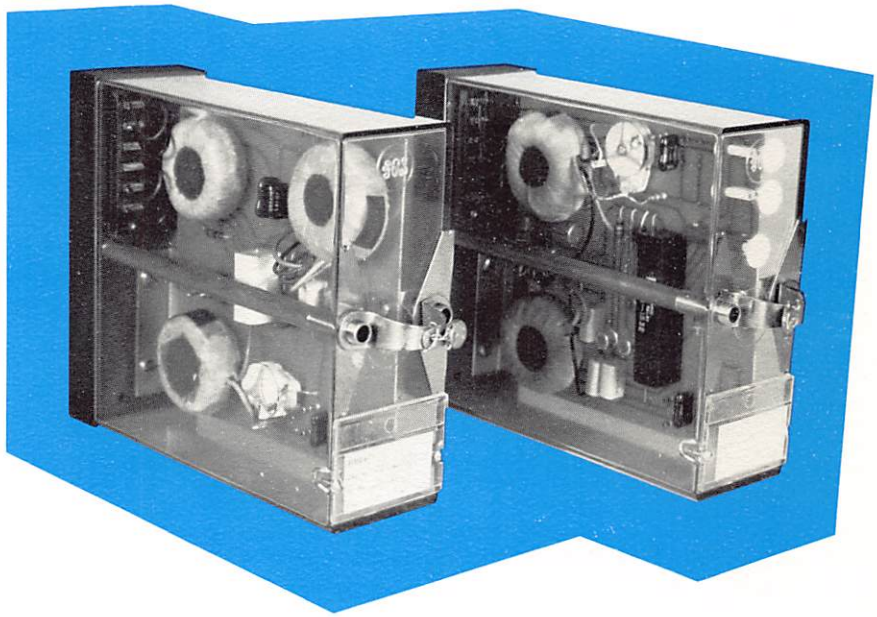
Please order by catalog number. Specify board name and channel.

NAME AND CATALOG NUMBER

Channel		Transmitter Oscillator	Transmitter Output Amplifier	Tuned Coupling Unit or PC Board for Transmitter or Receiver	Receiver Input	Receiver Detector
10	Ref No. Cat. No.	31049-95 Gr 10 P92-730	31049-240 Gr 10 P92-770	332-4 Gr 10 P92-830	31049-98 Gr 10 P92-750	31049-94 Gr 10 P92-790
11	Ref No. Cat. No.	31049-95 Gr 11 P92-731	31049-240 Gr 11 P92-771	332-4 Gr 11 P92-831	31049-98 Gr 11 P92-751	31049-94 Gr 11 P92-791
12	Ref No. Cat. No.	31049-95 Gr 12 P92-732	31049-240 Gr 12 P92-772	332-4 Gr 12 P92-832	31049-98 Gr 12 P92-752	31049-94 Gr 12 P92-792
13	Ref No. Cat. No.	31049-95 Gr 13 P92-733	31049-240 Gr 13 P92-773	332-4 Gr 13 P92-833	31049-98 Gr 13 P92-753	31049-94 Gr 13 P92-793
14	Ref No. Cat. No.	31049-95 Gr 14 P92-734	31049-240 Gr 14 P92-774	332-4 Gr 14 P92-834	31049-98 Gr 14 P92-754	31049-94 Gr 14 P92-794
15	Ref No. Cat. No.	31049-95 Gr 15 P92-735	31049-240 Gr 15 P92-775	332-4 Gr 15 P92-835	31049-98 Gr 15 P92-755	31049-94 Gr 15 P92-795
16	Ref No. Cat. No.	31049-95 Gr 16 P92-736	31049-240 Gr 16 P92-776	332-4 Gr 16 P92-836	31049-98 Gr 16 P92-756	31049-94 Gr 16 P92-796
17	Ref No. Cat. No.	31049-95 Gr 17 P92-737	31049-240 Gr 17 P92-777	332-4 Gr 17 P92-837	31049-98 Gr 17 P92-757	31049-94 Gr 17 P92-797
18	Ref No. Cat. No.	31049-95 Gr 18 P92-738	31049-240 Gr 18 P92-778	332-4 Gr 18 P92-838	31049-98 Gr 18 P92-758	31049-94 Gr 18 P92-798
19	Ref No. Cat. No.	31049-95 Gr 19 P92-739	31049-240 Gr 19 P92-779	332-4 Gr 19 P92-839	31049-98 Gr 19 P92-759	31049-94 Gr 19 P92-799
20	Ref No. Cat. No.	31049-95 Gr 20 P92-740	31049-240 Gr 20 P92-780	332-4 Gr 20 P92-840	31049-98 Gr 20 P92-760	31049-94 Gr 20 P92-800
21	Ref No. Cat. No.	31049-95 Gr 21 P92-741	31049-240 Gr 21 P92-781	332-4 Gr 21 P92-841	31049-98 Gr 21 P92-761	31049-94 Gr 21 P92-801
22	Ref No. Cat. No.	31049-95 Gr 22 P92-742	31049-240 Gr 22 P92-782	332-4 Gr 22 P92-842	31049-98 Gr 22 P92-762	31049-94 Gr 22 P92-802
23	Ref No. Cat. No.	31049-95 Gr 23 P92-743	31049-240 Gr 23 P92-783	332-4 Gr 23 P92-843	31049-98 Gr 23 P92-763	31049-94 Gr 23 P92-803
24	Ref No. Cat. No.	31049-95 Gr 24 P92-744	31049-240 Gr 24 P92-784	332-4 Gr 24 P92-844	31049-98 Gr 24 P92-764	31049-94 Gr 24 P92-804
25	Ref No. Cat. No.	31049-95 Gr 25 P92-1001	31049-240 Gr 25 P92-1006	31049-246 Gr 25 P92-845	31049-128 Gr 25 P92-875	31049-238 Gr 25 P92-805
26	Ref No. Cat. No.	31049-95 Gr 26 P92-1002	31049-240 Gr 26 P92-1007	31049-246 Gr 26 P92-846	31049-128 Gr 26 P92-876	31049-238 Gr 26 P92-806
27	Ref No. Cat. No.	31049-95 Gr 27 P92-1003	31049-240 Gr 27 P92-1008	31049-246 Gr 27 P92-847	31049-128 Gr 27 P92-877	31049-238 Gr 27 P92-807

GRS CATALOG 92-3

GRS TYPE F2 CARRIER SYSTEM



Lets you add facilities without adding line wire

- *37 DIFFERENT CHANNELS*
- *COMPACT, PLUG-IN UNITS*
- *CAN BE CODED FOR SAFETY CIRCUITS*
- *FOR TWO-WIRE LINE OR MICROWAVE*

GRS
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A UNIT OF GENERAL SIGNAL
BOX 600 ROCHESTER NEW YORK 14602

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GRS TYPE F2 CARRIER SYSTEM

GRS Type F2 carrier equipment provides an economical means of transmitting information between remote field locations and a control office or display location, over existing two-wire lines such as cTc code lines, communication lines, etc. The carrier can be coupled into any existing two-wire line, passed from one line to another, superimposed on microwave, or transmitted over any other telecommunication system. Microwave or telecommunication equipment may require special coupling devices, depending upon the input requirements.

ADDS TO YOUR PRESENT SYSTEM

Where coding systems are operated at full capacity and extra channels are needed, Type F2 carrier is the quickest, easiest answer. It couples into existing lines without affecting the line's original application. Signals can be jumped around relay contacts, even transferred from one line to another.

A REAL SPACE SAVER

Type F2 carrier transmitters and receivers are plug-in units, the same size and plug-in arrangements as GRS Type B1 relays. Each unit is only 2 7/16" wide, 6 5/16" high, and 8 9/16" deep.

ADD CHANNELS ANYTIME

You can start with only one or two channels, as needed. Then later on, when more are needed, just add them on. There are 37 channels available, and many channels can be transmitted over a single line. For safety circuits, Type F2 carrier units can be coded as shown in Figure 1, pages 4 and 5. When so used, the safe separation is by means of the code rates and not the carrier frequencies.

TROUBLE-FREE

With reliable, solid-state, printed circuit construction and only receiver gain to adjust, there's little that can go wrong. In the event of accidental damage, just unplug the old unit and plug in the new one.

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IT WORKS AND KEEPS ON WORKING

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OPERATION

Figures 1 and 2, pages 4 and 5, show typical applications of Type F2 carrier in HD signal indication circuits. The transmitter connects to any convenient two-wire line without affecting the other services on the line. The carrier signal is transmitted via the line to the control office or display location where it is detected by the receiver to pick up the receiver output relay. This is the basic system — a transmitter at one end of the line and a receiver at the other end. Relay contacts along the line can be bypassed, or the signal can be transferred from one line to another, by means of a coupling transformer and d-c blocking capacitors. In Figure 2, two signals are used simultaneously for a two-indication circuit. Where it is necessary to divert the signals through separate circuits, an isolation filter (reference 7 Figure 2) separates the signals.

Thirty-seven frequencies are available ranging from 430 Hz to 7.3 KHz (see page 9). For more detailed technical information, see GRS Pamphlet 1259, "GRS Type F2 Carrier Units Operation and Maintenance."

INSTALLATION

The transmitter and receiver are housed in standard Type B relay covers, and plug into Type B relay plugboards. The transmitter requires 12 volts d-c at 10 to 15 ma; the receiver requires 12 volts d-c at 10 to 20 ma. Receiver output is a dry reed relay with Form A contacts. The contacts can handle currents up to one ampere at voltages below 15 volts. Where higher voltages are involved, the maximum current becomes less. The total power consumed by loads at voltages above 15 volts cannot exceed 15 watts or 15 volt-amperes.

When no approach lighting relay is used, choke or reactor 11, Figures 1 and 2, must be installed to avoid shunting out the carrier signal through the HD line battery.

Lightning arresters should be at all wayside housing entrance and exit points. Surge filter 19 should be used with each transmitter and receiver. Gas discharge lightning arresters should be used to protect filters, transmitter, and receivers. Depending on the location, an arrester, reference 9, may be required to protect gas discharge arresters. See Figures 1 and 2.

The wires should be treated as any other high frequency communications circuit, that is, twisted pairs and transpositions.

Consult your GRS sales representative before using a Type F2 carrier system on lines which are also used with other carrier equipment.

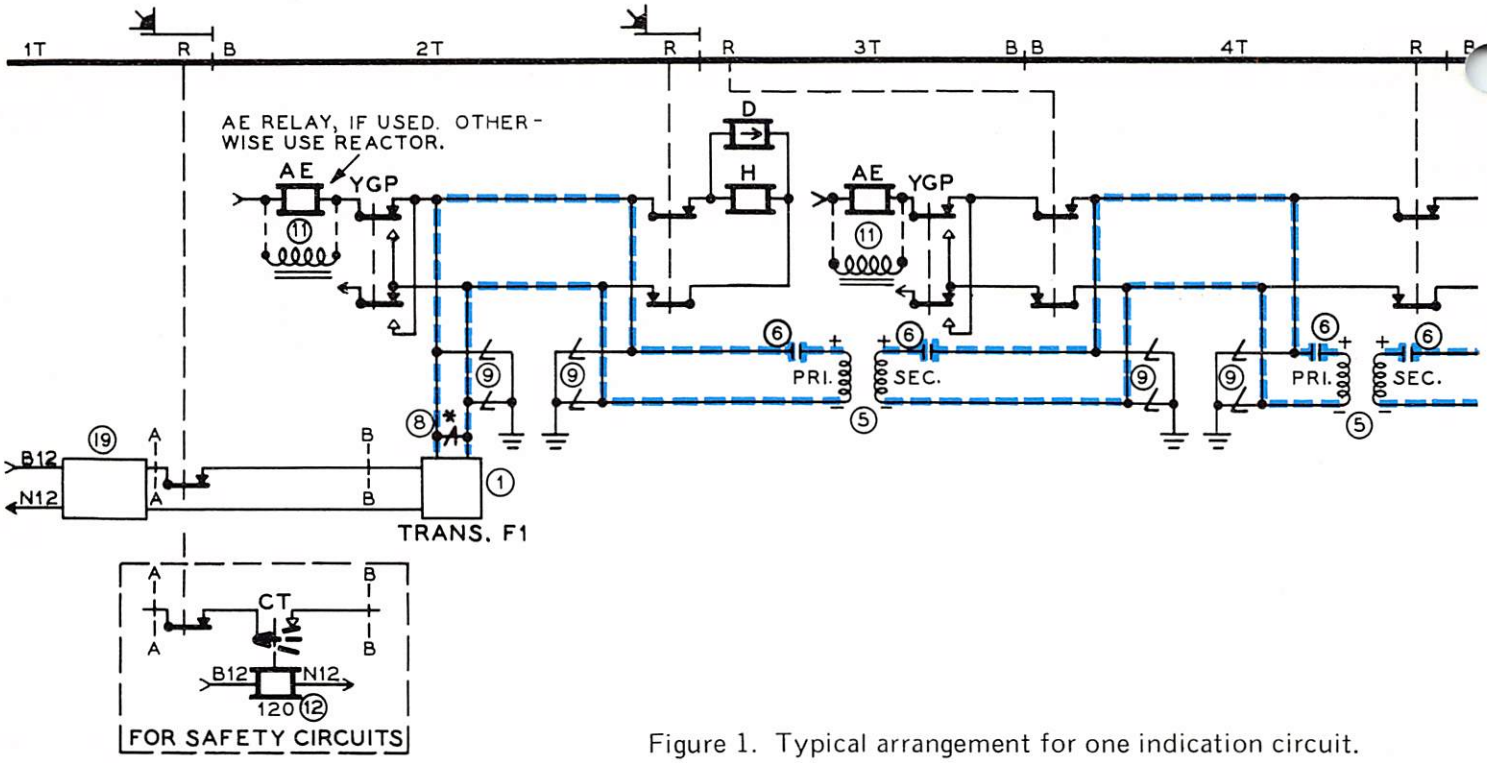


Figure 1. Typical arrangement for one indication circuit.

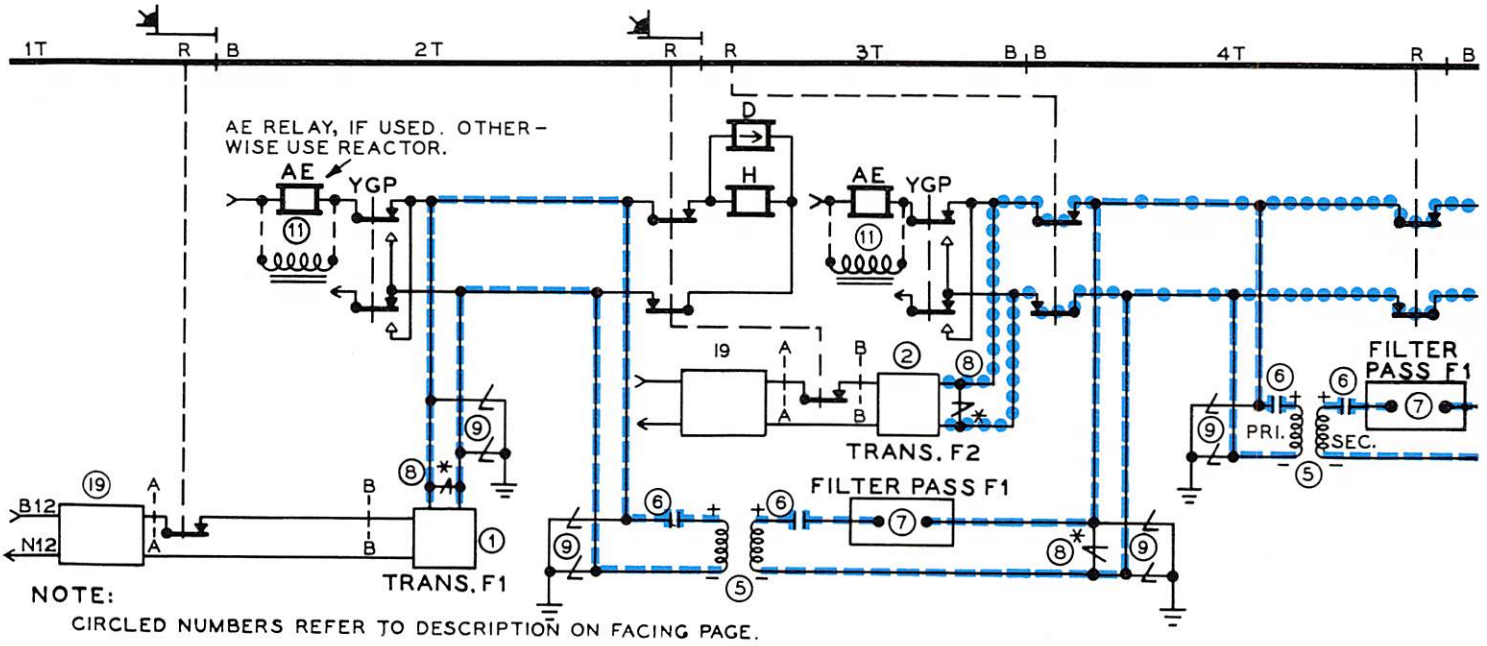
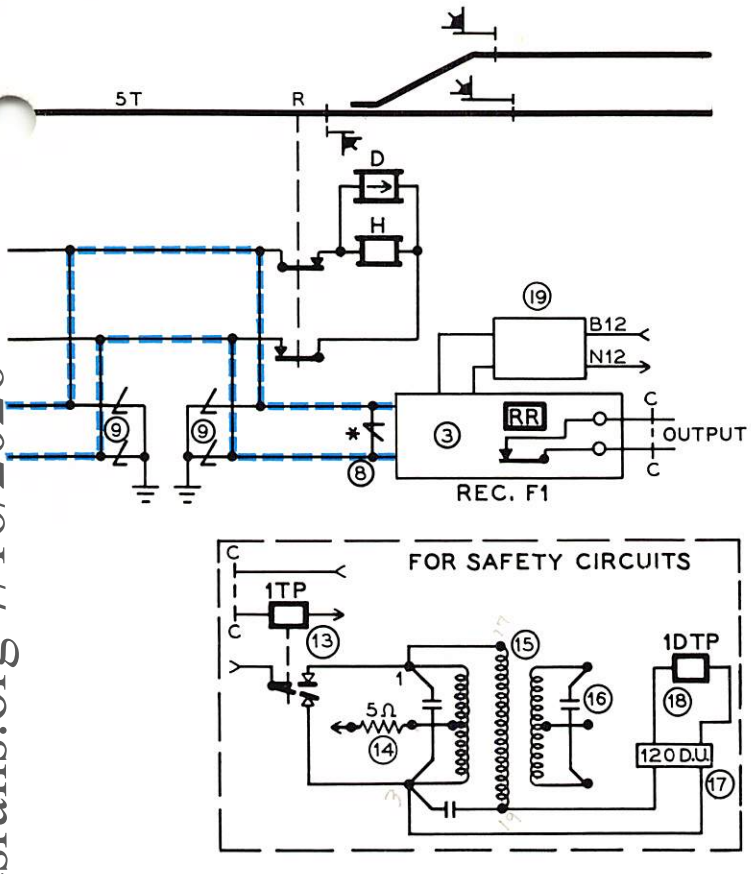
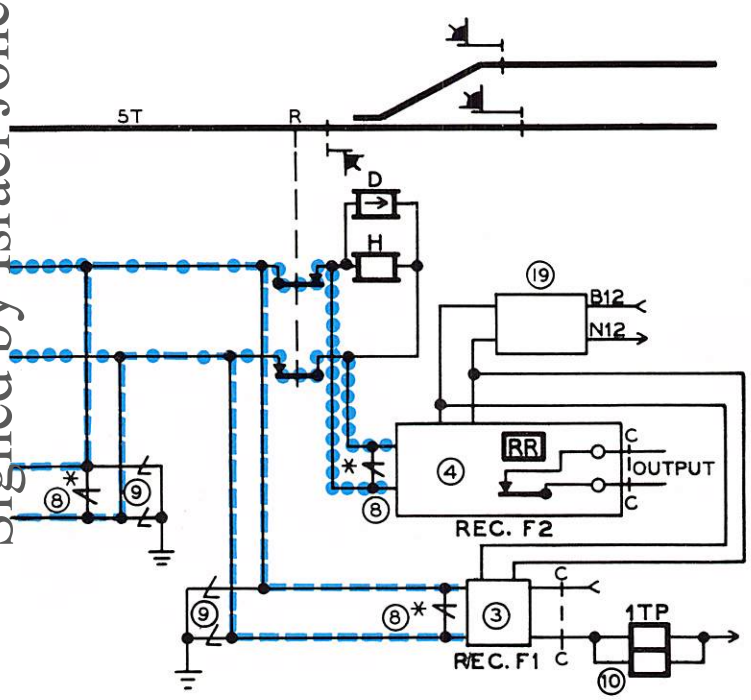


Figure 2. Typical arrangement for two indication circuits.





FIGURES 1 AND 2 REFERENCE NUMBERS	DESCRIPTION
1	TRANSMITTER FREQUENCY 1
2	TRANSMITTER FREQUENCY 2
3	RECEIVER FREQUENCY 1
4	RECEIVER FREQUENCY 2
5	COUPLING TRANSFORMER
6	D-C BLOCKING CAPACITOR, 2.0 MFD
7	FILTER 1.4 KHz, or 1.85 KHz
8	GAS DISCHARGE LIGHTNING ARRESTER
9	CLEARVIEW LIGHTNING ARRESTER
10	RELAY, TYPE B1 OR J
11	CHOKE OR REACTOR OR APPROACH LIGHTING RELAY
12	CODE TRANSMITTER, 120-RATE
13	RELAY, TYPE B1, CODE RESPONSIVE
14	RESISTOR, 5-OHM
15	DECODING TRANSFORMER
16	SUPPRESSION UNIT
17	DECODING UNIT, 120 RATE
18	RELAY, TYPE B1, 9 OHM.
19	D-C POWER FILTER

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DISTANCE

The maximum distance between a transmitter and receiver depends upon the db losses introduced by the equipment associated with the line circuit – relays, signal mechanisms, line coupling units, line drops, line length, etc. When the total loss exceeds 20 db, a carrier repeater is required. The equipment losses for open line only are as follows:

Each HD, or other relay across line	0.1db
Each approach lighting relay	1.0db
Each SA-1 signal mechanism	0.1db
Each reactor (choke)	0.1db (0.19db)
Each line coupling unit	1.0db
Each line drop	0.1db
Each tuning unit (filter)	
Loss to pass frequency	3.0db
Loss to rejected frequency	0.1db
Each mile of line	0.25db
Transmitter feeding bidirectional	3.0db
Intermediate receiver -- same frequency	3.0db

A repeater, Figure 3, consists of a receiver and a transmitter operating on the frequency of the channel to be repeated. The receiver output keys the transmitter, delivering a new signal for further transmission.

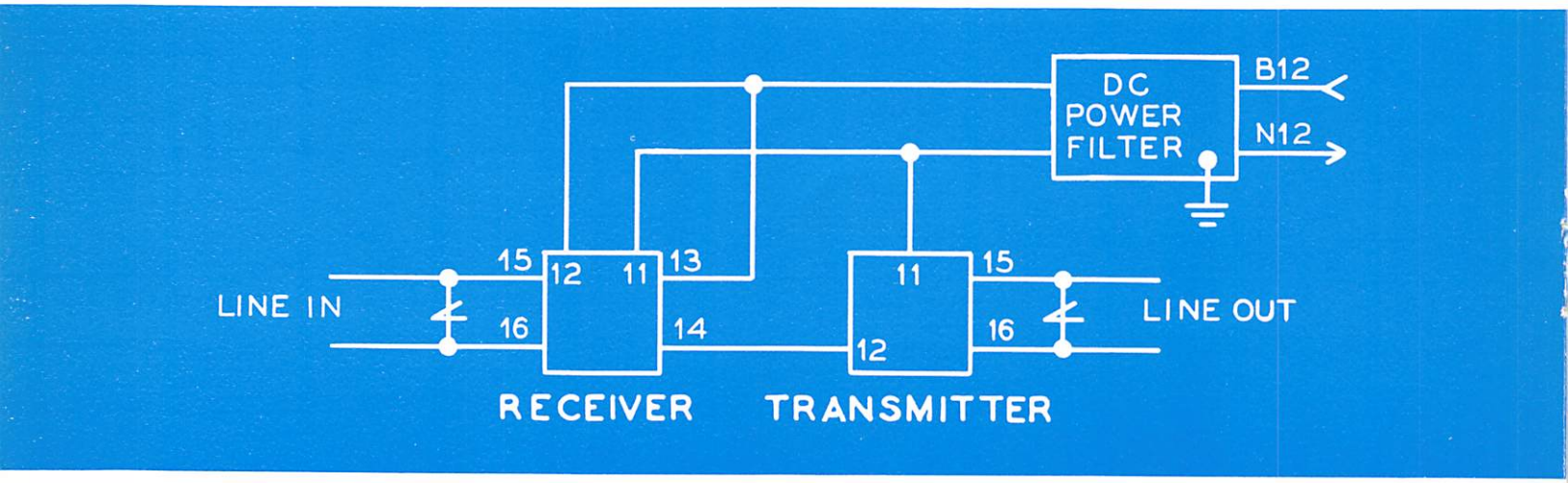


Figure 3. Repeater arrangement.

GRS TYPE F2 SPECIFICATIONS

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TRANSMITTER

Input voltage	12 volts d-c nominal (6 cells of lead).
Input current	10 — 15 ma.
Output level with 12-volts d-c input	+5 dbm into 600 ohms. Nonadjustable.
Output frequency	37 channels between 0.430 KHz and 7.3 KHz See page 9.
Maximum keying speed	Approximately 2 pulses per second for good pulse shape.
Output impedance — on channel	Approximately 300 ohms.
Output impedance — off channel	Greater than 2000 ohms in adjacent channel.
Ambient temperature range	- 40 to +160 F.

RECEIVER

Input voltage	12 volts d-c nominal (6 cells of lead).
Input current	10 ma. idle; 20 ma. when receiving a signal.
Sensitivity	-15 dbm, or 0.15 volt
Output	Dry reed relay, Form A contact, 15w resistive load (1 amp or 250 volts maximum). Contact protection is needed for inductive loads.

ORDERING INFORMATION

BASIC SYSTEM

For each channel, order:
- 1 transmitter
- 1 receiver
- 2 plugboards
- 2 filters, power
- 2 gas discharge arresters

For each housing entrance and/or exit, order:
- 2-3 Clearview arresters

For each set of relay contacts to be bypassed, order:
- 1 coupling transformer
- 2 d-c blocking capacitors

(The above are also used to transfer a signal from one line to another.)

If no approach lighting relays are used, for each HD line battery order:
- 1 reactor (or choke)

To isolate a channel, order:
- 1 isolation filter per channel
- 1 gas discharge arrester

See pages 9 and 10 for catalog numbers.

CODED SYSTEM

Order basic system plus:
- 1 Code transmitter, 120 rate
- 1 Code-responsive relay
- 1 Decoding transformer
- 1 Suppression unit
- 1 Decoding unit, 120 rate
- 1 D-c relay (decoder output), Type B1
- 1 Type B2 plugboard
- 2 Type B1 plugboards

See page 10 for catalog numbers.

TYPE F2 CARRIER UNITS

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To order, specify Transmitter or Receiver and give catalog number.

FREQUENCY KHz ±0.5%	CATALOG NUMBER TRANSMITTER	RECEIVER
0.430	A92-301	A92-341
0.510	A92-302	A92-342
0.590	A92-303	A92-343
0.670	A92-304	A92-344
0.750	A92-305	A92-345
0.830	A92-306	A92-346
0.910	A92-307	A92-347
1.0	A92-308	A92-348
1.1	A92-309	A92-349
1.2	A92-310	A92-350
1.3	A92-311	A92-351
1.4	A92-312	A92-352
1.5	A92-313	A92-353
1.6	A92-314	A92-354
1.7	A92-315	A92-355
1.85	A92-316	A92-356
2.05	A92-317	A92-357
2.3	A92-318	A92-358
2.5	A92-319	A92-359
2.7	A92-320	A92-360
3.0	A92-321	A92-361
3.3	A92-322	A92-362
3.6	A92-323	A92-363
3.81	A92-324	A92-364
4.05	A92-325	A92-365
4.29	A92-326	A92-366
4.53	A92-327	A92-367
4.77	A92-328	A92-368
5.01	A92-329	A92-369
5.25	A92-330	A92-370
5.5	A92-331	A92-371
5.8	A92-332	A92-372
6.1	A92-333	A92-373
6.4	A92-334	A92-374
6.7	A92-335	A92-375
7.0	A92-336	A92-376
7.3	A92-337	A92-377

TYPE F2 CARRIER UNITS ACCESSORIES

Please order by name, shown in BOLD TYPE, and catalog number.

NAME	CATALOG NUMBER
PLUGBOARD, for transmitter or receiver	A62-506
ISOLATION FILTER, specify by channel frequency	
COUPLING TRANSFORMER, to bypass signal control relay contacts	A95-301
CAPACITOR, 2.0 mfd., d-c blocking	A92-395
TYPE B CODE TRANSMITTER, 120 rate	A62-171
TYPE B CODE RESPONSIVE RELAY, 2FB	A62-156
TYPE B1 RELAY (decoder output)	A62-314
TYPE J RELAY	A69-100
TYPE B1 RELAY	A62-277
TYPE B1 PLUGBOARD	A62-506
TYPE B2 PLUGBOARD	A62-508
TYPE J RELAY COUPLER	P69-101
DECODING TRANSFORMER	A18-100
SUPPRESSION UNIT	A18-180
DECODING UNIT, 120 rate	A18-118
ARRESTER, "Clearview", for use at housing entrance	P3-253
ARRESTER, gas discharge, for use at input terminals of selective filters, transmitters, and receivers	P3-314
FILTER, for use between transmitter or receiver terminals and 12 volt d-c power source	A92-393
REACTOR, for use between HD line battery and transmitter connection if approach lighting relay is not used	A92-394
CHOKE (in lieu of reactor)	A92-396

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MAIN OFFICE AND PLANT
BOX 600 ROCHESTER NY 14602 Phone: 716 · 436-2020 Cable: GENRASIG (ROCHESTER NY)
Telex: 978317

ATLANTA OFFICE
3379 PEACHTREE ROAD NE ATLANTA GA 30326 Phone: 404 · 233-7373

CHICAGO OFFICE
SUITE 2120 PRUDENTIAL PLAZA CHICAGO IL 60601 Phone: 312 · 467-1221

MONTREAL OFFICE
SUITE 1731 1 PLACE VILLE MARIE MONTREAL QUEBEC H3B 2C1
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NEW YORK OFFICE
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WASHINGTON OFFICE
MONTGOMERY CENTER SUITE 613 8630 FENTON STREET SILVER SPRING MD 20910
Phone: 301 · 587-4770

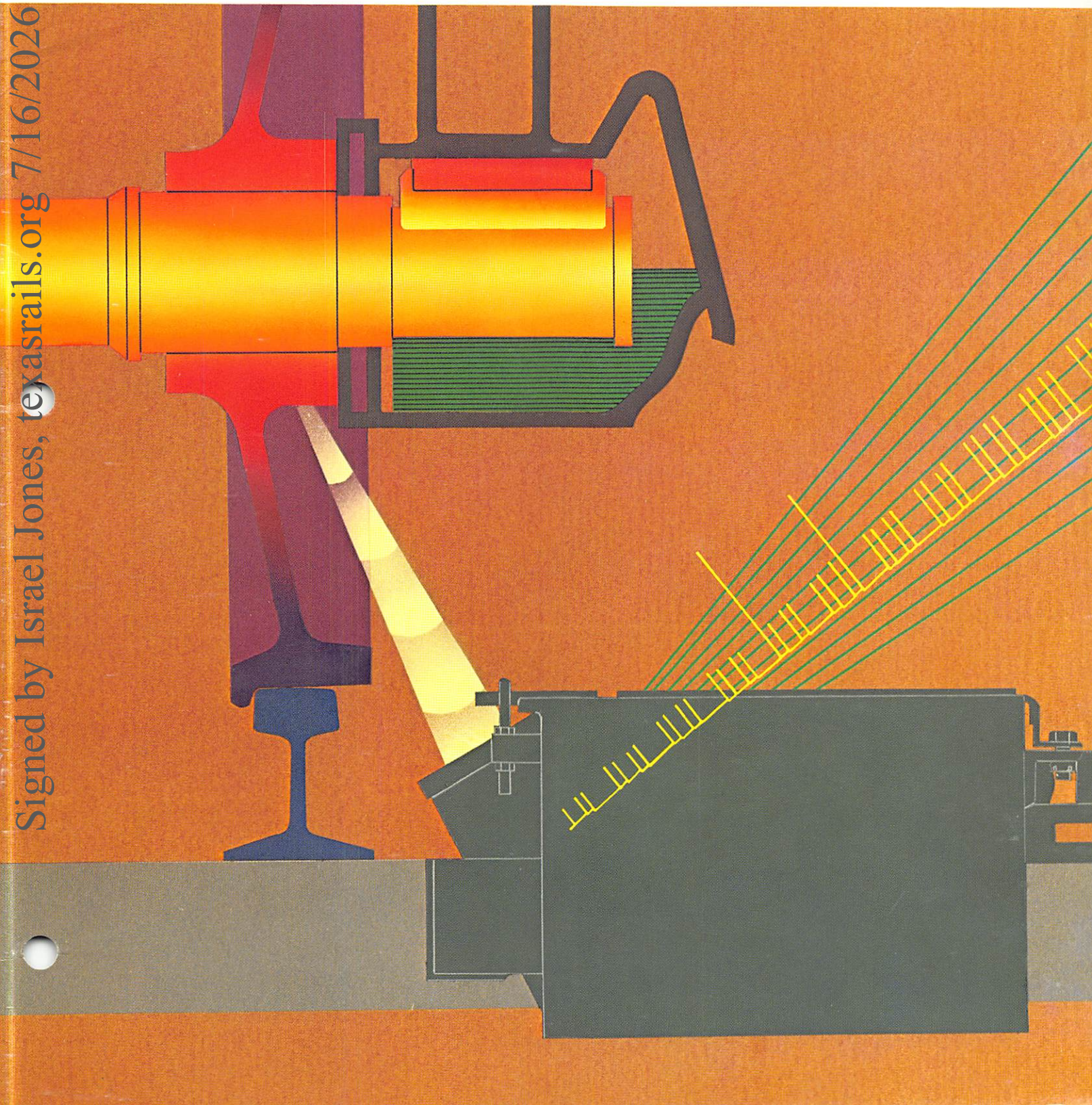
GRS
GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL


GRS

WHEEL THERMO-SCANNER UNIT II

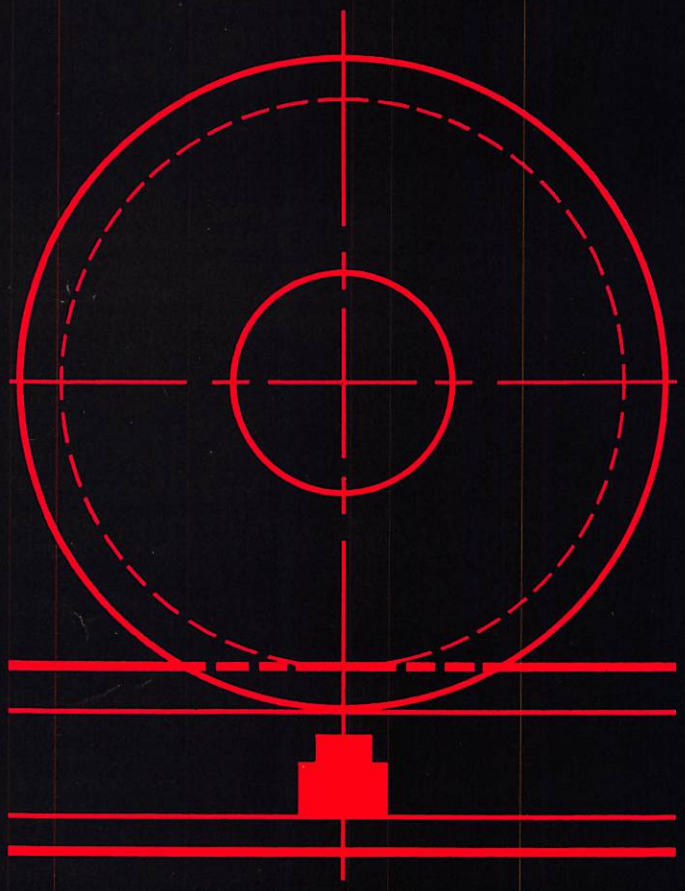
FOR FAST, RELIABLE, HOT JOURNAL DETECTION

GRS CATALOG **92-4**



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Modular Design Fits Any Application

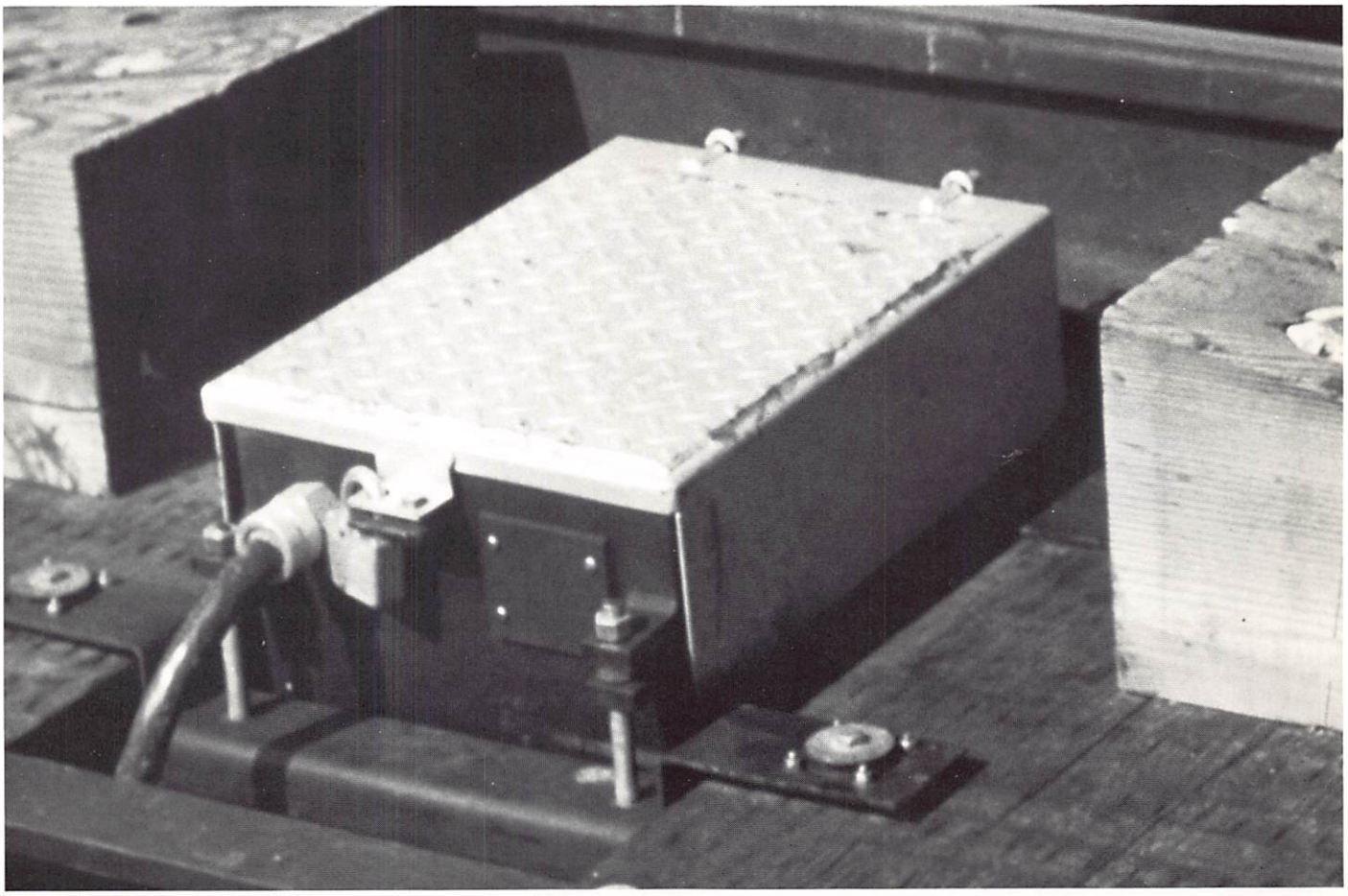
The latest GRS hot journal detector—called Wheel Thermo-Scanner Unit II—features an improved scanner and component assembly, a new thermal line printer, and a redesigned printed circuit board in the electronics module which increases system detecting and recording efficiency. Also, the redesigned radiometer cell, amplifier gate board, and voltage regulator board are mechanically and electrically compatible with older optically-gated systems—their substitution can substantially improve system reliability.

The modular Wheel Thermo-Scanner Unit II is a solid-state system for detecting and indicating abnormally hot journal temperatures of railroad cars traveling at speeds from 5 to 85 mph.

A building block, plug-in module arrangement provides functional flexibility with minimum equipment and saves the cost of custom engineering. The standard modules meet the requirement of any installation: for single-direction and double-direction scanning on single or multiple track. System arrangements are:

- Unidirectional operation with advance start by a wheel detector.
- Unidirectional operation with reverse-direction lockout.
- Bidirectional operation with advance start by either of two wheel detectors.

The output of a Wheel Thermo-Scanner Unit II can be transmitted directly over a three-wire line for distances up to five miles. For greater distances, an appropriate carrier is used.



Typical wayside scanner installation.

FEATURES

Fast, Uniform Scanning

As each wheel passes the scanner, a magnetic wheel detector precisely spots the wheel's position within ±¼ inch. A fast, internal shutter opens for two milliseconds, taking a "heat snapshot" of the wheel hub. Then the system records the wheel hub temperature and is ready for the next wheel. With right-angle viewing, scanning characteristics are identical for both directions of traffic movement.

Continual Self-Checking

While the Wheel Thermo-Scanner Unit II is waiting for the next train, it checks itself, once every minute, against a reference target on the inner side of the scanner door and automatically adjusts itself to compensate for ambient temperature changes, natural aging of components, etc. This constant self-monitoring goes on day and night. If, for any reason, the unit drifts out of calibration beyond its capabilities of compensation, it automatically notifies the monitoring office.

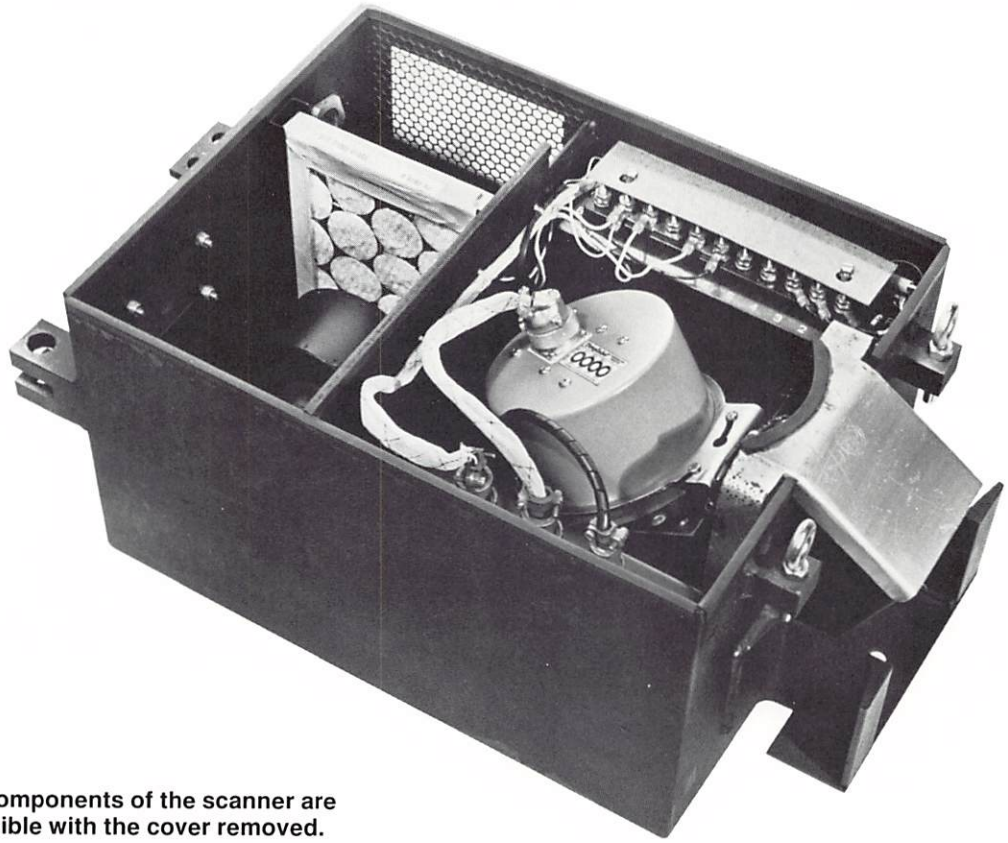
After each train is scanned, the unit checks itself against the reference target and records that check. Thus you are automatically informed, after each train, whether or not the unit was, at that time, within calibration.

Easy Installation

Track equipment—scanners and wheel detectors—mount on the ties. There are no foundations to pour, no need to drill rails. The modular equipment cabinet mounts on a standard 19-inch rack in the wayside housing.

Precise Scanning Where It Counts

The scanner is focused to look upward to a ½-inch square area on the wheel hub close to the journal—a point equally accessible with any type of bearing or any standard wheel size. This point, being in direct contact with the journal, is the natural heat sink for a hot journal. Trouble can be detected here before the outside of the journal begins to heat up. Furthermore, this area provides uniform scanning for either direction of train movement.



The internal components of the scanner are readily accessible with the cover removed.

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Scanner

The scanner, Figure 2, consists of a radiometer and associated optics, ambient sensor, door operating mechanism, blower, and target heater, all housed in a sturdy shock-mounted steel case. No components or cables are mounted on the cover. Cabling within the scanner is completely plug coupled for ease of maintenance. Internal optical alignment is unnecessary, as the entire beam enters the housing. All electronics are housed in a replaceable, repairable module, with the ambient thermistor separately replaceable.

The radiometer contains: an optical system (which includes a mirror in the bottom of the scanner case) to focus infrared energy radiated from the wheel journal onto an infrared detector, associated electronics, and a shutter to protect the detector from undesired stray infrared radiation. Circuit changes in the redesigned radiometer cell enable it to use high-reliability components. The radiometer is hermetically sealed to prevent the entry of dirt and moisture.

The infrared detector, a one-millimeter square metallic crystal, changes its resistance when exposed to infrared radiation—it is photoconductive. A thin layer of vapor-deposited metal on the surface of the detector reflects visible light but allows heat to pass.

The detector is at the focus of a precise system of flat and parabolic front surface mirrors. This optical system focuses a beam of heat from a ¾-inch square spot on the wheel hub through the open scanner door to the chrome mirror in the bottom of the scanner case, thence to the parabolic mirror in the radiometer, the flat mirror on the inner side of the radiometer window, and to the detector crystal in the radiometer.

Normally the shutter blocks heat radiation from striking the detector. The passage of a wheel over the scanner wheel detector generates a gating pulse, which rotates

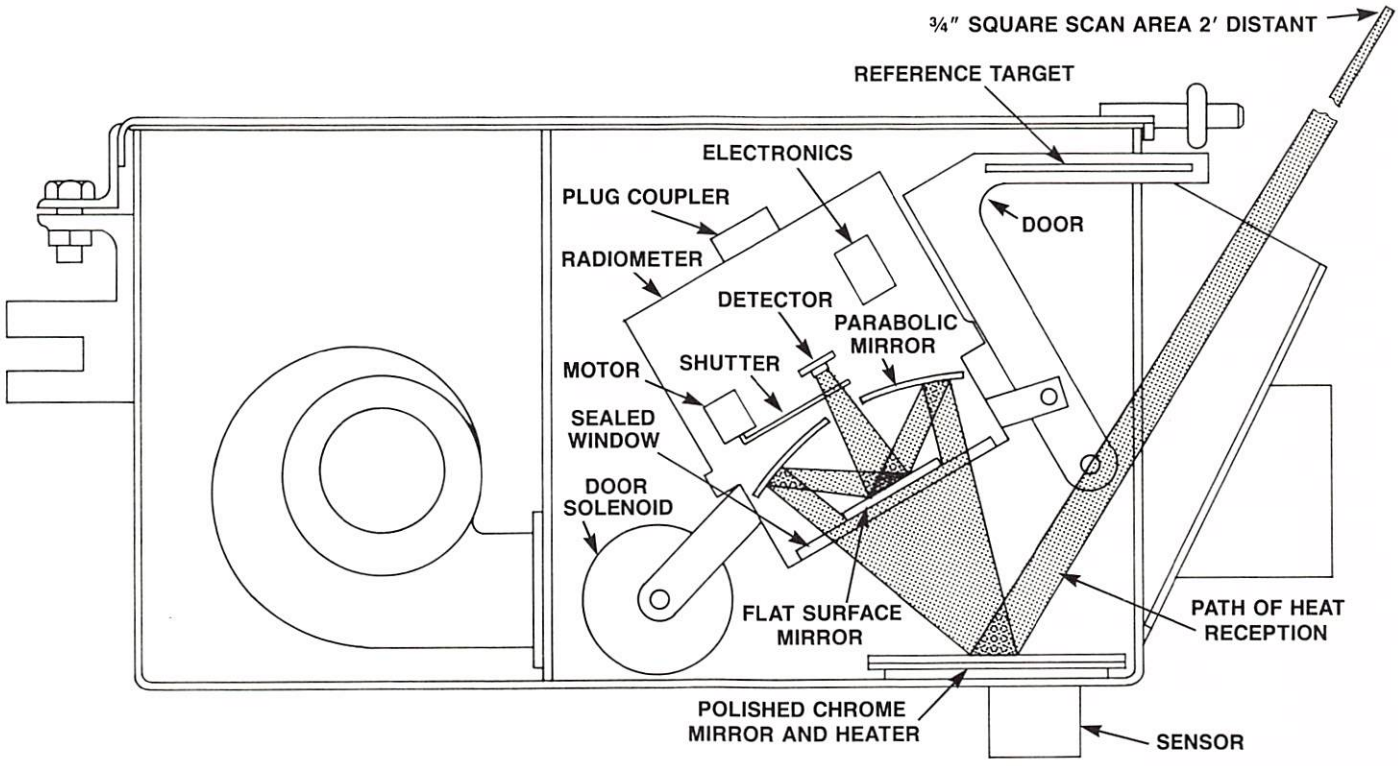


Figure 2. Simplified cross sectional diagram of scanner.

the shutter to expose the detector at the precise instant the wheel hub comes into the field of view. The shutter is open for two milliseconds, and a heat pulse is generated by the detector. The heat pulse is amplified in a high-gain preamplifier (located in the radiometer). The output drives the line back to the wayside housing at a level which precludes noise and transient interference.

The door is electrically operated and self locking. It is opened by a rotary solenoid and closed by a spring. The solenoid is connected to the door by a dead center mechanism which locks the door to protect against vandalism. The door opens upon the arrival of a train and closes 14 seconds after the last journal is scanned.

The ambient sensor is part of the electronic module. The sensor controls the temperature of a reference target heater, which is mounted on the inside of the scanner door. The sensor and target heater are parts of the self-calibration feature. The door heater and calibration target functions are combined. The calibration target is completely viewed when the door is closed.

Mirror and door electric heaters ensure all-weather operation. The small heater mounted under the mirror melts snow and evaporates moisture. The door heater prevents snow and ice buildup from interfering with the scanner door.

Blower

The blower, an integral part of the scanner housing, pressurizes the optical path of the scanner with filtered air to keep out snow, rain, dust, etc., during the passage of a train. It also helps to clear the path extending part way toward the wheel hub to reduce snow blockage. It operates only when the scanner door is open.

The blower is equipped with a replaceable filter, screen, and hood. The filter should last for several months, depending upon environmental conditions.

Wheel Detector

The wheel detector, Figure 3, is an epoxy-encapsulated magnetic device tie-mounted on the inside of the rail about ¼ inch below the position of a passing wheel flange. Shims provide for differences in rail height. This type of mounting eliminates the need for rail drilling and the problems associated with rail creepage. The magnetic structure contains permanent magnets, which set up a flux field through the coil. When the wheel approaches, Figure 4, the magnetic flux builds up until the wheel is exactly over the center line of the structure and then decays as the wheel recedes. A current is generated in the coil by the action of this flux. It has one polarity during flux buildup and the opposite during flux decay.

The point of current reversal is relevant to wheel position within ± ¼ inch. The coil is protected from lightning damage by arresters and by the rail connections and heavy ground wire running to the wayside housing.

A bidirectional system, Figure 1, uses four wheel detectors—two advance wheel detectors, positioned 45 feet on either side of the scanners in systems without carrier (or 200 feet in systems with carrier), and two scanner wheel detectors, positioned 3½ inches on either side of the center of the scanner's line of detection (to allow for the time lapse between the moment of wheel detection and opening of the radiometer shutter).



Figure 3. Scanner magnetic wheel detectors for bidirectional operation.

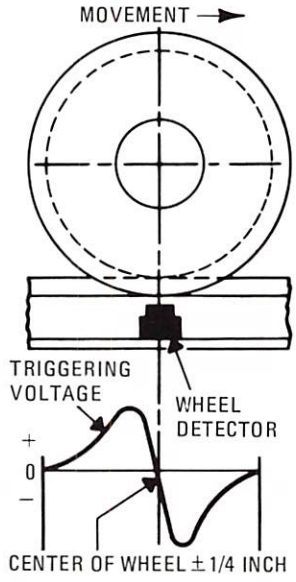


Figure 4. Wheel detector output current.

Junction Box

A cast iron junction box, which mounts on a cast iron pedestal installed in the ballast near the scanner assembly, provides cable connections for the wheel detectors and scanners and contains lightning protection devices for the track-mounted equipment. Cabling between the junction box and associated scanner is protected by waterproof hose.

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The modular equipment system cabinet, Figure 5, usually installed in a wayside housing, has space for the plug-in printed circuit boards used in the system. The number and arrangement of the boards depend upon the requirements of the installation.

A mother board, in the back of the modular system cabinet, contains plug couplers to receive the printed circuit boards. Parallel buses on the mother board permit any printed circuit board to operate equally well in any of the plug couplers mounted on the board. Faston terminals on the back of the mother board enable jumpering additional functions between boards and provide for input and output cable connections.

This unique design provides essentially unlimited capacity for expansion and/or change. As more capacity or different capabilities are required at any scanner location, the additional modules are plugged in—and at any convenient slot.

The input-output wiring can be traced visually without reference to circuit drawings. Further, module changeout quickly localizes trouble.

The printed circuit boards available for use in the modular equipment cabinet are as follows:

Amplifier Gate Logic Board

This redesigned board uses CMOS logic and high-reliability components. More gain extends the useful life of the radiometer cell, that is, the amplifier works with a much lower signal from the cell. The board amplifies the output of its associated scanner to a level suitable for local recording or line transmission at the precise instant that the wheel hub is optically aligned in the field of view of the scanners. The board: generates a pedestal voltage for each wheel passing over the wheel detector to provide a display even though there is no heat; squares the gating wheel detector pulse, which rotates the radiometer shutter; maintains radiometer sensitivity with an AGC network and alarms when sensitivity cannot be maintained; and generates a system check pulse after scanning each train.

Gate Generator Board

Amplifies the triggering pulse from the wheel detector to produce the gate signals which drive the amplifier gate.

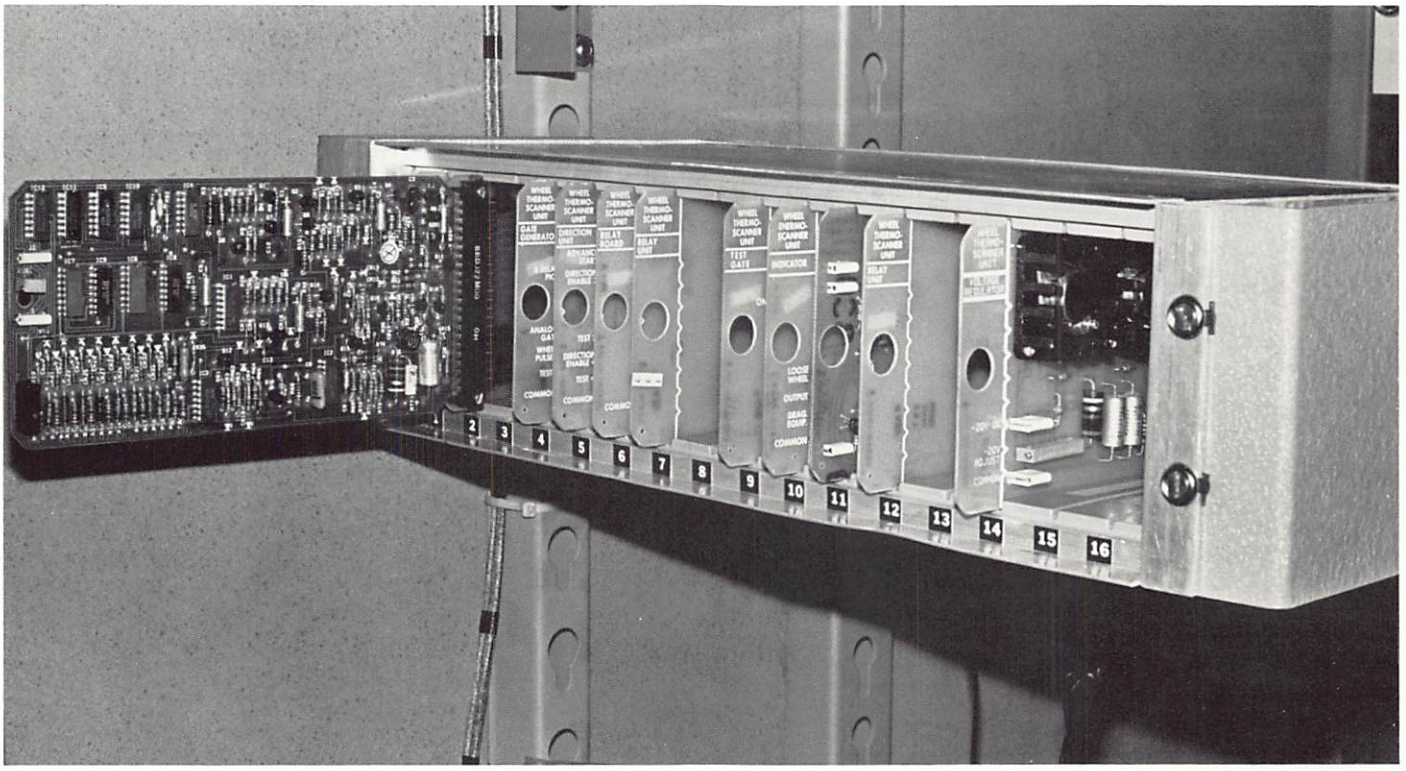


Figure 5. Typical installation of wayside modular equipment cabinet mounted in a 19-inch rack.

A transistor drives a repeater relay in the test unit which activates a door relay in the dual relay unit to activate the scanner door solenoid. Locks the AGC network in the amplifier gate and enables additional repeater relays to activate the carrier and recorder.

Test Unit Board

Provides analog output signals for control of a local recorder or for operation of carrier equipment. Has two level potentiometers and a clamping circuit for the heat signal. Includes two relays which repeat the function of the relay in the gate generator.

Regulator Board

Regulates the 28-volt d-c power supply to provide separate regulated 24 volts for the cell shutter and alarm boards, as well as double regulation for the electronic boards operating from the 20-volt supply.

Direction Unit Board

Determines train direction by the sequence of wheel detector inputs—in a bidirectional system. Also locks out the system (relay interlock) if a train approaches from the opposite direction in a unidirectional system.

Direction Relay Unit Board—Dual
(bidirectional operation only)
Controlled by the direction unit to select the scanner wheel detector for the direction of train movement; disconnects the scanner wheel detector for the opposite direction of traffic.

Relay Unit Board—Dual
(heavy-duty contacts)
Repeats the recorder output from the amplifier gate logic boards to control the recorder. Also repeats the door control relay on the test unit to operate the scanner door solenoids. Has four sets of independent contacts rated at 10 amperes.

Application Board

Processes the analog gate pulse from the gate generator to drive a wheel count device (in the form of a relay contact closure) or any other application which may be required.

Hot Journal Absolute/Differential Alarm Boards

Provide an alarm (in the form of a contact closure) when either a hot journal is detected or the temperature differential between the ends of the same axle exceeds a predetermined level. Both the absolute and differential alarm levels are adjustable.

Indicator Unit Board

Processes the outputs of a loose wheel detector and a dragging equipment detector. A loose wheel is indicated on the recorder by a single wide pulse on both channels A and B; dragging equipment is indicated by five consecutive pulses on both channels.

Relay Unit Board—Single

Activates local alarms. Has a general purpose relay with two sets of independent contacts rated at 2 amperes.

Overlay Track Circuit Transceiver Board

Detects the presence of a train without the use of d-c track circuits. Operates an approach repeater relay in the test unit. With carrier equipment, turns on the carrier system before the train reaches the wheel detector. Also maintains direction lockout when a train stops while passing the scanner.

Overlay Track Circuit Tuner Board

Resonates the track circuit and the track leads at the operating frequency of the transceiver.

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The two-channel, solid-state recorder, Figure 6, has four heated-stylus markers for producing two event traces and two journal heat traces on roll-type rectilinear graph paper. This thermal line printer, with no moving parts, prints the day of the year (on a 365-day basis) and the time (on a 2400-hour basis) along the edge of the recording paper. Figure 7 shows the appearance of a typical recording.

Each channel has its own power supply and plug-in amplifier. Separate stylus controls are provided for each channel—gain, position, and heat. The panel also has a manual run pushbutton and power on/off toggle switch. Chart speeds, at either 5 mm or 10 mm per second, are selected by the toggle switch.

Each analog channel on the 500-foot roll graph paper is 50 mm wide. Loading the graph paper is achieved directly from the front of the recorder. The recorder has a positive drive takeup attachment.

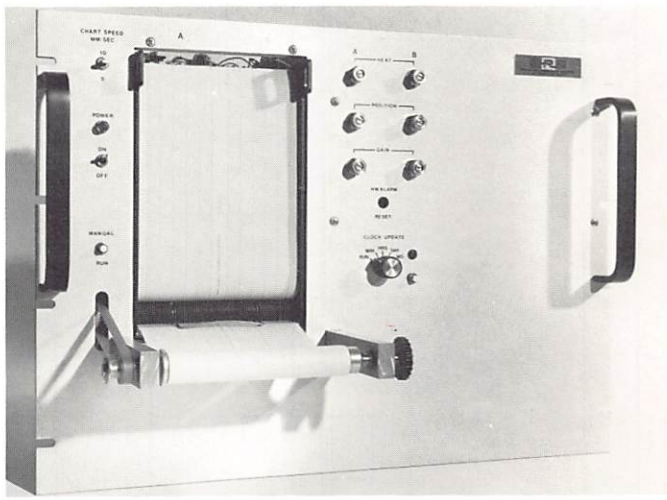


Figure 6. Two-channel, analog, solid-state, heated-stylus recorder.

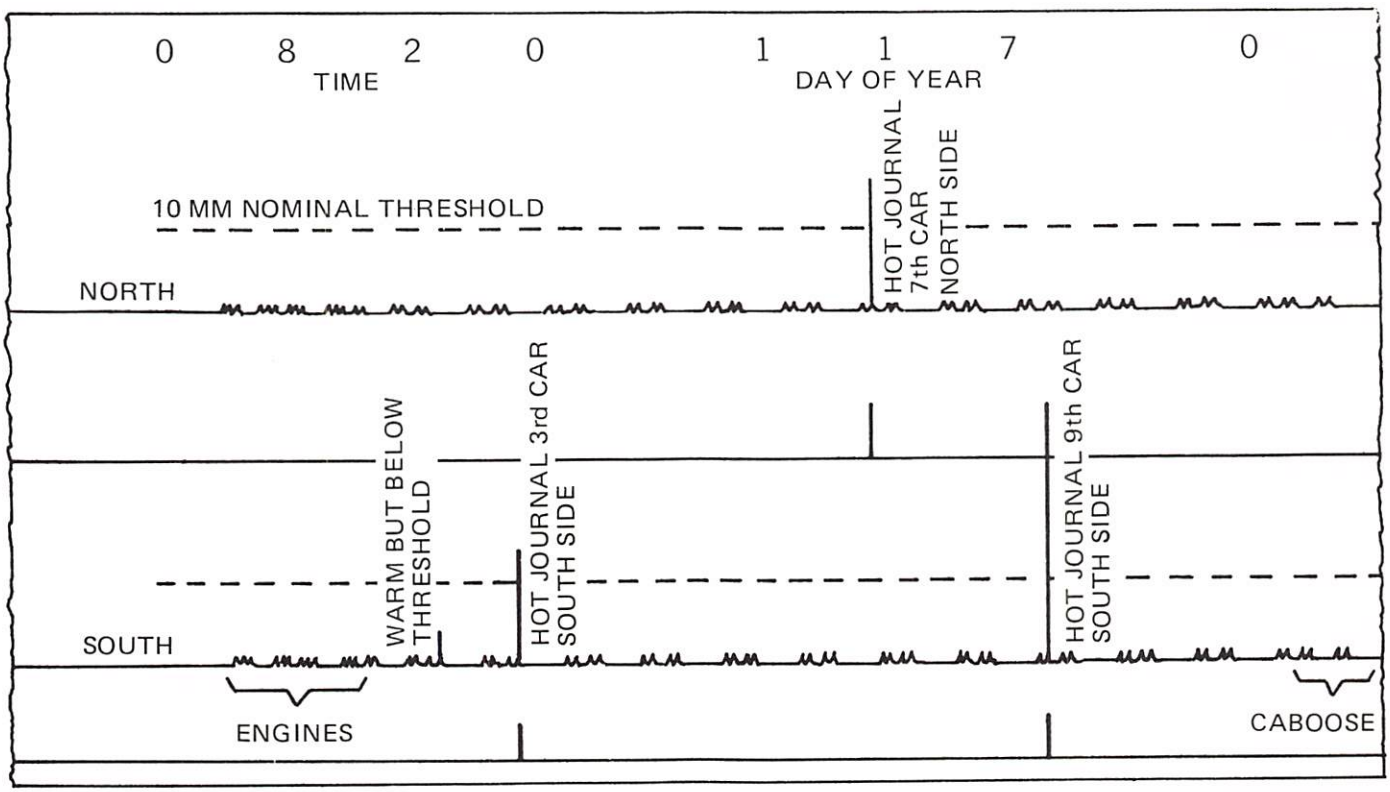


Figure 7. Section of typical recorder tape showing relative journal temperatures, event traces, and times and date.

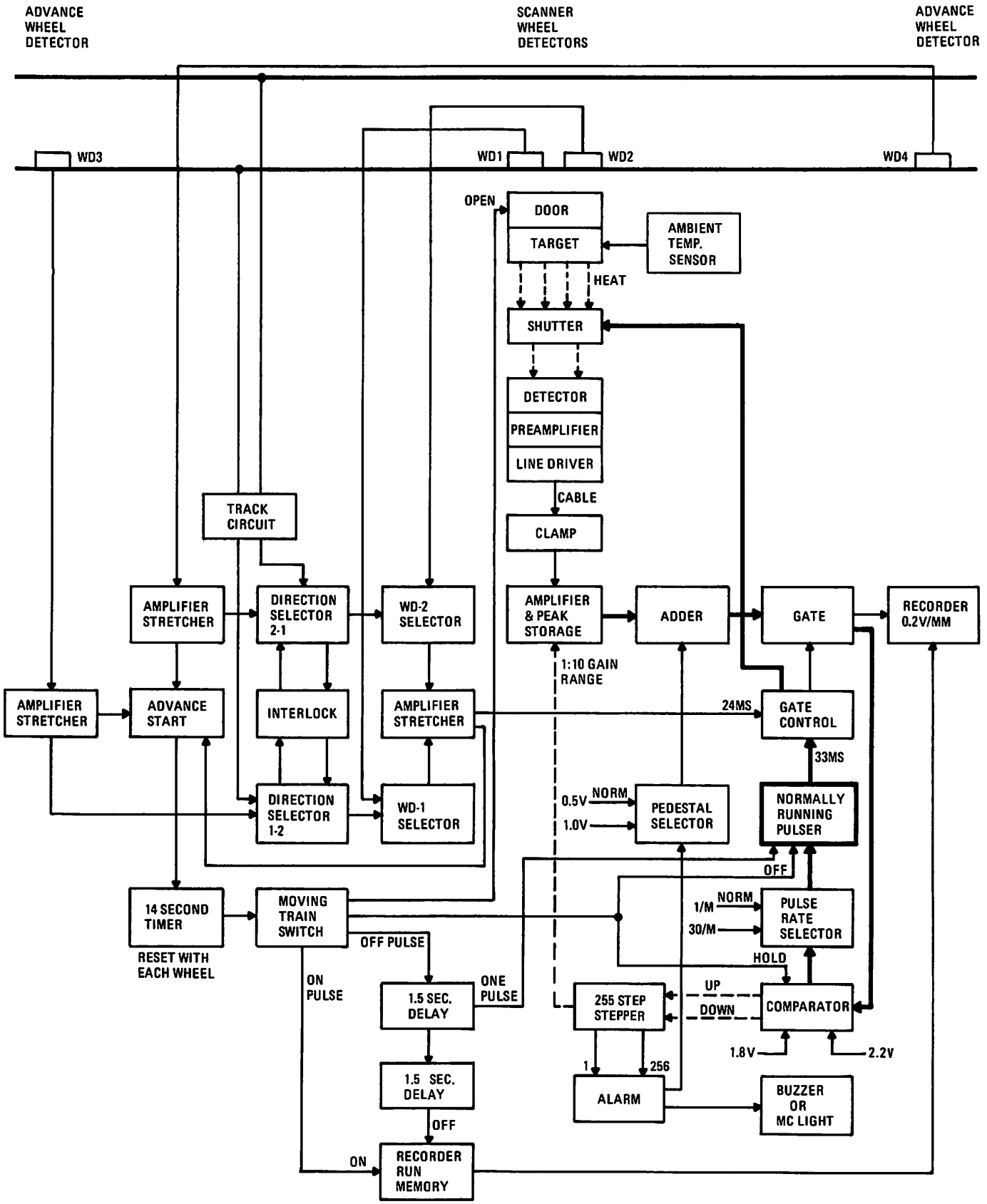


Figure 8. Block diagram, bidirectional system operation.

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General

As the train approaches the scanner location, it passes over either advance wheel detector WD3 or WD4, Figure 8. This announces arrival and readies the system for operation. It also establishes train direction, which is used to select the scanner wheel detector preceding the center line of the scanner. For example, if advance wheel detector 3 is actuated, scanner wheel detector 1 is selected. This direction is referred to as direction 1–2, with reference to the scanner wheel detectors.

The train next actuates WD1, which causes the scanner to scan the journals and convert radiated heat energy to electricity on a proportional basis. The electrical analog of the wheel heat profile is carried by cable to the housing where electronic equipment extracts the information desired.

The activation of an advance wheel detector and selected scanner wheel detector operates a 14-second timer which keeps the system in operation. When the train slows and stops at the scanner installation, the timer times out and the scanner reverts to standby operation. If a track circuit relay contact is available, or if an overlay transceiver is provided, the direction of train movement is retained. If, however, no track circuit information is available, the train direction is lost. For this reason, track circuits are recommended where trains may stop. When the train starts again, the first wheel over an active wheel detector reactivates the system, which continues to scan the remaining wheels until the last wheel passes. After 14 seconds, the system again reverts to standby operation and, when the track circuit clears, the directional memory is released.

System on Standby

During the absence of a train, the Wheel Thermo-Scanner II system is on standby. Standby operation involves a self-calibration feature which, once every minute, opens the radiometer shutter. The normal optical path of the radiometer is, however, blocked by the door which is closed when no train is passing. As previously described, the target on the inside of the door is heated to a temperature above ambient which is indicative of an overheated journal. This temperature is set to 80 degrees F above the ambient temperature. Thus the radiometer reads the temperature of the target. In the wayside housing, the amplifier gate board analyzes the output voltage. If it is at a level other than that expected from a hot journal, the gain is changed to bring the output to the proper level. This gain is controlled by a 255-step digital counter.

The heavy lines on the block diagram, Figure 8, outline this operation. Starting with the heavy-lined block, the normally running pulser produces pulses once each minute. The pulses pass through the gate control circuits and open the shutter in the radiometer. With the door closed, the radiometer reads the target temperature which is translated by the preamplifier to a potential of about 1 volt. The heat pulse is fed back through the cable to the test unit board in the modular equipment cabinet where an electronic circuit clamps the output pulse after a predetermined time. The clamp circuit terminates the heat pulse approximately 6 milliseconds following the opening of the shutter. This pulse is fed to an amplifier and a peak storage device (a capacitor with isolation circuitry). The device stores the highest voltage attained from the time the shutter is opened until the signal is clamped. The highest voltage comes from the hottest part of the hub.

A fixed voltage pulse (called a pedestal) is added to the heat pulse. The pedestal serves to mark, on the recorder, the passage of a train wheel which generates little or no heat if the journal is cool or cold. The pedestal is normally 0.5 volt in amplitude. The combined heat pulse and pedestal is fed through a gate circuit (controlled by the same gate pulse that originated the shutter movement) to the comparator.

The comparator checks that the voltage of the combined pulse (representing a hot journal) is between 1.8 and 2.2 volts. If the voltage is not within these limits, sensing circuits in the comparator step the 255-step stepper one step in the direction required to correct the situation. The 255-step stepper controls the gain of the amplifier through which the heat pulse was fed before the peak storage. When the heat pulse is low, the comparator causes the stepper to increase the gain in the amplifier so that, after one or more steps, the pulse is of the expected height. This ensures that, during normal operation, heat measured from an overheated journal (at the same temperature as the target) would cause a 10-mm pulse to be displayed, which is considered the hot journal threshold.

A supplemental comparator circuit, the pulse rate selection, governs the pulse rate of the normally running pulser by increasing the rate from one per minute to thirty per minute any time the comparator detects a pulse out of tolerance. This ensures prompt correction of any gain change and is especially valuable during initial start-up and test. Dirt on the optics, component aging, ambient temperature changes, and faulty system alignment are a few things which might cause a change in the heat pulse output.

A second supplemental circuit in the 255-step stepper is an alarm circuit. It senses when the stepper has stepped either to the top or bottom of its range. The circuit then causes the pedestal selection to double the pedestal voltage. This doubles the height of the pedestal displayed

on the recorder to warn the person reading the tapes that the system is no longer able to compensate for whatever condition is causing the heat pulse reduction. When such a condition is corrected, the comparator steps the gain back down again to get the heat pulse within tolerance. The comparator does not operate during normal system operation; just during standby.

Train Approaches

As the train approaches the scanner site, it occupies the track circuit (if one has been provided) so that the direction established when the train first actuates the advance wheel detector is maintained during the train's presence. This may be a spare contact on an existing track relay, if such is available, or it can be a series overlay track circuit. GRS can furnish a series overlay on boards which plug directly into the modular equipment cabinet.

Train Actuates Advance Wheel Detector

The train, after occupying the track circuit, passes over the advance wheel detector. The electrical pulse generated by the wheel detector coil is fed over a cable to the wayside housing, where it is amplified and shaped by an amplifier-stretcher which picks up an interlocked relay on the direction unit board (the direction selector) to establish train direction. The relay is held up while the track circuit is occupied. The activated direction selector selects the proper wheel detector for operating the scanner.

The gate generator, associated with the advance wheel detector and the selected scanner wheel detector, has a second output, which provides an advance start for taking the system out of standby and readying it for operation. The advance start circuit actuates a 14-second timer, which is reset to zero when a wheel passes a wheel detector. The timer, in turn, operates a moving train relay as long as wheels keep resetting the timer, and turns off 14 seconds after the last wheel pulse. The relay being energized activates a local recorder and/or unmutes the carrier to operate an office recorder. A second function of this relay is to open the scanner door, thus removing the calibration target from the view of the detector. A third function is to stop the normally running pulser and hold the 255-step stepper in the position it had attained at the time the train arrived.

The distance between the advance wheel detector and the selected scanner wheel detector must be long enough to allow the door to open and the recorder to start before the train reaches the scanner. For high speed trains (up to 85 mph) this distance is 45 feet, unless carrier is used. With carrier and no overlay track circuit, the one-second squelch time requires an advance distance of 200 feet.

Train Actuates Scanner Wheel Detector

When a wheel passes the selected scanner wheel detector, the associated gate generator applies a 24-ms pulse to the gate control circuitry in the same manner as the normally running pulser did during standby operation. The gate control circuitry opens the shutter, allowing the detector to view the passing wheel hub, which has, in the meantime, moved into view. The heat received during the wheel scan is converted into electrical energy in the same manner as described under standby operation. The heat pulse is gated, amplified, stored, stretched, and added to the pedestal through the gate circuit to the recorder, where it is displayed. This activity is repeated for each wheel of the train.

Train Leaves

When the last wheel of the train passes over the selected scanner wheel detector, the recorder receives its final journal heat indication. When the last wheel passes over the trailing advance wheel detector, the 14-second timer receives its last pulse. Fourteen seconds later, the timer times out and turns off the moving train switch. The switch closes the scanner door, interposing the calibration target in the detector field of view. The off pulse of the moving train switch starts a second timer which, 1½ seconds later (to give the door time to close), puts a single pulse into the pulser to open the shutter in the usual way. This action displays, on the still-running tape recorder, one calibration pulse, which causes a stylus deflection to the 10-mm line. This indicates the system's calibration throughout the passage of the train. One and a half seconds after the second timer operates, a third timer operates which turns off the recorder run memory. This deactivates the local recorder and/or mutes the carrier to deactivate the office recorder. The action is the same for a train that slows and stops; the recorder shuts off to conserve paper.

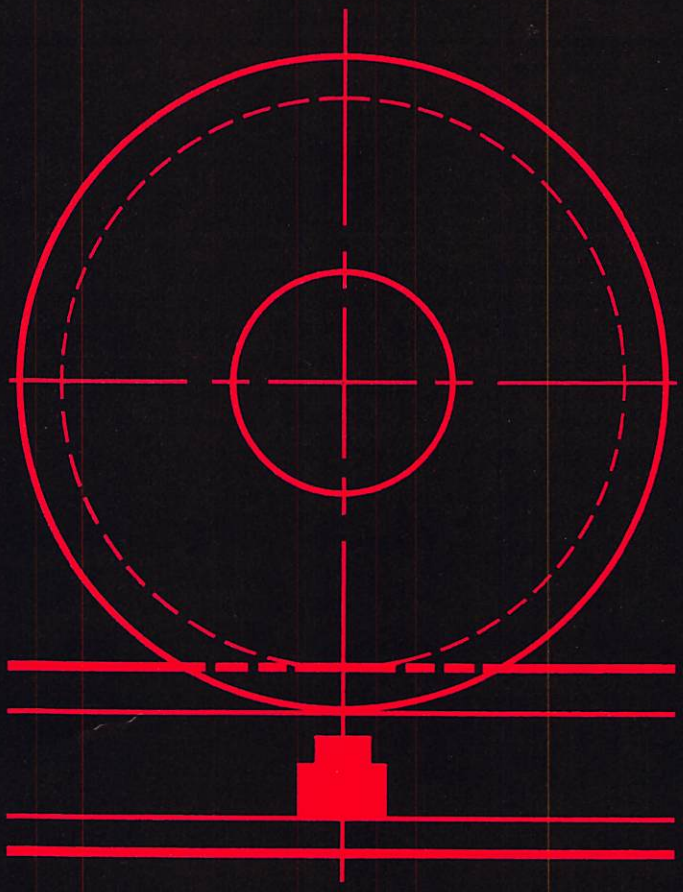
Following scanner shutdown, calibration pulse generation, recorder shutdown, and the train clearing the track circuit, the directional memory is dropped, and the system is ready once more to accept a train from either direction. The system is now on standby and returns to its self-calibrating function.

Signed by Israel Jones, texasrails.org 7/16/2026

Locating GRS Wheel Thermo-Scanner Unit II

1. The Wheel Thermo-Scanner site should be located on tangent track at least 500 feet from the nearest curve or switch, in the normal direction(s) of traffic—500 feet allows the trucks to return to their normal position so that they are not skewed when passing the detector. On a curve at high speed, centrifugal force pushes the flanges toward the outer rail, changing the normal geometry of rail and hub (the hub is scanned). At low speeds on a curve, gravity pulls the flanges against the inner rail, again changing this geometry.
2. The track at, and a suitable distance ahead of, a scanner location should be reasonably level—prolonged braking can cause false readings.
3. The scanner should be located where the train has been operating at normal speeds for at least ten miles—this allows time for hub heating to occur if a journal is defective. A distance over ten miles is preferred when the scanner density (scanners/100 miles) is less than 10.
4. Track width should be held to gauge at least 100 feet each side of a bidirectional scanner. Gauge wider than 4 feet 8½ inches should be avoided. Gauge should be properly maintained. Guard rails are not required.
5. The scanner should be located where there is an adequate source of 120-volt 60-Hz power—the line voltage should be capable of staying between the limits of 103 to 127 volts. The circuit should allow one side to be grounded at the equipment location—an isolation transformer may be necessary.
6. Locate the wayside electronic equipment cabinet within 80 feet of the track-mounted equipment.
7. Ballast in the area of the scanner location should be clean and firmly tamped. The ties should be in good condition.

ORDERING INFORMATION



To order a complete Wheel-Thermo Scanner Unit II or parts thereto, please refer to TRACKSIDE COMPONENTS on page 17 and WAYSIDE COMPONENTS on page 18. The following material and equipment are not furnished:

2 bridge timbers, 14″ square, 10′ long.
2 guard ramps to protect scanners.
1 wayside housing (if not factory wired); see GRS Assemblies Catalog Section 5.
4 ground rods and ground wire.

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PLEASE ORDER BY NAME, SHOWN IN BOLD TYPE, AND CATALOG NUMBER.

NAME	CATALOG NUMBER
SCANNER, complete with mounting	**A92-890**
SCANNER, without mounting and radiometer cell	**A92-891**
SCANNER ALIGNMENT FIXTURE	**A92-924**
RADIOMETER CELL	**A92-915**
WHEEL DETECTOR, dual	**A92-910**
ADVANCED WHEEL DETECTOR, single	**A92-911**
MOUNTING PLATE, for wheel detector	**P92-986**
WHEEL DETECTOR GUARD, with hardware 5⅞ inches high for 119 lb rail or larger 5⅛ inches high for 115 lb rail or smaller	 **P92-991** **P92-992**
ADVANCED WHEEL DETECTOR, rail mounted	**A92-895**
JUNCTION BOX, complete with lightning arresters and terminal blocks	**A92-925**
CABLE, 100-foot, for scanner	**P92-977**
CABLE, 200-foot, for advance wheel detector	**P92-1101**
CABLE, 18-foot, for scanner wheel detector	**P92-1102**
WIRE, No. 6 G.E. Flamenol Black, 140′	**P92-1103**
CABLE, four-conductor, No. 16 Type S.O., 200′	**P92-1104**
HARDWARE KIT, bidirectional	**P92-990**

WAYSIDE COMPONENTS

PLEASE ORDER BY NAME, SHOWN IN BOLD TYPE, AND CATALOG NUMBER.

NAME	CATALOG NUMBER
MODULAR EQUIPMENT CABINET, without printed circuit boards	P92-1105
TEST UNIT BOARD	P92-916
AMPLIFIER GATE LOGIC BOARD	P92-1106
GATE GENERATOR BOARD	P92-907
DIRECTION UNIT BOARD	P92-908
DIRECTION RELAY UNIT BOARD	P92-969
REGULATOR BOARD	P92-1107
RELAY UNIT BOARD, dual	P92-906
RELAY UNIT BOARD, single	P92-923
OVERLAY TRACK CIRCUIT TRANSCEIVER BOARD	P92-924
OVERLAY TRACK CIRCUIT TUNER BOARD	P92-925
INDICATOR UNIT BOARD	P92-967
HOT JOURNAL ABSOLUTE/DIFFERENTIAL ALARM BOARD, alarms on either side of train	P92-974
HOT JOURNAL ABSOLUTE/DIFFERENTIAL ALARM BOARD, alarms only on one side of train	P92-1108
APPLICATION BOARD	P92-1109
TEST GATE BOARD, mounts in equipment cabinet and provides wheel pulse for testing	P92-1085
EXTENDER BOARD, for test purposes	P92-926
LIGHTNING PROTECTION EQUIPMENT	
ARRESTER, Equalizer	A3-255
ARRESTER, Heavy Duty	A3-258
SPECIAL TOOLS	
FASTON CRIMPING TOOL, for 0.187 Faston terminals	P92-905
CRIMPING TOOL, for ¼-inch ring type terminals	P92-904
OFFICE EQUIPMENT	
GRS HEATED-STYLUS RECORDER	A92-898
PAPER, for heated-stylus recorder, 500-foot roll	P92-1000
PAPER, for ink stylus recorder z-fold, 1000-foot package	P92-988
PAPER, for ink stylus recorder, 500-foot roll	P92-999
INK, for ink stylus recorder, ½ pint	P92-985

GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL

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Telex: 978317

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REPRESENTATIVES AND LICENSEES THROUGHOUT THE WORLD.

PHASE SELECTIVE CODED TRACK CIRCUIT

FOR POSITIVE TRAIN DETECTION IN ELECTRIFIED TERRITORY

GRS CATALOG **92-7**

GRS



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Introduction 3
Operation 4
Installation 5
Ordering Data Needed 5
Ordering Information 7

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FEATURES

- ***Single or Double-Direction Running.***
- ***Compatible with 100Hz Cab Signaling.***
- ***High Shunting Sensitivity.***
- ***Rate Coded to Provide Multiple Indications.***
- ***Improved Broken Rail Detection.***
- ***Phase Selectivity Provides Insulated Joint Breakdown Protection.***
- ***Receiver Provides Frequency and Phase Selectivity to Unwanted Signals.***
- ***Circuit Lengths to 7000 Feet with A-c Ballast Resistance to 3 Ohms/1000 Feet.***
- ***Uses Time-Proven GRS Coded Track Components.***

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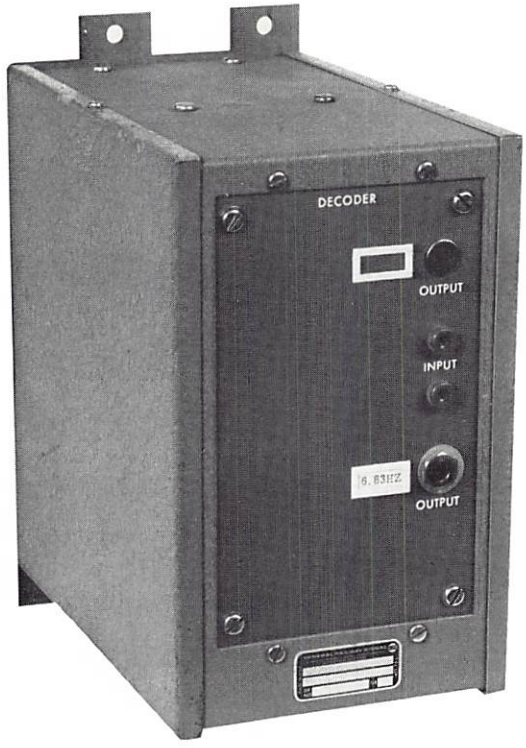
INTRODUCTION

The GRS phase selective coded track circuit for use in electrified territory is a technological refinement of the service-proven coded track circuit developed many years ago. It uses standard GRS components - plus a new phase selective track detector - to provide broken down joint protection, excellent shunting sensitivity, and broken rail protection.

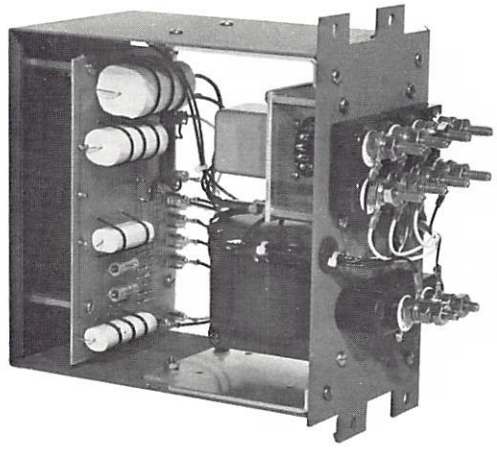
The circuit uses either mechanical or solid-state code rate transmitters to apply either coded 100Hz energy to mainline tracks or coded 200Hz energy to interlocking tracks. Improved shunting sensitivity and the high efficiency of the phase selective detector permit a track circuit of up to 7000 feet for 100Hz operation, and up to 4500 feet for 200Hz operation, at an a-c ballast resistance of 3 ohms/1000 feet minimum, for both operations.

Coding the current to the rails at rates of 75, 120, or 180 pulses per minute, in accordance with the condition of the next track circuit in advance, causes appropriate components at the relay end of the circuit to respond selectively to the code received. The multiple proceed aspects are controlled through the rails, thereby eliminating the need for signal control line wires.

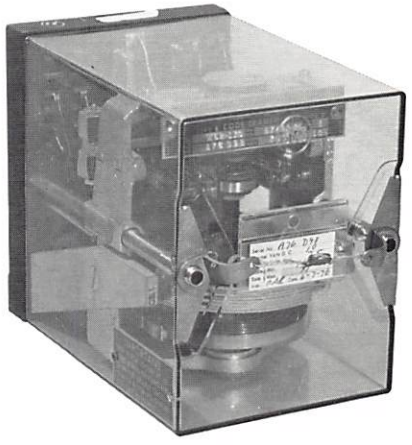
The coded energy in the rails can be inductively coupled to passing trains for the control of cab signals, thus providing the engineer with a continuous, up-to-the-second indication of track conditions immediately ahead of his train.



Decoder



Phase Selective Track Detector
(cover removed)



Mechanical Code Transmitter

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OPERATION

A simplified overall diagram of the phase selective track circuit is shown in Figure 1. At the sending end of the circuit, (on the right), the code transmitter contact interrupts the 110 volts a-c feeding the autotransformer. The signal is coupled to the rail by the track transformer. For train detection only, a single code rate is used; for cab signaling, multiple rates are used in conjunction with the required speed limits. Combinations of inductor L1 and resistor R1 are used to obtain the proper phase relationship for normal operation.

At the receiving end, the coded track signal voltage is stepped up by the track transformer to the level required for operation of the phase selective detector. The detector input contains a tuned filter which minimizes propulsion interference that would otherwise interrupt normal coding action.

With no signal in the rails, the reference voltage from the phase reference transformer is converted by the detector to positive d-c, which moves the code-responsive magnetic-stick relay armature to the normal position. The correct phase signal from the rails reduces the positive d-c voltage on one relay coil and applies positive d-c voltage to the other coil, causing the armature to move to its reverse position. Thus a coded a-c track signal of the correct phase causes the relay to follow the code rate.

The code responsive relay can be used to drive various combinations of decoding equipment. A typical combination is for discrete-rate decoding (as shown in Figure 2), which uses a master decoding transformer and passive rate decoders with their associated relays. Another typical combination is for all-rate decoding (as shown in Figure 3), which uses repeater relay TPR to drive a delayed pickup arrangement for track occupancy relay HR. The delay minimizes the effects of poorly shunting trains. The values shown will provide a nominal delay of two normal-reverse cycles of the repeater relay TPR. Relay TFBPR ensures that relay HR will not pick up unless the repeater relay is functioning properly. It also provides for rapid dropaway of HR when the track is shunted.

For further application information and details of phase selective track circuit operation, as well as complete maintenance and trouble-shooting procedures, refer to GRS Pamphlet P1697.

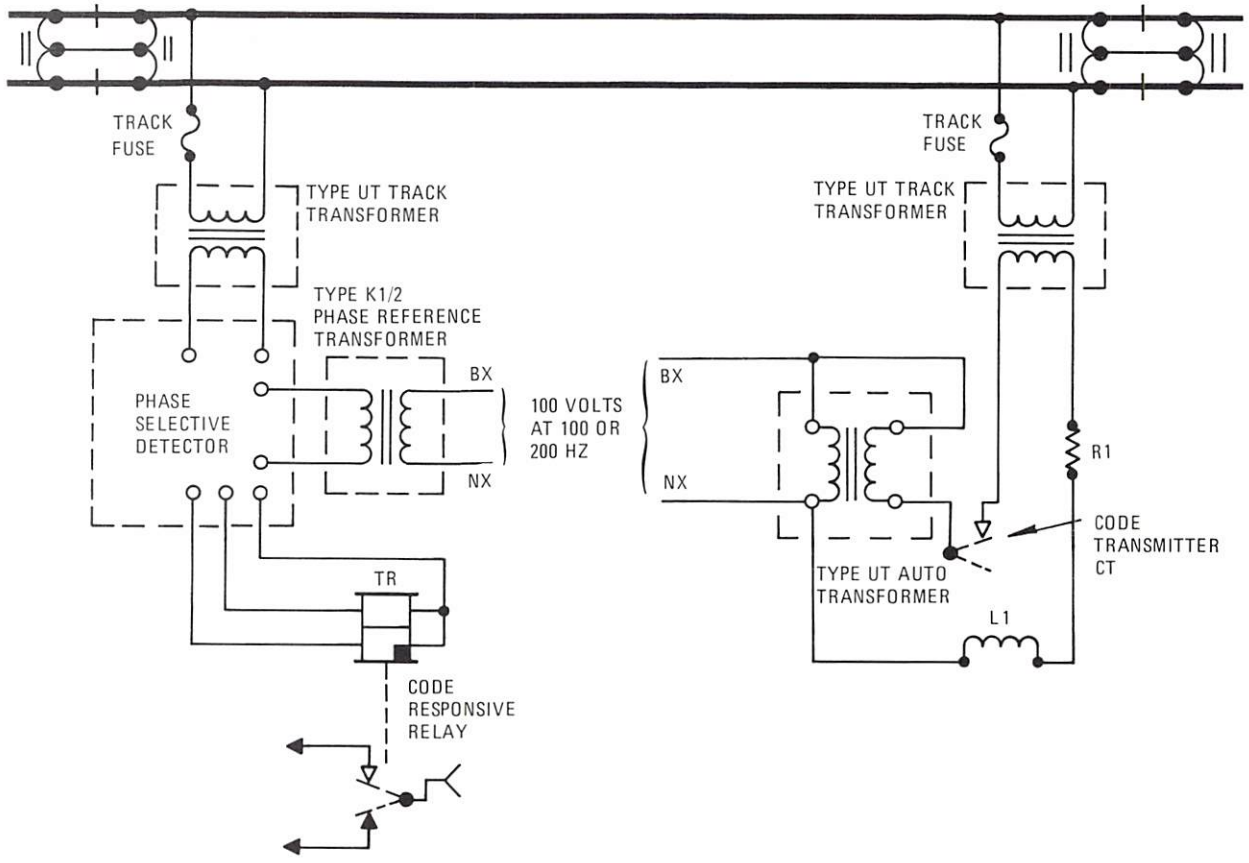


Figure 1. Simplified diagram of phase selective track circuit.

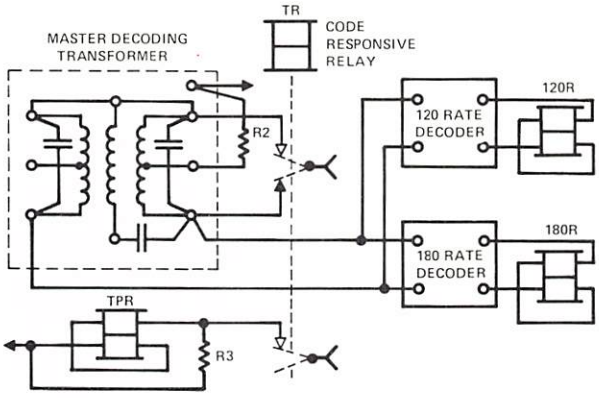


Figure 2. Discrete-rate decoding.

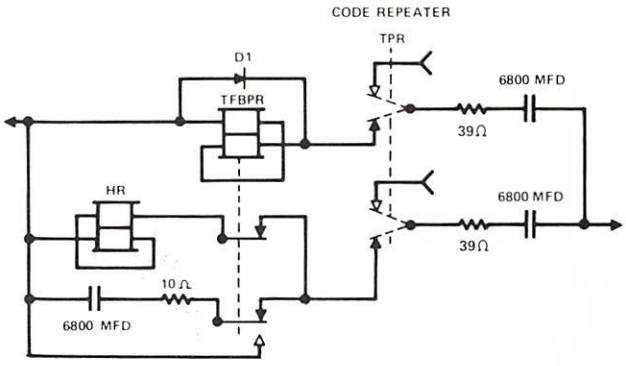


Figure 3. All-rate decoding.

INSTALLATION

The phase selective track circuit uses components that are designed for easy plug-in mounting in a wayside case or housing. These components provide optimum operating efficiency and long service, while requiring only minimal maintenance.

The track circuit is designed for single- or double-direction running, and is of the double-rail, insulated joint type. It requires a power source of 110 VAC/100Hz for mainline operation or 110 VAC/200Hz for interlocking use, with an amplitude stability of ± 5% and a frequency stability of ± 3%. The power must be from a common source with a distribution line, as opposed to individual motor generators at each location.

The transmitter power adjustments are accomplished by the use of transformer taps. Code rate generators and decoders require a 12volt d-c energy source.

ORDERING DATA NEEDED

Each phase selective track circuit has its own special requirements that can best be met by designing the circuit to meet these specific requirements. When considering the installation of a circuit, please provide GRS with the following information:

- Weight of rail.
- Type of rail bonds to be used.
- Type and size of battery.
- Signal controls desired, including decoding timing requirements.
- Minimum ballast resistance per 1000 feet of track.

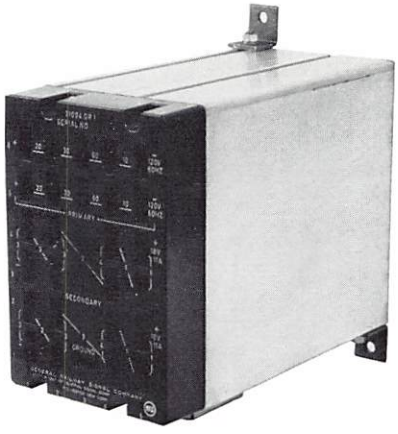
Concerning the last item, the minimum ballast resistance usually is lower than anticipated. GRS suggests that the measurements be taken under wet ballast conditions to determine the actual value.

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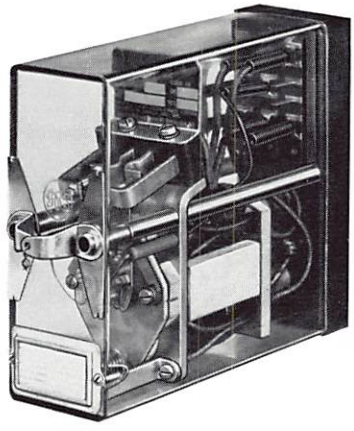
PHASE SELECTIVE TRACK CIRCUIT COMPONENTS



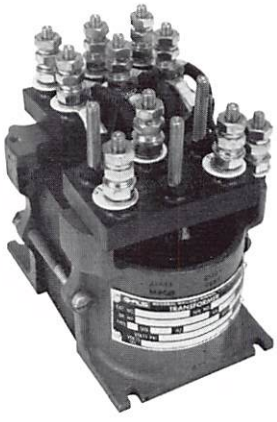
Solid-State
Transmitter



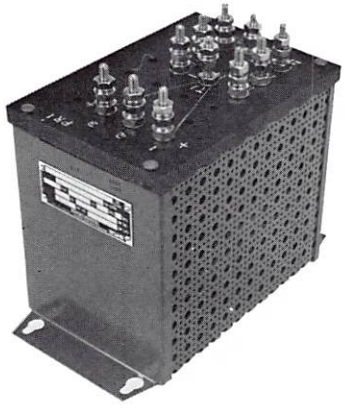
Type UT
Transformer



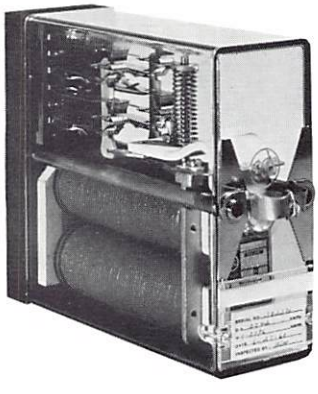
Code Repeater
Relay



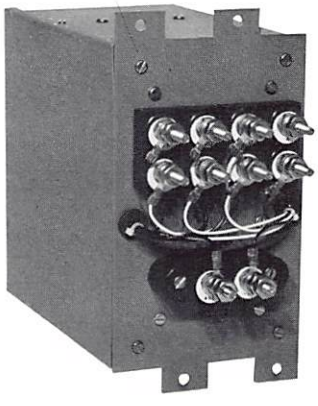
Phase Reference
Transformer



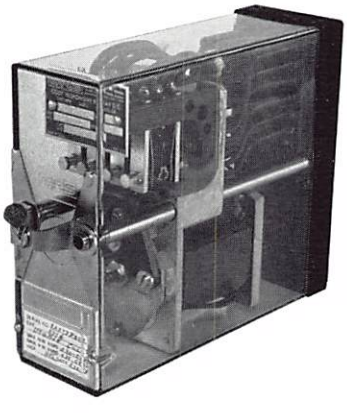
Master Decoding
Transformer



Track Detector
Relay



Phase Selective
Detector



Code Responsive
Relay

ORDERING INFORMATION

Please order by name and catalog number shown in BOLD TYPE.

NAME	CATALOG NUMBER	
BASIC TRACK CIRCUIT		
CODE TRANSMITTER, solid-state (CT):	A92-690	
BOARD, code rate 75 cpm	P92-693	
BOARD, code rate 120 cpm	P92-694	
BOARD, code rate 180 cpm	P92-695	
CODE TRANSMITTER, mechanical (CT):	under 30 volts	30 volts & over
CODE RATE 75 cpm	A62-170	A62-175
CODE RATE 120 cpm	A62-171	A62-176
CODE RATE 180 cpm	A62-172	A62-177
CODE REPEATER RELAY (OPTIONAL)	A62-575	
CODE RESPONSIVE RELAY (TR)	A62-600	
DETECTOR, phase selective	A92-969	
TRANSFORMER, phase reference, Type K1/2	A95-121	
TRANSFORMER, track, Type UT	A95-50	
RESISTOR, 50 ohm (R1)	A92-957	
* INDUCTOR (L1)	A92-989	
FUSE, 20 ampere	P3-176	
FUSE BLOCK	A3-295	
DECODING OPTIONS		
TRANSFORMER, master decoding	A18-100	
RATE RELAY	A62-319	
DECODER 120 cpm code rate	A92-964	
DECODER 180 cpm code rate	A92-961	
SUPPRESSOR, for decoding transformer	A18-180	
RESISTOR, 5 ohm (R2)	A92-967	
CODE REPEATER RELAY (TPR)	A62-156	
RESISTOR, 1000 ohm (R3)	A18-197	
FRONT-BACK REPEATER RELAY (TFBPR)	A62-315	
DIODE (D1)	A53-115	
TRACK RELAY (HR)	A62-122	

* For 100 Hz track circuits less than 4500 ft.

GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL

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FIRST INTERSTATE BANK OF CALIFORNIA BUILDING 1330 BROADWAY SUITE 1440 OAKLAND CA 94612
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MONTGOMERY CENTER 8630 FENTON STREET SUITE 613 SILVER SPRING MD 20910
Phone: 301 • 587-4770

GRS INTERNATIONAL

MAIN OFFICE
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G.R.S. TRADING CORPORATION
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Cable: GENRASIG (ROCHESTER NY) Telex: 978317

GEC-GENERAL SIGNAL LIMITED
ELSTREE WAY BOREHAMWOOD HERTFORDSHIRE WD6 1RX ENGLAND Phone: 44-1-953-2030
Cable: RAILSIGKO BOREHAMWOOD (ENGLAND) Telex: 851-22777 GECBWD G BOREHAMWOOD (ENGLAND)

ALGEMENE SEIN INDUSTRIE B.V.
CROESELAAN 28 3521 CB UTRECHT NETHERLANDS Phone: 31-30-94-26-46
Cable: GENRASIG UTRECHT (NETHERLANDS) Telex: 844-47455 GRASI NL UTRECHT (NETHERLANDS)

REPRESENTATIVES AND LICENSEES THROUGHOUT THE WORLD

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SIGNAL SYSTEMS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A92-301	29802-37GR1		XMTR	9
A92-302	29802-37GR2		XMTR	9
A92-303	29802-37GR3		XMTR	9
A92-304	29802-37GR4		XMTR	9
A92-305	29802-37GR5		XMTR	9
A92-306	29802-37GR6		XMTR	9
A92-307	29802-37GR7		XMTR	9
A92-308	29802-37GR8		XMTR	9
A92-309	29802-37GR9		XMTR	9
A92-310	29802-37GR10		XMTR	9
A92-311	29802-37GR11		XMTR	9
A92-312	29802-37GR12		XMTR	9
A92-313	29802-37GR13		XMTR	9
A92-314	29802-37GR14		XMTR	9
A92-315	29802-37GR15		XMTR	9
A92-316	29802-37GR16		XMTR	9
A92-317	29802-37GR17		XMTR	9
A92-318	29802-37GR18		XMTR	9
A92-319	29802-37GR19		XMTR	9
A92-320	29802-37GR20		XMTR	9
A92-321	29802-37GR21		XMTR	9
A92-322	29802-37GR22		XMTR	9
A92-323	29802-37GR23		XMTR	9
A92-324	29802-37GR24		XMTR	9
A92-325	29802-37GR25		XMTR	9
A92-326	29802-37GR26		XMTR	9
A92-327	29802-37GR27		XMTR	9
A92-328	29802-37GR28		XMTR	9
A92-329	29802-37GR29		XMTR	9
A92-330	29802-37GR30		XMTR	9
A92-331	29802-37GR31		XMTR	9
A92-332	29802-37GR32		XMTR	9
A92-333	29802-37GR33		XMTR	9
A92-334	29802-37GR34		XMTR	9
A92-335	29802-37GR35		XMTR	9
A92-336	29802-37GR36		XMTR	9
A92-337	29802-37GR37		XMTR	9
A92-341	29803-28GR1		RECEIVER	9
A92-342	29803-28GR2		RECEIVER	9
A92-343	29803-28GR3		RECEIVER	9
A92-344	29803-28GR4		RECEIVER	9
A92-345	29803-28GR5		RECEIVER	9
A92-346	29803-28GR6		RECEIVER	9
A92-347	29803-28GR7		RECEIVER	9
A92-348	29803-28GR8		RECEIVER	9
A92-349	29803-28GR9		RECEIVER	9
A92-350	29803-28GR10		RECEIVER	9
A92-351	29803-28GR11		RECEIVER	9
A92-352	29803-28GR12		RECEIVER	9
A92-353	29803-28GR13		RECEIVER	9
A92-354	29803-28GR14		RECEIVER	9
A92-355	29803-28GR15		RECEIVER	9
A92-356	29803-28GR16		RECEIVER	9
A92-357	29803-28GR17		RECEIVER	9
A92-358	29803-28GR18		RECEIVER	9
A92-359	29803-28GR19		RECEIVER	9
A92-360	29803-28GR20		RECEIVER	9
A92-361	29803-28GR21		RECEIVER	9
A92-362	29803-28GR22		RECEIVER	9
A92-363	29803-28GR23		RECEIVER	9
A92-364	29803-28GR24		RECEIVER	9
A92-365	29803-28GR25		RECEIVER	9
A92-366	29803-28GR26		RECEIVER	9
A92-367	29803-28GR27		RECEIVER	9
A92-368	29803-28GR28		RECEIVER	9
A92-369	29803-28GR29		RECEIVER	9
A92-370	29803-28GR30		RECEIVER	9
A92-371	29803-28GR31		RECEIVER	9
A92-372	29803-28GR32		RECEIVER	9
A92-373	29803-28GR33		RECEIVER	9
A92-374	29803-28GR34		RECEIVER	9
A92-375	29803-28GR35		RECEIVER	9
A92-376	29803-28GR36		RECEIVER	9
A92-377	29803-28GR37		RECEIVER	9
A92-393	58496-41GR1		FILTER	3, 6, 10
A92-394	58721 GR1		REACTOR	10
A92-395			CAPACITOR COMPLETE	10
	52281-659		CAPACITOR	
	49092-606	2	BRACKET	
A92-396	57409-10GR1		CHOKE	10
A92-397	59730-2		XFMR	
A92-614	332-11GR1		COUPLING A92-614	3, 6
A92-621	13444-5GR1		REACTOR	3, 6
A92-636	42100-5GR1		REACTOR	
A92-637	42100-8GR1		REACTOR	
A92-690	331-9GR1		XMTR	
A92-740	330-11GR1		RECEIVER	
A92-741	330-11GR2		RECEIVER	
A92-750	38638-16GR1		CASE	6

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SIGNAL SYSTEMS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A92-755			POLE MOUNTING KIT DWG 59649-22 GR1	
	0582-1	2	BOLT/NUT	
	0645-1	2	BOLT	
	1048-5	4	NUT	
	1048-6	6	NUT	
	01250-21	8	WASHER	
	01272-8	4	NUT	
	01273-10	2	WASHER	
	2400-1	2	WASHER	
	03615-28	4	SCREW	
	5676-14	4	BOLT	
	20476-4	2	BOLT	
	20476-6	2	BOLT	
	35378-12	2	ADAPTER	
	35845-659		PLATE	
	40513	2	SCREW	
	53029-75	4	WASHER	
A92-840	331-13GR1		XMTR	
A92-841	331-13GR2		XMTR	
A92-850	333 GR2		POWER AMP	
A92-855	333-3GR1		POWER AMP.	
A92-890	23423-9GR1		RADIOMETER	
A92-891	23423-8GR1		RADIOMETER	
A92-895	23418-2GR1		WHL DET	
A92-898	18792-16		RECORDER	
A92-900	2683-16		CABINET	
A92-901	2684-17		CABINET	
A92-902	18792-5		RECORDER	
A92-903	29003-4GR1		SOURCE FIXTURE	
A92-904			WTSU COMP. W/LAYOUT	
	23430-11		WTSU	
	23431-12GR1		LAYOUT	
A92-905			WTSU COMP. W/LAYOUT	
	23430-11		WTSU	
	23431-12GR2		LAYOUT	
A92-906			WTSU COMP. W/LAYOUT	
	23430-11		WTSU	
	23431-12GR3		LAYOUT	
A92-910	23418-8GR1		DETECTOR	
A92-911	23418-8GR2		DETECTOR	
A92-912	23471-1GR1		AIMING FIXTURE	
A92-913	30431 GR2		TEST LIGHT	
A92-914	30869-1GR5		CABINET	
A92-915	31099-2GR1		RADIOMETER CELL	
A92-916	42560-68GR5		SCANNER ASSEMBLY	
A92-918	43920-38GR1		JCT.BOX	
A92-919	43920-39GR1		JCT. BOX	
A92-920	43920-39GR2		JCT. BOX	
A92-921	43920-40GR1		JCT. BOX	
A92-922	56910-71		RECORDER	
A92-923	59271-4		CABINET	
A92-924	23471-3		FIXTURE ASSY	
A92-925	52918-32GR1		JCT. BOX	
A92-950	18792-11		RECORDER	
A92-951	18792-12		RECORDER	
A92-955	30424-7GR1		BOND COMP.	
A92-956	27954-2GR1		XFMR	
A92-957	50482-34GR1		RESISTOR ASSEM	
A92-958	59761-76GR1		PWR SUPPLY	
A92-961	57822-13GR1		DECODER	
A92-963	57822-13GR3		DECODER	
A92-964	57822-13GR4		DECODER	
A92-966	29014-1GR2		DETECTOR 200 HERTZ	
A92-967	53587-40		RESISTOR	
A92-968	50482-35		RESISTOR PHASE	
A92-969	29014-2GR1		DETECTOR	
A92-970	27359-7GR1		TRANSC	
A92-974	31138-2GR4		FREQ SET	
A92-975	31138-2GR5		FREQ.SET	
A92-976	31138-2GR6		FREQ.SET	
A92-977	31138-2GR7		FREQ.SET	
A92-978	31138-2GR8		FREQ.SET	
A92-979	31138-2GR9		FREQ.SET	
A92-980	31138-2GR10		FREQ.SET	
A92-981	31138-2GR11		FREQ.SET	
A92-985	31449-1GR1		ISLAND GRP	
A92-989	13444-10GR1		REACTOR PHASE SEL	

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SIGNAL SYSTEMS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A92-990	55233-6GR1		WIDE BAND SHUNT	
A92-991	43920-42GR1		TUNED SHUNT	
A92-992	43920-41GR1		TUNED SHNT	
A92-993	43920-41GR2		TUNED SHNT	
A92-994	43920-41GR3		TUNED SHNT	
A92-995	43920-41GR4		TUNED SHNT	
A92-996	43920-41GR5		TUNED SHNT	
A92-997	43920-41GR6		TUNED SHNT	
A92-998	43920-41GR7		TUNED SHNT	
A92-1010			RECEIVER CHANNEL 10 DWG 330-16 GR 10	5
	330-16GR1		RECEIVER	
	31138-3GR10		FREQ SET	
A92-1011			RECEIVER CHANNEL 11 DWG 330-16 GR 11	5
	330-16GR1		RECEIVER	
	31138-3GR11		FREQ SET	
A92-1012			RECEIVER CHANNEL 12 DWG 330-16 GR 12	5
	330-16GR1		RECEIVER	
	31138-3GR12		FREQ SET	
A92-1013			RECEIVER CHANNEL 13 DWG 330-16 GR 13	5
	330-16GR1		RECEIVER	
	31138-3GR13		FREQ SET	
A92-1014			RECEIVER CHANNEL 14 DWG 330-16 GR 14	5
	330-16GR1		RECEIVER	
	31138-3GR14		FREQ SET	
A92-1015			RECEIVER CHANNEL 15 DWG 330-16 GR 15	5
	330-16GR1		RECEIVER	
	31138-3GR15		FREQ SET	
A92-1016			RECEIVER CHANNEL 16 DWG 330-16 GR 16	5
	330-16GR1		RECEIVER	
	31138-3GR16		FREQ SET	
A92-1017			RECEIVER CHANNEL 17 DWG 330-16 GR 17	5
	330-16GR1		RECEIVER	
	31138-3GR17		FREQ SET	
A92-1018			RECEIVER CHANNEL 18 DWG 330-16 GR 18	5
	330-16GR1		RECEIVER	
	31138-3GR18		FREQ SET	
A92-1019			RECEIVER CHANNEL 19 DWG 330-16 GR 19	5
	330-16GR1		RECEIVER	
	31138-3GR19		FREQ SET	
A92-1020			RECEIVER CHANNEL 20 DWG 330-16 GR 20	5
	330-16GR1		RECEIVER	
	31138-3GR20		FREQ SET	
A92-1021			RECEIVER CHANNEL 21 DWG 330-16 GR 21	5
	330-16GR1		RECEIVER	
	31138-3GR21		FREQ SET	
A92-1022			RECEIVER CHANNEL 22 DWG 330-16 GR 22	5
	330-16GR1		RECEIVER	
	31138-3GR22		FREQ SET	

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CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A92-1023			RECEIVER CHANNEL 23 DWG 330-16 GR 23	5
	330-16GR1		RECEIVER	
	31138-3GR23		FREQ SET	
A92-1024			RECEIVER CHANNEL 24 DWG 330-16 GR 24	5
	330-16GR1		RECEIVER	
	31138-3GR24		FREQ SET	
A92-1025			RECEIVER CHANNEL 25 DWG 330-16 GR 25	5
	330-16GR1		RECEIVER	
	31138-3GR25		FREQ SET	
A92-1026			RECEIVER CHANNEL 26 DWG 330-16 GR 26	5
	330-16GR1		RECEIVER	
	31138-3GR26		FREQ SET	
A92-1027			RECEIVER CHANNEL 27 DWG 330-16 GR 27	5
	330-16GR1		RECEIVER	
	31138-3GR27		FREQ SET	
A92-1050	27359-8GR25		XCVR	3
A92-1051	27359-8GR26		XCVR	3
A92-1052	27359-8GR27		XCVR	3
A92-1060	27359-9GR1		XCVR	
A92-1065	330-17GR1		RCVR COMP	
A92-1070	331-16GR1		XMTR	
A92-1110			XMTR CHANNEL 10 DWG 331-15 GR 10	5
	331-15GR1		XMTR	
	31138-4GR10		FREQ SET	
A92-1111			XMTR CHANNEL 11 DWG 331-15 GR 11	5
	331-15GR1		XMTR	
	31138-4GR11		FREQ SET	
A92-1112			XMTR CHANNEL 12 DWG 331-15 GR 12	5
	331-15GR1		XMTR	
	31138-4GR12		FREQ SET	
A92-1113			XMTR CHANNEL 13 DWG 331-15 GR 13	5
	331-15GR1		XMTR	
	31138-4GR13		FREQ SET	
A92-1114			XMTR CHANNEL 14 DWG 331-15 GR 14	5
	331-15GR1		XMTR	
	31138-4GR14		FREQ SET	
A92-1115			XMTR CHANNEL 15 DWG 331-15 GR 15	5
	331-15GR1		XMTR	
	31138-4GR15		FREQ SET	
A92-1116			XMTR CHANNEL 16 DWG 331-15 GR 16	5
	331-15GR1		XMTR	
	31138-4GR16		FREQ SET	
A92-1117			XMTR CHANNEL 17 DWG 331-15 GR 17	5
	331-15GR1		XMTR	
	31138-4GR17		FREQ SET	

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CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A92-1118			XMTR	5
			CHANNEL 18	
			DWG 331-15	
			GR 18	
	331-15GR1		XMTR	
	31138-4GR18		FREQ SET	
A92-1119			XMTR	5
			CHANNEL 19	
			DWG 331-15	
			GR 19	
	331-15GR1		XMTR	
	31138-4GR19		FREQ SET	
A92-1120			XMTR	5
			CHANNEL 20	
			DWG 331-15	
			GR 20	
	331-15GR1		XMTR	
	31138-4GR20		FREQ SET	
A92-1121			XMTR	5
			CHANNEL 21	
			DWG 331-15	
			GR 21	
	331-15GR1		XMTR	
	31138-4GR21		FREQ SET	
A92-1122			XMTR	5
			CHANNEL 22	
			DWG 331-15	
			GR 22	
	331-15GR1		XMTR	
	31138-4GR22		FREQ SET	
A92-1123			XMTR	5
			CHANNEL 23	
			DWG 331-15	
			GR 23	
	331-15GR1		XMTR	
	31138-4GR23		FREQ SET	
A92-1124			XMTR	5
			CHANNEL 24	
			DWG 331-15	
			GR 24	
	331-15GR1		XMTR	
	31138-4GR24		FREQ SET	
A92-1125			XMTR	5
			CHANNEL 25	
			DWG 331-15	
			GR 25	
	331-15GR1		XMTR	
	31138-4GR25		FREQ SET	
A92-1126			XMTR	5
			CHANNEL 26	
			DWG 331-15	
			GR 26	
	331-15GR1		XMTR	
	31138-4GR26		FREQ SET	
A92-1127			XMTR	5
			CHANNEL 27	
			DWG 331-15	
			GR 27	
	331-15GR1		XMTR	
	31138-4GR27		FREQ SET	
A92-1130	23423-7GR1		RADIOMETER	5
A92-1131	3204-5GR2		BLOWER	5
A92-1132	55116-7GR1		SUPPORT	5
A92-1135	31750 GR1		CODE XMTR	
A92-1136	57822-18GR1		DECODER	

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SIGNAL SYSTEMS

CAT.NO.	DRAWING NO. QTY	NAME	PG.
P92-689	23441-4GR1	DIODE	
P92-690	31049-26GR1	BOARD	
P92-692	31049-111GR2	BOARD	
P92-693	31049-111GR3	BOARD	
P92-694	31049-111GR4	BOARD	
P92-695	31049-111GR5	BOARD	
P92-696	31049-111GR6	BOARD	
P92-697	31049-111GR7	BOARD	
P92-698	31049-111GR8	BOARD	4
P92-700	31049-73GR2	SUPP BD	4, 7
P92-703	31049-222GR8	REC AMP BD	
P92-704	31049-79GR5	BOARD	
P92-705	31049-80GR1	REL DR BD	7
P92-706	31049-233GR1	BOARD	4
P92-710	31138-3GR10	FREQ SET	7
P92-711	31138-3GR11	FREQ SET	7
P92-712	31138-3GR12	FREQ SET	7
P92-713	31138-3GR13	FREQ SET	7
P92-714	31138-3GR14	FREQ SET	7
P92-715	31138-3GR15	FREQ SET	7
P92-716	31138-3GR16	FREQ SET	7
P92-717	31138-3GR17	FREQ SET	7
P92-718	31138-3GR18	FREQ SET	7
P92-719	31138-3GR19	FREQ SET	7
P92-720	31138-3GR20	FREQ SET	7
P92-721	31138-3GR21	FREQ SET	7
P92-722	31138-3GR22	FREQ SET	7
P92-723	31138-3GR23	FREQ SET	7
P92-724	31138-3GR24	FREQ SET	7
P92-725	31138-3GR25	FREQ.SET	7
P92-726	31138-3GR26	FREQ.SET	7
P92-727	31138-3GR27	FREQ.SET	7
P92-730	31049-95GR10	OSC BD	8
P92-731	31049-95GR11	OSC BD	8
P92-732	31049-95GR12	OSC BD	8
P92-733	31049-95GR13	OSC BD	8
P92-734	31049-95GR14	OSC BD	8
P92-735	31049-95GR15	OSC BD	8
P92-736	31049-95GR16	OSC BD	8
P92-737	31049-95GR17	OSC BD	8
P92-738	31049-95GR18	OSC BD	8
P92-739	31049-95GR19	OSC BD	8
P92-740	31049-95GR20	OSC BD	8
P92-741	31049-95GR21	OSC BD	8
P92-742	31049-95GR22	OSC BD	8
P92-743	31049-95GR23	OSC BD	8
P92-744	31049-95GR24	OSC BD	8
P92-747	31049-97GR1	MOD BD	7
P92-748	31049-97GR2	BD MDTLR	4
P92-750	31049-98GR10	INPUT REC BD	8
P92-751	31049-98GR11	INPUT REC BD	8
P92-752	31049-98GR12	INPUT REC BD	8
P92-753	31049-98GR13	INPUT REC BD	8
P92-754	31049-98GR14	INPUT REC BD	8
P92-755	31049-98GR15	INPUT REC BD	8
P92-756	31049-98GR16	INPUT REC BD	8
P92-757	31049-98GR17	INPUT REC BD	8
P92-758	31049-98GR18	INPUT REC BD	8
P92-759	31049-98GR19	INPUT REC BD	8
P92-760	31049-98GR20	INPUT REC BD	8
P92-761	31049-98GR21	INPUT REC BD	8
P92-762	31049-98GR22	INPUT REC BD	8
P92-763	31049-98GR23	INPUT REC BD	8
P92-764	31049-98GR24	INPUT REC BD	8
P92-767	31049-99GR1	IN/OP BD	7
P92-770	31049-448 GR10	AMP BD	
P92-771	31049-448 GR11	AMP BD	
P92-772	31049-448 GR12	AMP BD	
P92-773	31049-448 GR13	AMP BD	
P92-774	31049-448 GR14	AMP BD	
P92-775	31049-448 GR15	AMP BD	

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CAT.NO.	DRAWING NO. QTY	NAME	PG.
P92-776	31049-448 GR16	AMP BD	
P92-777	31049-448 GR17	AMP BD	
P92-778	31049-448 GR18	AMP BD	
P92-779	31049-448 GR19	AMP BD	
P92-780	31049-448 GR20	AMP BD	
P92-781	31049-448 GR21	AMP BD	
P92-782	31049-448 GR22	AMP BD	
P92-783	31049-448 GR23	AMP BD	
P92-784	31049-448 GR24	AMP BD	
P92-786	31049-235GR1	BOARD	
P92-787	31049-103GR1	KIT	6
P92-789	31049-239GR1	JUMPER BD	7
P92-790	31049-94GR10	REC DET BD	
P92-791	31049-94GR11	REC DET BD	
P92-792	31049-94GR12	REC DET BD	
P92-793	31049-94GR13	REC DET BD	
P92-794	31049-94GR14	REC DET BD	
P92-795	31049-94GR15	REC DET BD	
P92-796	31049-94GR16	REC DET BD	
P92-797	31049-94GR17	REC DET BD	
P92-798	31049-94GR18	REC DET BD	
P92-799	31049-94GR19	REC DET BD	
P92-800	31049-94GR20	REC DET BD	
P92-801	31049-94GR21	REC DET BD	
P92-802	31049-94GR22	REC DET BD	
P92-803	31049-94GR23	REC DET BD	
P92-804	31049-94GR24	REC DET BD	
P92-805	31049-94GR25	REC DET BD	
P92-806	31049-94GR26	REC DET BD	
P92-807	31049-94GR27	REC DET BD	
P92-810	31138-4GR10	FREQ SET	7
P92-811	31138-4GR11	FREQ SET	7
P92-812	31138-4GR12	FREQ SET	7
P92-813	31138-4GR13	FREQ SET	7
P92-814	31138-4GR14	FREQ SET	7
P92-815	31138-4GR15	FREQ SET	7
P92-816	31138-4GR16	FREQ SET	7
P92-817	31138-4GR17	FREQ SET	7
P92-818	31138-4GR18	FREQ SET	7
P92-819	31138-4GR19	FREQ SET	7
P92-820	31138-4GR20	FREQ SET	7
P92-821	31138-4GR21	FREQ SET	7
P92-822	31138-4GR22	FREQ SET	7
P92-823	31138-4GR23	FREQ SET	7
P92-824	31138-4GR24	FREQ SET	7
P92-825	31138-4GR25	FREQ SET	7
P92-826	31138-4GR26	FREQ SET	7
P92-827	31138-4GR27	FREQ SET	7
P92-830	332-4GR10	COUP UNIT	8
P92-831	332-4GR11	COUP UNIT	8
P92-832	332-4GR12	COUP UNIT	8
P92-833	332-4GR13	COUP UNIT	8
P92-834	332-4GR14	CPLNG UNIT	8
P92-835	332-4GR15	COUP UNIT	8
P92-836	332-4GR16	COUP UNIT	8
P92-837	332-4GR17	CPLNG UNIT	8
P92-838	332-4GR18	COUP UNIT	8
P92-839	332-4GR19	COUP UNIT	8
P92-840	332-4GR20	COUP UNIT	8
P92-841	332-4GR21	COUP UNIT	8
P92-842	332-4GR22	COUP UNIT	8
P92-843	332-4GR23	COUP UNIT	8
P92-844	332-4GR24	COUP UNIT	8
P92-845	31049-246 GR25	BD CPLG UNIT	8
P92-846	31049-246 GR26	BD CPLG UNIT	8
P92-847	31049-246 GR27	BD CPLG UNIT	8
P92-850	59649-17GR1	PLATE	
P92-855	31049-402 GR25	REC DET BOARD	4
P92-856	31049-402 GR26	REC DET BOARD	4
P92-857	31049-402 GR27	REC DET BOARD	4
P92-860	31049-162GR3	BOARD	
P92-861	31049-163GR2	BOARD	
P92-862	31049-327GR1	BOARD	

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SIGNAL SYSTEMS

CAT.NO.	DRAWING NO. QTY	NAME	PG.
P92-863	31049-328GR1	BOARD	
P92-864	31049-329GR1	BOARD	
P92-865	31049-329GR2	BOARD	
P92-866	31049-354GR1	BOARD	
P92-875	31049-128 GR25	REC.IN.BD.	8
P92-876	31049-128 GR26	REC.IN.BD.	8
P92-877	31049-128 GR27	RCVR IN. BOARD	8
P92-901	0934-40	PWR SUPPLY	24
P92-902	0934-20	PWR SUPPLY	23
P92-903	5235 GR5	BOARD	
P92-904	24745	TOOL	26
P92-905	24745-41	TOOL	26
P92-906	30858 GR2	BOARD ASSY	21
P92-907	30858-2GR2	BOARD	21
P92-908	30858-3GR1	BOARD	21
P92-912	30858-10GR1	BOARD	23
P92-913	30858-10GR2	BOARD	23
P92-914	30858-10GR3	BOARD	23
P92-915	30858-10GR4	BOARD	23
P92-916	30858-11GR1	BOARD	23
P92-917	30858-13GR1	BOARD	
P92-918	30858-15GR1	BOARD	
P92-919	30858-15GR2	BOARD	
P92-920	30858-15GR3	BOARD	
P92-921	30858-15GR4	BOARD	24
P92-923	30858-19GR2	BOARD	23
P92-924	30858-22GR1	BOARD	22
P92-925	30858-23GR1	BOARD	22
P92-926	30858-24GR1	BOARD	
P92-927	30858-54GR1	BOARD	21, 25
P92-928	30858-26GR1	BOARD	
P92-929	30858-26GR2	BOARD	
P92-930	30858-26GR3	BOARD	
P92-931	30858-26GR4	BOARD	
P92-932	30858-26GR5	BOARD	
P92-933	30858-26GR6	BOARD	
P92-934	30858-26GR7	BOARD	
P92-935	30858-26GR8	BOARD	
P92-936	30858-26GR9	BOARD	
P92-937	30858-26GR10	BOARD	
P92-938	30858-26GR11	BOARD	
P92-939	30858-26GR12	BOARD	
P92-940	30858-26GR13	BOARD	
P92-941	30858-26GR14	BOARD	
P92-942	30858-26GR15	BOARD	
P92-943	30858-26GR16	BOARD	
P92-944	30858-26GR17	BOARD	
P92-945	30858-26GR18	BOARD	
P92-946	30858-27GR1	BOARD	25
P92-947	30858-28GR1	BOARD	25
P92-948	30858-29GR1	BOARD	
P92-949	30858-29GR2	BOARD	
P92-950	30858-29GR3	BOARD	
P92-951	30858-29GR4	BOARD	
P92-952	30858-29GR5	BOARD	
P92-953	30858-29GR6	BOARD	
P92-954	30858-29GR7	BOARD	
P92-955	30858-29GR8	BOARD	
P92-956	30858-29GR9	BOARD	
P92-957	30858-29GR10	BOARD	
P92-958	30858-29GR11	BOARD	
P92-959	30858-29GR12	BOARD	
P92-960	30858-29GR13	BOARD	
P92-961	30858-29GR14	BOARD	
P92-962	30858-29GR15	BOARD	
P92-963	30858-29GR16	BOARD	
P92-964	30858-29GR17	BOARD	
P92-965	30858-29GR18	BOARD	25
P92-966	30858-30GR1	BOARD	
P92-967	30858-34GR1	BOARD	22
P92-968	30858-37GR1	BOARD	25
P92-969	30858-41GR1	BOARD	21
P92-970	30858-44GR1	BOARD	21
P92-974	30858-46GR1	BOARD	22
P92-975	38216-43GR1	CABLE-3 FT	20
P92-976	38216-43GR4	CABLE-5 FT	20
P92-978	42760-232GR1	JUMPER 3"	21
P92-979	42760-232GR2	JUMPER 12"	21
P92-980	42760-232GR3	JUMPER 18"	21
P92-981	42760-240GR1	JUMPER 20"	21
P92-982	42760-241GR1	JMPR 20 FT	21
P92-983	46048-22GR8	TERM BLOCK	
P92-984	46048-28GR2	TERM BLOCK	
P92-985	49145-4	INK 1/2 PT	
P92-986	52238-195	PLATE	
P92-987	52313-34	HOSE	20
P92-988	55029-36 0	ROLL PAPER PAPER	24
P92-989	57629-9GR1	KIT	20

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SIGNAL SYSTEMS

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
P92-990			KIT P92-990	20
	57629-9GR1		KIT	
	068	6	LAG SCREW	
	40513	4	SCREW	
	59825-140	8	TERMINAL	
	59825-132	14	TERMINAL	
P92-991			GUARD ASSEMBLY COMPLETE	22
	58776-5		GUARD	
	2472-45	2	SCREW	
	42333-41	2	NUT	
	01250-17	2	NUTS	
P92-992			GUARD ASSEMBLY COMPLETE	22
	58776-6		GUARD	
	2472-45	2	SCREWS	
	42333-41	2	NUTS	
	01250-17	2	NUTS	
P92-994	59473-364GR1		BOARD	21
P92-995	59474-511		BOARD	23
P92-998	30858-19GR1		BOARD	24
P92-999			ROLL PAPER	24
	55029-38	500	PAPER (FT)	
P92-1000			ROLL PAPER	
	55029-39	500	PAPER	
P92-1001	31049-95GR25		BD OSC	4, 8
P92-1002	31049-95GR26		BD OSC 17.0 KHZ	4, 8
P92-1003	31049-95GR27		BD OSC 20.9 KHZ	4, 8
P92-1006	31049-448 GR25		AMP BD	
P92-1007	31049-448 GR26		AMP BD	
P92-1008	31049-448 GR27		AMP BD	
P92-1011	31049-248GR1		AMP.BOARD	
P92-1012	31049-249GR1		AMP.BOARD	
P92-1020	31049-220 GR17		CODE GEN BOARD	
P92-1021	31049-220 GR18		CODE GEN BOARD	
P92-1022	31049-220 GR19		CODE GEN BOARD	
P92-1023	31049-220 GR20		CODE GEN BOARD	
P92-1024	31049-220 GR21		CODE GEN BOARD	
P92-1034	31049-376GR4		OSC BOARD	
P92-1035	31049-376GR5		OSC BOARD	
P92-1036	31049-376GR6		OSC BOARD	
P92-1037	31049-376GR7		OSC BOARD	
P92-1038	31049-376GR8		OSC BOARD	
P92-1039	31049-376GR9		OSC BOARD	
P92-1040	31049-376 GR10		OSC BOARD	
P92-1041	31049-376 GR11		OSCILLATOR BOARD	
P92-1046	31049-373GR1		PWR FILTER	
P92-1048	31049-380GR1		MOTION DET	
P92-1050	31049-374GR1		RCVR AMP	
P92-1052	31049-371GR2		RLY DRIVER	
P92-1054	31049-375GR1		MOTION DET. AMP.	
P92-1055	31049-375GR2		MOTION DET.AMP.	
P92-1057	31049-378GR1		IS.AMP.	
P92-1059	31049-379GR1		IS LEV DET	
P92-1062	01092-442		XMTR FLT CH 4	
P92-1063	01092-443		XMTR FLT CH 5	
P92-1064	01092-444		XMTR FLT CH 6	
P92-1065	01092-445		XMTR FLT CH 7	
P92-1066	01092-446		XMTR FLT CH 8	
P92-1067	01092-447		XMTR FLT CH 9	
P92-1068	01092-448		XMTR FLT CH 10	
P92-1069	01092-449		XMTR FLT CH 11	

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SIGNAL SYSTEMS

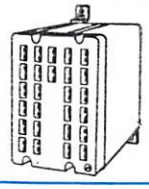
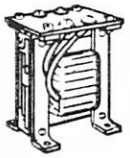
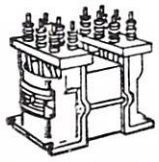
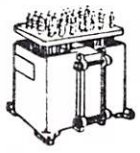
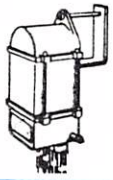
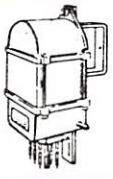
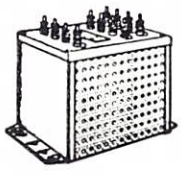
CAT.NO.	DRAWING NO.	QTY	NAME	PG.	CAT.NO.	DRAWING NO.	QTY	NAME	PG.
P92-1070	01092-450		REC FILTER CH. 4						
P92-1071	01092-451		REC FILTER CH. 5						
P92-1072	01092-452		REC FILTER CH.6						
P92-1073	01092-453		REC FILTER CH. 7						
P92-1074	01092-454		REC FILTER CH. 8						
P92-1075	01092-455		REC FILTER CH. 9						
P92-1076	01092-456		REC FILTER CH. 10						
P92-1077	01092-457		REC FILTER CH. 11						
P92-1080	31049-390GR1		REG BOARD						
P92-1084	47630-14GR5		CAP UNIT						
P92-1085	30858-56GR1		BD TST GTE						
P92-1086	56937-42		ARRESTER						
P92-1087	17558-7GR2		SUPPRESSOR						
P92-1088	59473-550GR1		CAP BOARD						
P92-1089	50482-252		RES BOARD						
P92-1090	17558-8GR1		SUPPRESSOR						
P92-1094	30858-46GR2		BOARD						
P92-1096	30858-52GR2		BOARD						
P92-1097	30858-43GR1		BOARD						
P92-1101	38216-43GR7		CABLE						
P92-1102	38216-43GR2		CABLE						
P92-1103	80457-15GR1		WIRE						
P92-1104	65156-54GR1		CABLE						
P92-1105	30869-111GR1		CABINET						
P92-1106	59473-607GR1		AMP BOARD						
P92-1107	30858-58GR1		REG BOARD						
P92-1108	30858-52GR1		ALARM BRD						
P92-1109	30858-53GR1		APPL BRD						

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GRS CATALOG 95-1

GRS TRANSFORMERS For Signaling and Control Systems

GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL

	TYPE	VOLTAGE RANGES		CAPACITY RANGES	PAGE
		PRIMARY	SECONDARY	VOLT-AMPERES	
	**UT** UNIVERSAL	120 - 240	1 - 18	396	4
	**S1** COMPACT	110 - 115	0.5 - 12.5	60	8
	**S2** COMPACT	110	10	5	8
	**K ½** REGULAR AND SPECIAL MOUNTINGS	110 - 230	1 - 18	25 - 100	8
	**K1 & K2** REGULAR MOUNTINGS	110 - 575	0.25 - 120	250 - 1000	11
	**K1** POLE MOUNTED	230 - 575	115	150 - 300	12
	**K2** POLE MOUNTED	230 - 575	115	750 - 1500	12
	**U1** VENTILATED CASE	110 - 230	0.25 - 27.75	220 - 310	13

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INTRODUCTION

GRS transformers, designed expressly for use in railway signaling, are available in a wide range of sizes, with capacities ranging from 5 to 1500 volt-amperes. Applications include: control panel lighting, signal lighting, battery charging, energy for a-c track circuits, relays, cTc code lines, etc.

Although designed primarily for 60-Hz operation, GRS transformers operate satisfactorily on line frequencies of 50 to 100 Hz with only a slight reduction of maximum available power.

RUGGED CONSTRUCTION

GRS transformers are made with silicon steel lamina to ensure high operating efficiency. Windings are of Formvar or polyurethane insulated wire. After winding, the coils are heated to drive out moisture, varnish dipped, and baked. Internal leads are securely fastened to A.A.R., Faston, or screw terminals.

All GRS transformers can withstand 3000 volts between windings or from winding to core, except Type S2, which can withstand 1000 volts between windings or from winding to core.

WIDE SELECTION

GRS has lighting transformers small enough to mount inside a signal housing, line transformers with pole mounting brackets, and battery charging and lighting transformers designed for wall, rack, or shelf mounting. Most types have primary and secondary taps to compensate for line voltage loss, provide for lamp dimming, etc.

VOLTAGE RATINGS AND TAPS

Transformer primary and secondary voltage ratings and taps are listed herein in abbreviated forms. Here are examples of such abbreviations, together with their meanings:

115(100-15)

The full winding is rated at 115 volts with taps at 100 and 15 volts. The current rating for this winding is the maximum current that can be delivered at 115 volts.

12(1-1-4-3-3)

The full winding is rated at 12 volts with taps to provide any voltage from 1 to 12 in 1-volt steps. The current rating is the maximum current that can be delivered at 12 volts.

230/115

Two 115-volt windings which can be connected on the terminal board either in series or in multiple to give 230 or 115 volts.

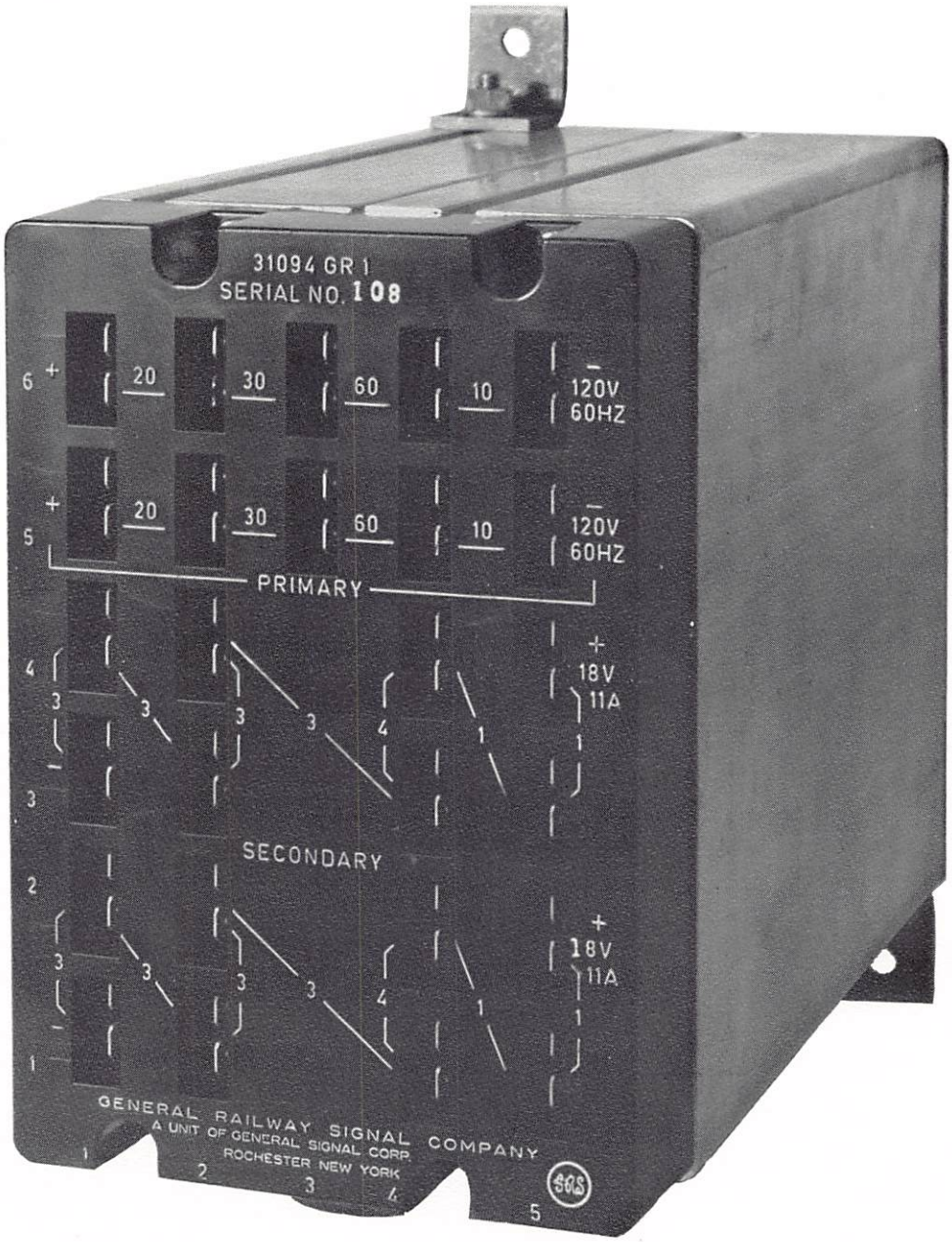
27.75[21(7-14)-6(1-3-2)-.75(.25-.5)]

The winding is wound in separate sections, parts of which may be connected in series to give a greater adjustment of terminal voltages than could be obtained from a continuous winding with the same number of terminal posts. Any voltage from 0.25 to 27.75 may be obtained in 0.25-volt steps.

Type UT

the Universal Transformer

Meets Virtually All Low-Voltage Power Requirements



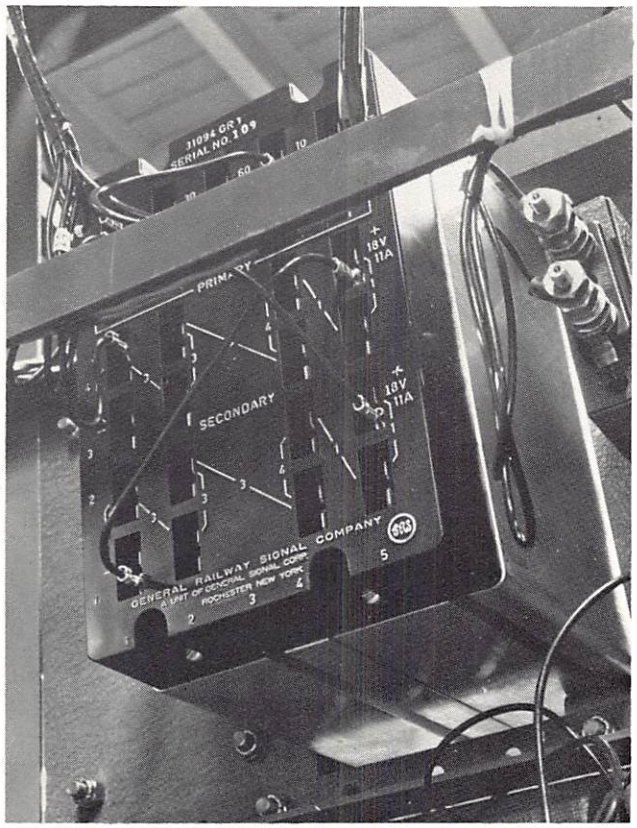
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The Type UT transformer meets virtually all of the low-voltage power requirements for railway signaling systems. It has two independent 120-volt 60-Hz primaries which can be connected either in parallel for a 120-volt input or in series for a 240-volt input. Each primary has 10-, 20-, 30-, and 60-volt taps. The two independent 18-volt secondaries are each capable of delivering 11 amperes at 1 to 18 volts in 1-volt steps. The secondaries can be connected in parallel to deliver 22 amperes at 1 to 18 volts. Available current is 25% less when the transformer is fed from a 50-Hz source.

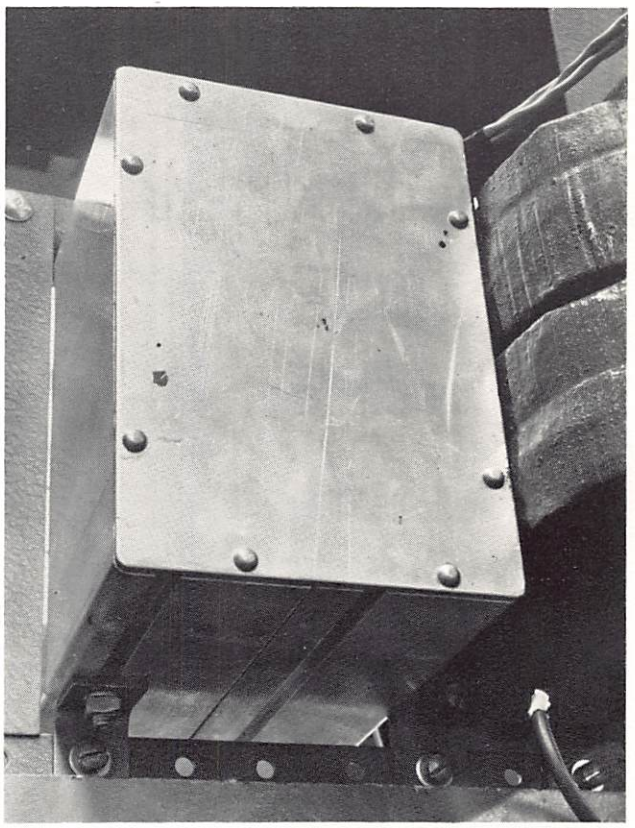
Each tap has two male terminals, which enable quickly made, positive connections using 0.250-inch Faston female terminals, which are included with the transformer. All terminals are protectively recessed in the impact-resistant "Noryl" resin terminal board. Numerals identifying the primary and secondary taps and interconnection lines are molded on the terminal board, as well as coordinate numbers for circuit reference.

Right-angle mounting brackets, supported in "T" slots in the two-piece extruded aluminum case, are adjustable to permit weight-balanced support on the crossrails of a Type B relay rack. Thus, the terminals are readily accessible on the wiring side of the rack. The brackets can be moved to the bottom of the case for backboard or shelf mounting.

The primary and secondary coils are varnish impregnated and encapsulated. The encapsulation material provides excellent heat dissipation.



Wiring side of rack.



Front of rack.

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Based on a careful study of the requirements of signal systems, the GRS Type UT transformer is ideal for handling the energy for signal lamps, a-c track circuits, battery charging rectifiers, control console panel lamps, cTc code lines, etc. Typical applications are shown in Figures 1 through 6.

ORDERING INFORMATION

To order, specify Type UT Transformer and give catalog number.

PRIMARY VOLTS	SECONDARY		TOTAL VOLT-AMPS	CATALOG NUMBER
	VOLTS	AMPERES		
240/120(20-30-60-10)	18(3-3-3-3-4-1-1)	11	396	A95-50

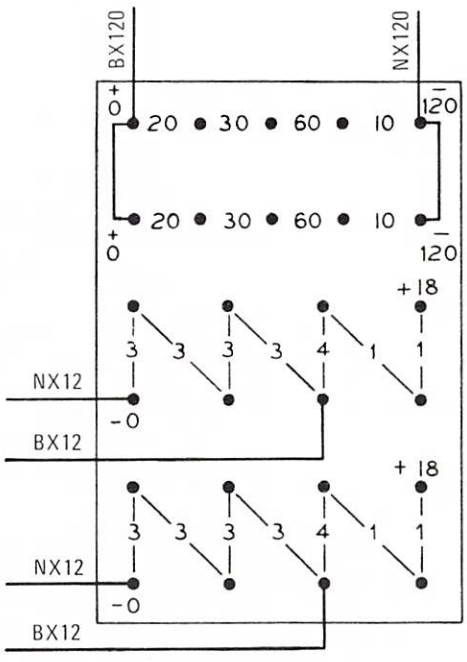


Figure 1. The two independent secondaries — 12 volts at up to 11 amperes each — can feed two a-c track circuits or feed signal lamps, including the power transfer relay.

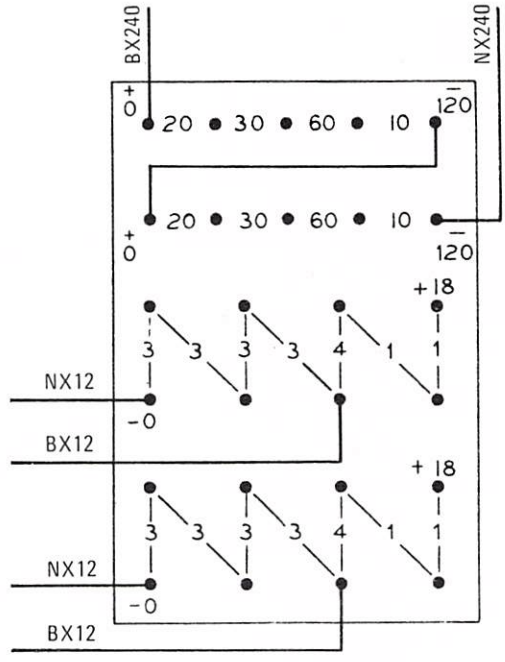


Figure 2. Same applications as described in Figure 1, except that the primaries are fed from 240 volts.

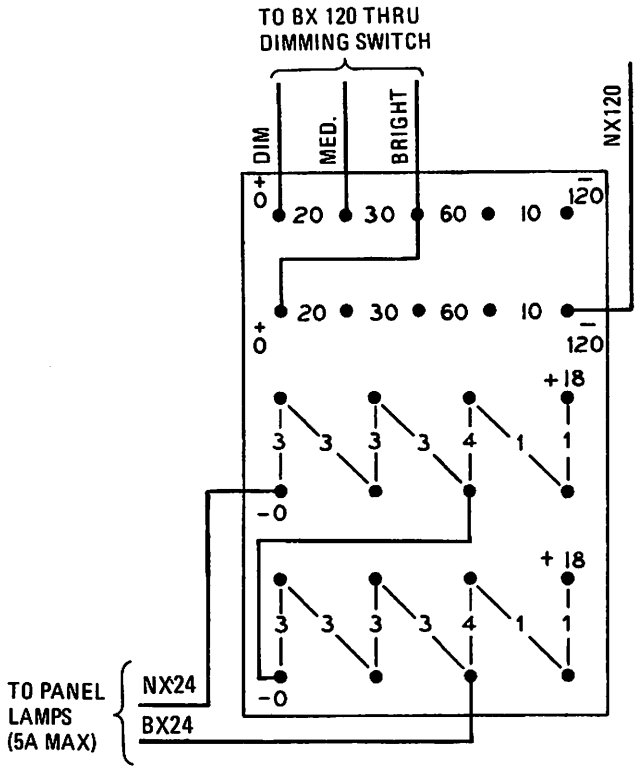


Figure 3. Control machine panel lamps fed from the series-connected secondaries to provide 24 volts at 5 amperes. Dimming is by switch selection of the primary taps.

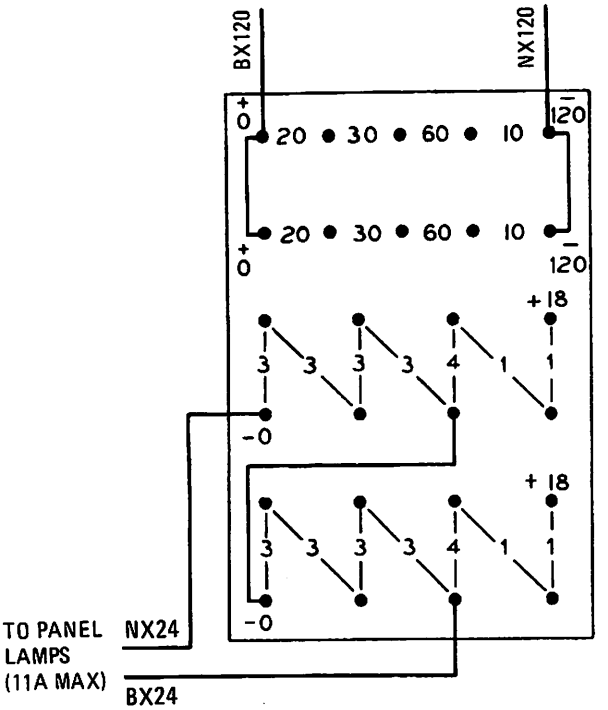


Figure 4. Primaries connected in parallel to provide 24 volts at 11 amperes for control machine panel lamps. Dimming is by a Variac.

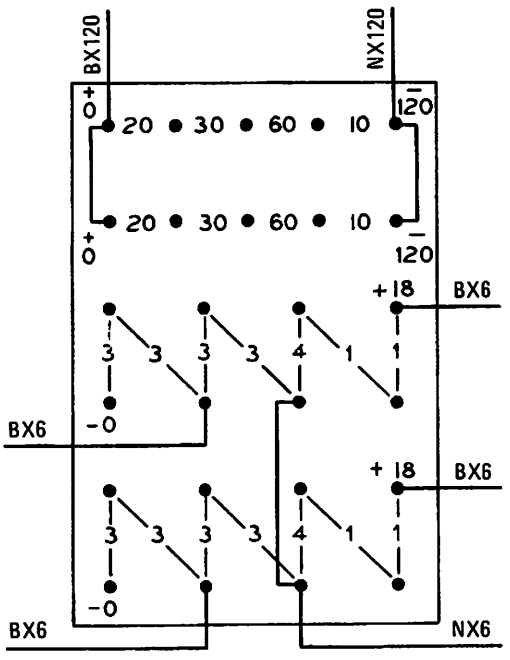


Figure 5. Secondaries star-connected with a single common to provide four 6-volt outputs at 11 amperes for control machine panel lamps. Dimming is by a Variac.

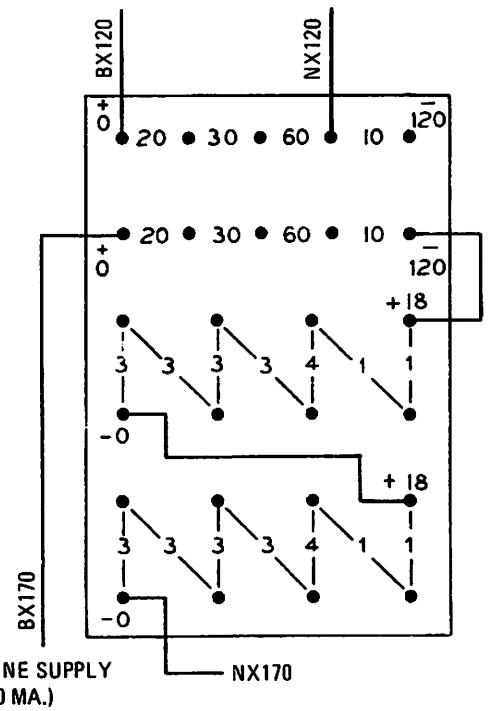
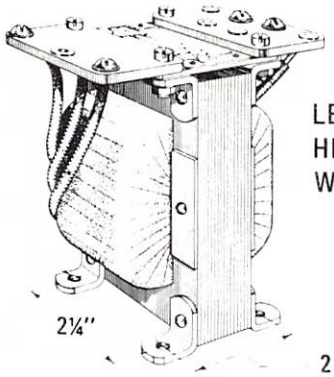


Figure 6. 170-volt output at up to 1.5 amperes for feeding a cTc line supply.

TYPES S1 AND S2 TRANSFORMERS

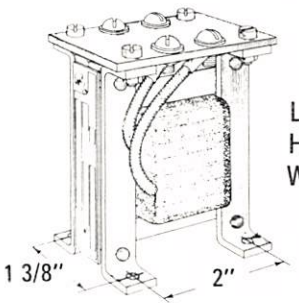
GRS Types S1 and S2 transformers are compact – they fit into the housings of most signal units and switch machines. Applications range from lighting signal lamps and panel lamps to feeding clearance track circuits. Connection is made to No. 10-32 screw terminals, which are securely fastened to a phenolic board, A.A.R. terminal posts, or Faston terminals.

TYPES S1

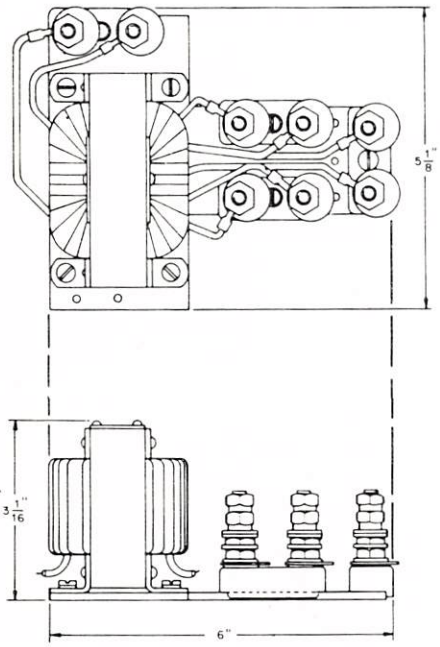


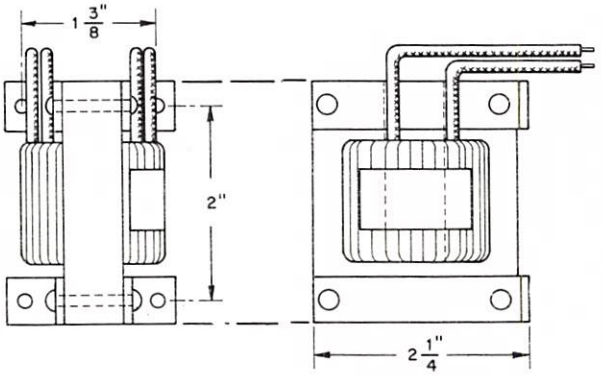
LENGTH - 4 13/16"
HEIGHT - 4 3/16"
WIDTH - 2 3/4"

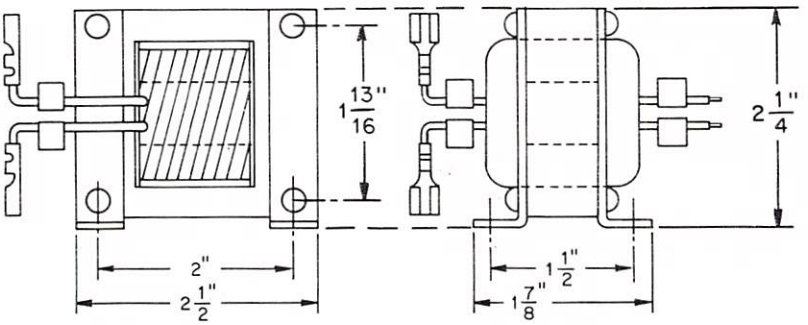
TYPES S2



LENGTH - 2 3/4"
HEIGHT - 3 1/8"
WIDTH - 1 3/4"







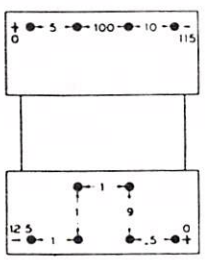


Figure 1

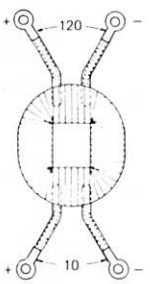


Figure 2

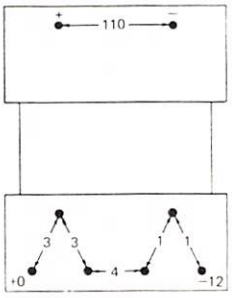


Figure 3

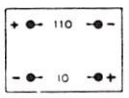


Figure 4

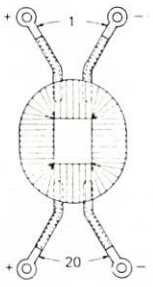


Figure 5

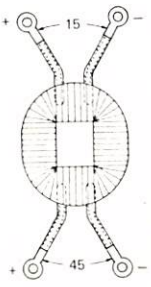


Figure 6

Voltage diagrams for Types S1, S2, and K½ Transformers.

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Voltage diagrams for Types S1, S2, and K½ Transformers.

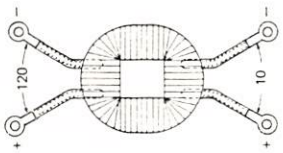


Figure 7

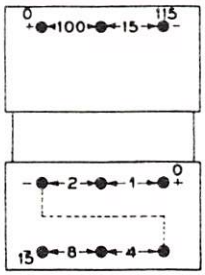


Figure 8

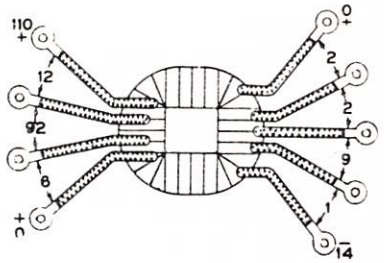


Figure 9

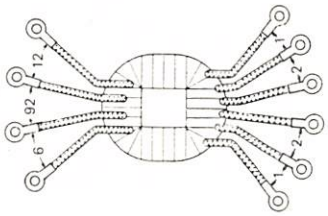


Figure 10

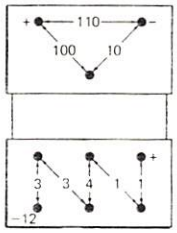


Figure 11

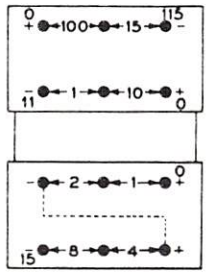


Figure 12

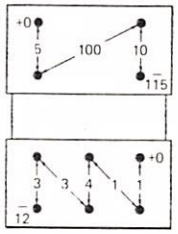


Figure 13

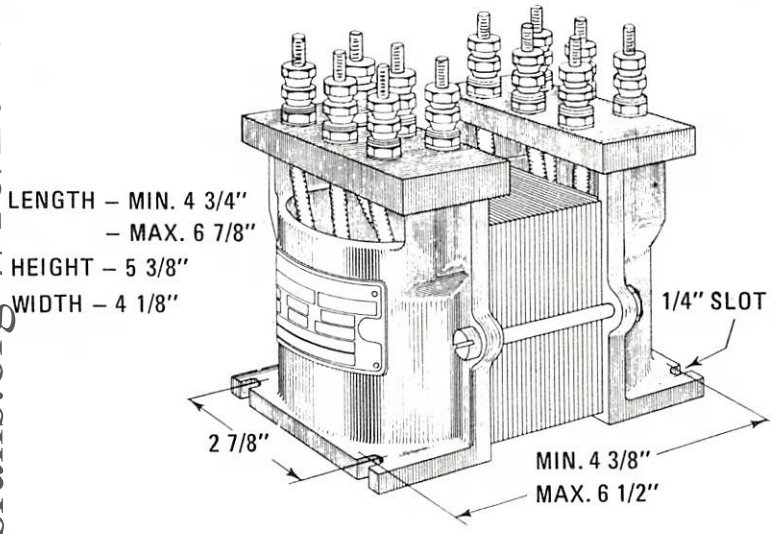
ORDERING INFORMATION

To order, specify Type of Transformer and give catalog number.

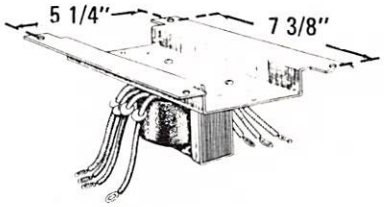
TYPE	PRIMARY VOLTS	SECONDARY		TOTAL VOLT-AMPS	VOLTAGE DIAGRAM	CATALOG NUMBER
		VOLTS	AMPERES			
S1	115 (5-100-10)	12.5(.5-9-1-1-1)	4.8	60	FIG. 1	A95-510
	120	10	6	60	FIG. 2	A95-601
	110	12(3-3-4-1-1)	3.3	40	FIG. 3	A95-602
	110	12(3-3-4-1-1)	3.3	40	FIG. 3	A95-603
S2	110	10	0.50	5	FIG. 4	A95-560
					FIG. 5	A95-570
	15	45			FIG. 6	A95-604
	120	10	.7	7	FIG. 7	A95-615
K½ (will not fit in signals)	115(100-15)	15[3(1-2)-12(4-8)]	6.7	100	FIG. 8	A95-10
	110(6-92-12)	14(2-2-9-1)	1.8	25	FIG. 9	A95-30
	110(6-92-12)	3(2-1)-3(2-1)	3.3	10	FIG 10	A95-38
	110(100-10)	12(1-1-4-3-3)	6.5	75	FIG. 11	A95-121
K½ (for mounting in signals)	110(5-95-10)	15(1-1-7-3-3)	6	90	FIG. 12	A95-102
	115(5-100-10)	12(1-1-4-3-3)	3.8	45	FIG. 13	A95-605

TYPE K½ TRANSFORMER

Type K½ transformer is used primarily for signal lighting and panel lighting. Catalog Numbers A95-10 and A95-121 are used in wayside housings to supply relay, signal, or code line energy: Catalog Number A95-30 and A95-38 mounts inside a Model 6 switch machine case to operate dwarf signal lights or a switch position indicator: Catalog Number A95-102 and A95-605 mount inside a Type D or Type G signal unit. See page 9 for ordering information.

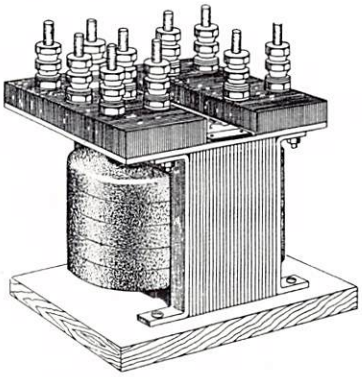


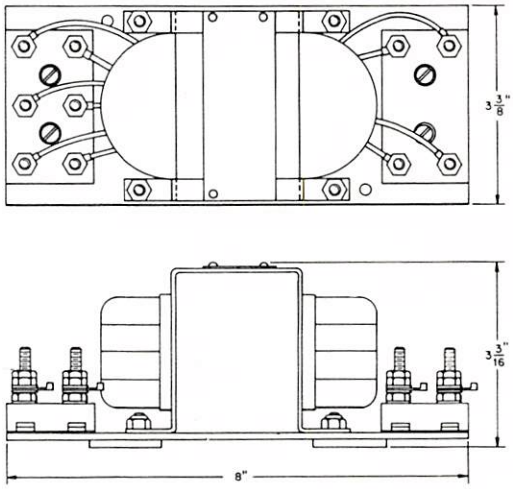
Catalog Nos. A95-10 and A95-121



HEIGHT – 3" APPROX.

Catalog Nos. A95-30 and A95-38



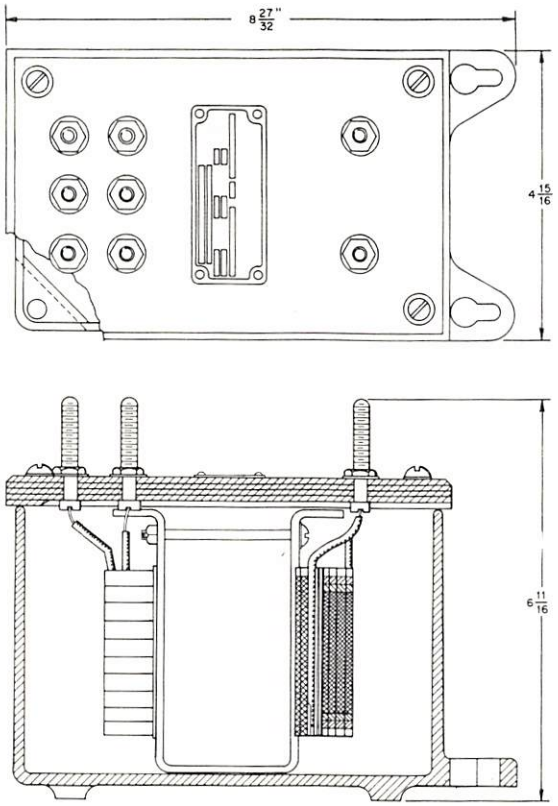


Catalog Nos. A95-102 and A95-605

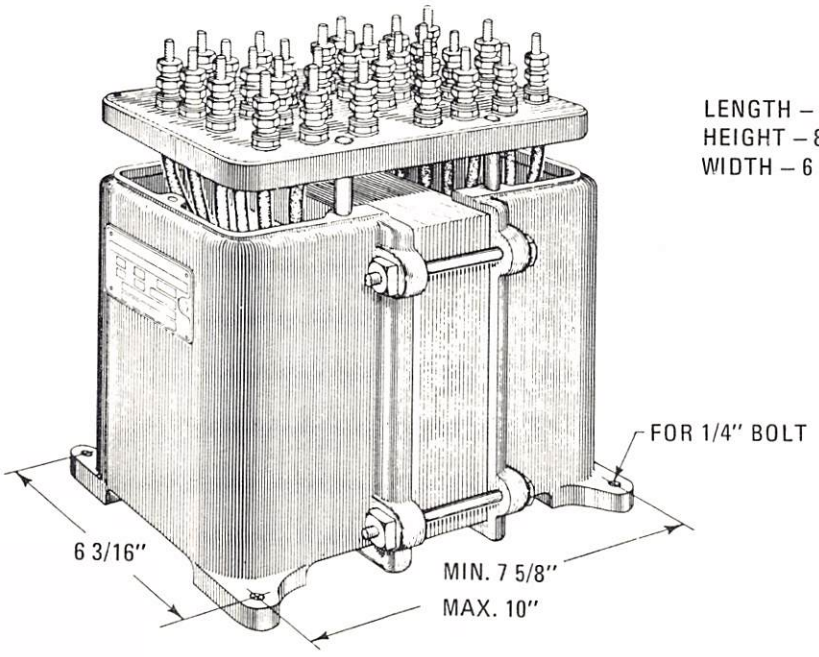
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TYPES K1 AND K2 TRANSFORMERS

The GRS Type K1 transformer has a cast-steel case with two mounting lugs on one end. A third lug can be supplied on the opposite end if required. The terminal board will accommodate up to 18 A.A.R. terminal posts. It is used for battery charging, signal lighting, track circuits, and other general uses.



The GRS Type K2 transformer has a cast-steel case and a terminal board containing up to 35 A.A.R. terminals. It is used to drop incoming power line voltage for operation of relays and battery chargers.



ORDERING INFORMATION

To order, specify Type K1 or K2 Transformer and give catalog number.

TYPE	PRIMARY VOLTS	SECONDARY			TOTAL VOLT - AMPS	VOLTAGE DIAGRAM	CATALOG NUMBER
		NO. OF WINDINGS	VOLTS	AMPERES			
K1	220 110/110(55-55)	1 2	220 14(4-3-5-1-1) 14(4-3-5-1-1)	0.7 4.3 4.3	150 145	FIG. 1 FIG. 2	A95-301 A95-606
K2	575/or 460 110(5-95-10) 230(10-210-10)	1 1 1	120(15-30-70-5) 40(25-3-3-3-3-3) 40(1-1-1-1-1-1-1-1-2-2-2-2-2-2-20)	9.1 18.75 12	1000 750 480	FIG. 3 FIG. 4 FIG. 5	A95-241 A95-607 A95-608

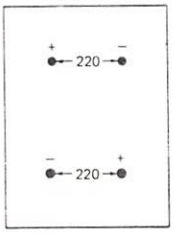


Figure 1

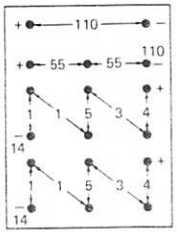


Figure 2

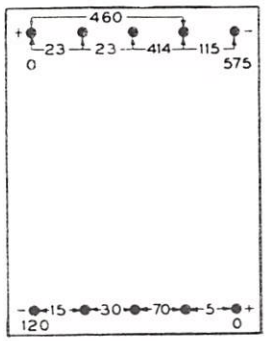


Figure 3

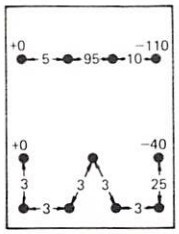


Figure 4

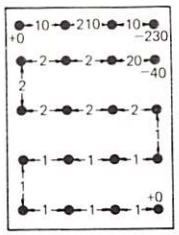


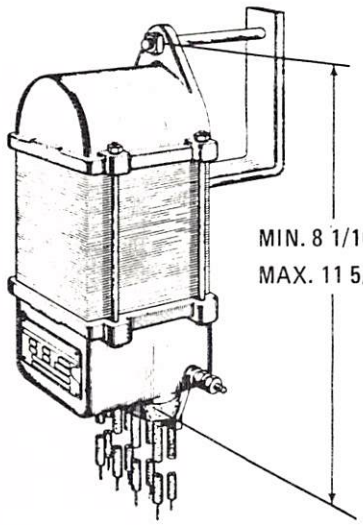
Figure 5

Voltage diagrams for Type K1 and K2 Transformers.

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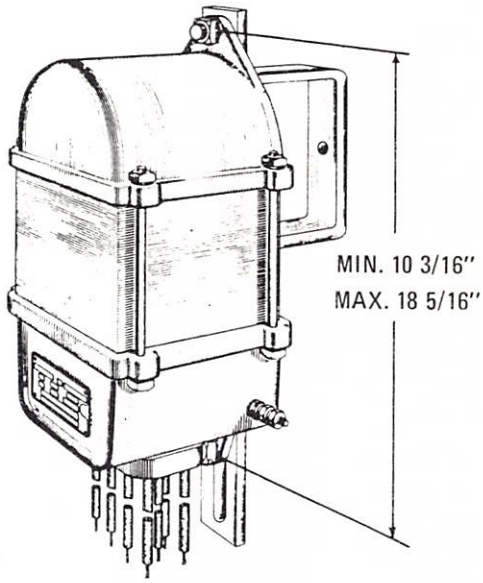
TYPES K1 AND K2 POLE-MOUNTED TRANSFORMERS

GRS Types K1 and K2 pole-mounted transformers provide 115 volts from a 230-, 460-, or 575-volt transmission line. Both types have weatherproof housings, 3-foot flexible leads, and brackets for mounting on a crossarm.



Type K1

WIDTH – 4 7/8"
DEPTH – 4 3/16"
HEIGHT – MIN. 9 1/16"
MAX. 12 5/8"



Type K2

WIDTH – 6 15/16"
DEPTH – 5 13/16"
HEIGHT – MIN. 11 3/16"
MAX. 19 5/16"

ORDERING INFORMATION

To order, specify Type of Transformer and give catalog number.

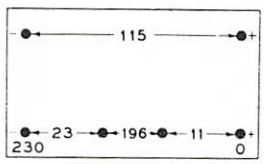


Figure 1

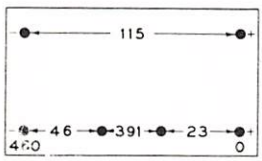


Figure 2

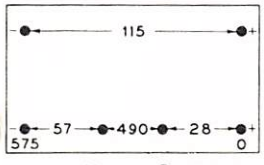


Figure 3

TYPE	PRIMARY VOLTS	SECONDARY VOLTS	SECONDARY AMPERES	TOTAL VOLTS-AMPS	VOLTAGE DIAGRAM	CATALOG NUMBER
K1	230(11-196-23)	115	2.61	300	FIG. 1	A95-305
	460(23-391-46)	115	1.31	150	FIG. 2	A95-310
	460(23-391-46)	115	2.61	300	FIG. 2	A95-315
	575(28-490-57)	115	1.31	150	FIG. 3	A95-320
	575(28-490-57)	115	2.61	300	FIG. 3	A95-325
	440	110	0.9	100	FIG. 4	A95-600
K2	110	140(10-110-20)	9.1	1000	FIG. 5	A95-345
	230(11-196-23)	115	13.05	1500	FIG. 1	A95-376
	460(23-391-46)	115	6.52	750	FIG. 2	A95-380
	460(23-391-46)	115	13.05	1500	FIG. 2	A95-381
	575(28-490-57)	115	6.52	750	FIG. 3	A95-385
	575(28-490-57)	115	13.05	1500	FIG. 3	A95-386
	230	460	3.26	1500	FIG. 6	A95-390

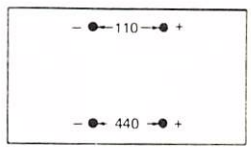


Figure 4

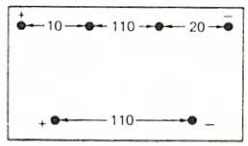


Figure 5

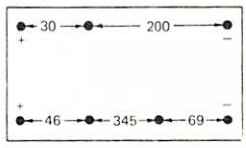
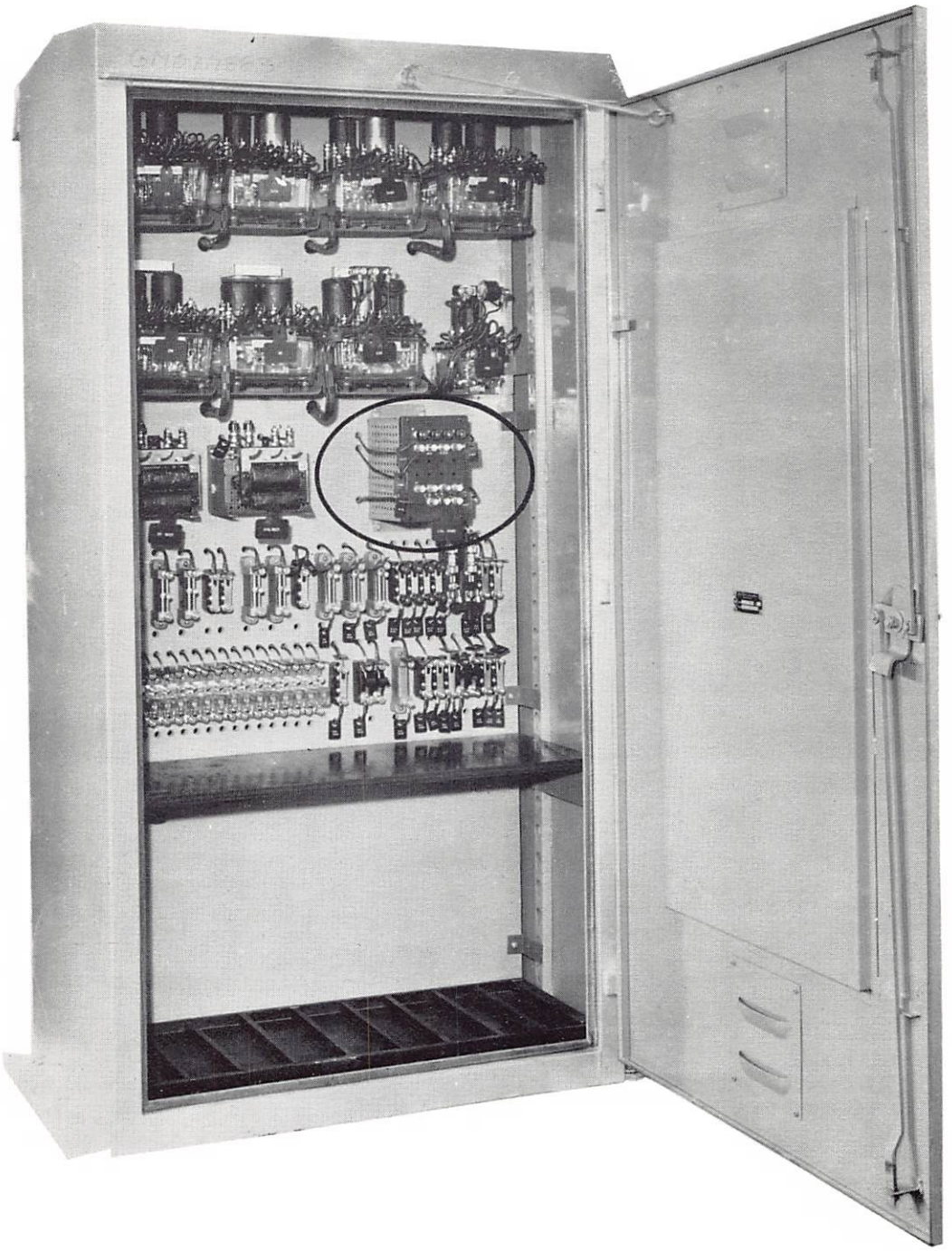


Figure 6

Voltage diagrams for pole mounted transformers.

TYPE U1 TRANSFORMER

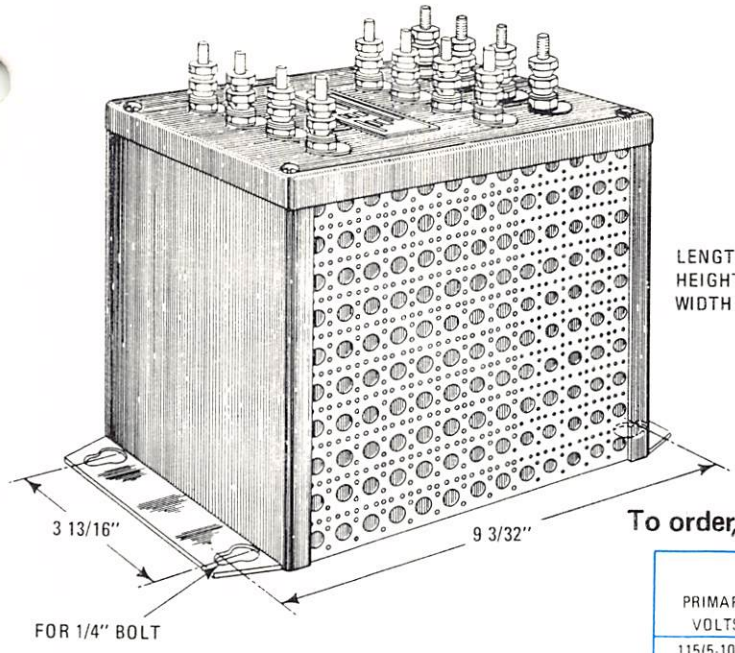
The GRS Type U1 transformer has a ventilated sheet-metal case, terminal board, and a maximum of four low voltage windings. It is designed for mounting in a wayside case or housing, a relay room, or in a control console for indication lamp lighting.



Typical installation of Type U1 Transformer, mounted on backboard of GRS high-single instrument case.

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Type U1 Transformers can be wall or shelf mounted.



ORDERING INFORMATION

To order, specify Type U1 Transformer and give catalog number.

PRIMARY VOLTS	SECONDARY NO. OF WINDINGS	SECONDARY VOLTS	SECONDARY AMPERES	TOTAL VOLT-AMPS	VOLTAGE DIAGRAM (See Page 15)	CATALOG NUMBER
115(5-100-10)	2	15(1-1-4-3-3-3)	8.3	250	Fig.1	A95-400
115(5-100-10)	2 1	22(4-4-12-2) 12(1-1-4-3-3)	3.4 12.5	300	Fig.2	A95-403
115(5-100-10)	1	15(1-1-4-3-3-3)	20.0	300	Fig.3	A95-407
115(5-100-10)	1 1	12(1-9-2) 15(1-1-4-3-3-3)	0.83 20.0	310	Fig.4	A95-410
230(10-200-20)	1 1	12(1-9-2) 15(1-1-4-3-3-3)	0.83 20.0	310	Fig.5	A95-425
170 (110-10-10-10-10-10-10	1	25 (1-1-1-1-1-1-19)	15	375	Fig. 6	A95-610

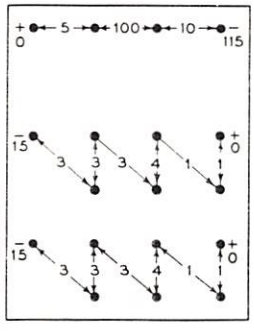


Figure 1

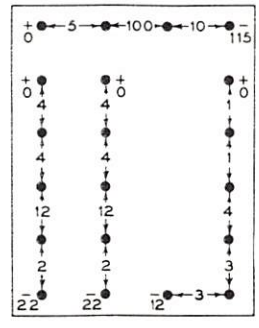


Figure 2

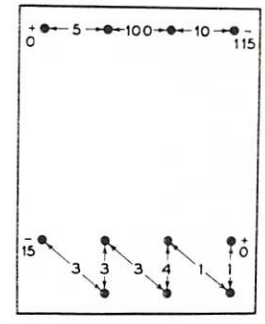


Figure 3

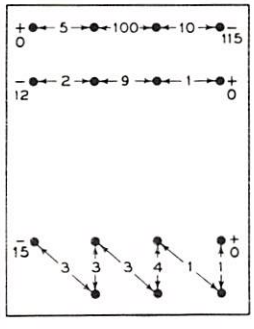


Figure 4

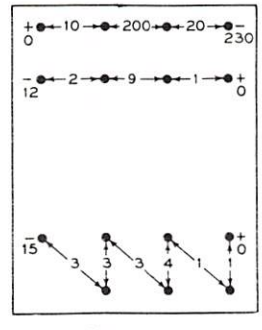


Figure 5

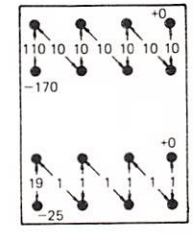


Figure 6

Voltage diagrams for Type U1 Transformers.

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GENERAL RAILWAY SIGNAL
A UNIT OF GENERAL SIGNAL
ROCHESTER NEW YORK 14602

CATALOG SECTION A95

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TRANSFORMERS - AIR-COOLED

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A95-010	38270-118GR6		K1/2 XFMR	9
A95-030	38270-18GR1		K1/2 XFMR	9
A95-038	38270-18GR2 (SEE P85)		K1/2 TRANS	9
A95-050			TRANSFORMER	
	31094 GR1		TFMR UNIV	
	59649-8GR11		KIT 20 TERM FASTON	
A95-102	38270-123GR1		K1/2 XFMR	9
A95-121	38270-25GR6		TRANSFMR	9
A95-241	38270-112GR1		K2 XFMR	12
A95-301	38270-100GR3 (SEE A92)		XFMR	12
A95-305			K1 XFMR	13
	38270-126GR7		K1 XFMR	
	38512-6		HANGER	
	0154-1		BOLT&NUT	
	44989		BOLT&NUT	
	01273-8	2	WASHER	
A95-310			K1 XFMR	13
	38270-126GR3		K1 XFMR	
	38512-4		HANGER	
	0154-1		BOLT&NUT	
	44989		BOLT&NUT	
	01273-8	2	WASHER	
A95-315			K1 XFMR	13
	38270-126GR8		K1 XFMR	
	38512-6		HANGER	
	0154-1		BOLT / NUT	
	44989		BOLT / NUT	
	01273-8	2	WASHER	
A95-320			K1 XFMR	13
	38270-126GR4		K1 XFMR	
	38512-4		HANGER	
	0154-1		BOLT&NUT	
	44989		BOLT&NUT	
	01273-8	2	WASHER	
A95-325			K1 XFMR	13
	38270-126GR9		K1 XFMR	
	38512-6		HANGER	
	0154-1		BOLT & NUT	
	44989		BOLT & NUT	
	01273-8	2	WASHER	
A95-345			XFMR COMPLETE WITH MOUNTING HARDWARE	13
	38270-103GR1		K 2 XFMR	
	38280-51		STRAP	
	44989	2	BOLT & NUT	
	01273-8		WASHER	
A95-376			K2 XFMR	13
	38270-133GR6		K2 XFMR	
	38280-51		STRAP	
	44989	2	B/N	
	01273-8	2	WASHER	
A95-380			K2 XFMR	13
	38270-131GR4		K2 XFMR	
	38280-27		STRAP	
	44989	2	BOLT&NUT	
	01273-8	2	WASHER	
A95-381			K2 XFMR	13
	38270-133GR7		K2 XFMR	
	38280-51		STRAP	
	44989	2	BOLT&NUT	
	01273-8	2	WASHER	
A95-385			K2 XFMR	13
	38270-131GR5		K2 XFMR	
	38280-27		STRAP	
	44989	2	BOLT&NUT	
	01273-8	2	WASHER	
A95-386			K2 XFMR	13
	38270-133GR8		K2 XFMR	
	38280-51		STRAP	
	44989	2	BOLT&NUT	
	01273-8	2	WASHER	
A95-390			XFMR COMPLETE WITH MOUNTING HARDWARE	13
	38270-133 GR12		K 2 XFMR	
	38280-51		STRAP	
	44989	2	BOLT & NUT	
	01273-8		WASHER	
A95-400	54940-103 GR40		U1 XFMR	15
A95-403	54940-103GR8		U1 XFMR	15

CATALOG SECTION A95

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TRANSFORMERS - AIR-COOLED

CAT.NO.	DRAWING NO.	QTY	NAME	PG.
A95-407	54940-103 GR37		U1 XFMR	15
A95-410	54940-103 GR41		U1 XFMR	15
A95-425	54940-103 GR44		U1 XFMR	15
A95-450	54940-103 GR72		XFMR-AIR COOLED U-1	
A95-451	54940-103 GR73		XFMR-AIR COOLED U-1	
A95-510	53715-111GR2		S1 XFMR	9
A95-560	53715-113GR4		S2 XFMR	9
A95-570	53715-6GR3 (SEE P85)		S2 XFMR	9
A95-600			XFMR COMPLETE WITH MOUNTING HARDWARE	13
	38270-126 GR10		K 1 XFMR	
	38512-5		HANGER	
	0154-1		BOLT & NUT	
	44989		BOLT & NUT	
	01273-8	2	WASHER	
A95-601	53715-143GR1		AIR-COOLED XFMR S-1	9
A95-602	53715-150GR1		AIR-COOLED XFMR S-1	9
A95-603	53715-154GR1		AIR-COOLED XFMR S-1	9
A95-604	53715-153GR1		AIR-COOLED XFMR S-2	9
A95-605	38270-159GR1		K 1/2 XFMR	9
A95-606	38270-100GR5		K 1 XFMR	
A95-607	38270-104GR5		K 2 XFMR	12
A95-608	38270-110GR3		K 2 XFMR	12
A95-610	54940-101GR1		U 1 XFMR	15
A95-615	53715-144GR1		S 2 XFMR	9
A95-616	38270-157GR1		K 1/2 XFMR	

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