**ACCEPTABLE PLUG-IN RELAYS FOR USE ON CALTRAIN PROJECTS**

<table>
<thead>
<tr>
<th>Relay Description</th>
<th>Base Type</th>
<th>Base Code</th>
<th>Contact Type</th>
<th>Alt vs. Old Site Tab</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relay 2-Ohm Based Neutral Track</td>
<td>B1</td>
<td>1</td>
<td>4RF</td>
<td>4RF-24-11</td>
<td>RELY</td>
</tr>
<tr>
<td>Relay 2-Ohm Based Neutral Track</td>
<td>B1</td>
<td>2</td>
<td>4RF</td>
<td>4RF-24-11</td>
<td>RELY</td>
</tr>
<tr>
<td>Relay 2-Ohm Based Neutral Regular</td>
<td>B1</td>
<td>3</td>
<td>4RF</td>
<td>4RF-24-11</td>
<td>RELY</td>
</tr>
<tr>
<td>Relay 2-Ohm Based Neutral Regular</td>
<td>B1</td>
<td>4</td>
<td>4RF</td>
<td>4RF-24-11</td>
<td>RELY</td>
</tr>
<tr>
<td>Relay 2-Ohm Based Neutral Regular</td>
<td>B1</td>
<td>5</td>
<td>4RF</td>
<td>4RF-24-11</td>
<td>RELY</td>
</tr>
<tr>
<td>Relay 2-Ohm Based Neutral Regular</td>
<td>B1</td>
<td>6</td>
<td>4RF</td>
<td>4RF-24-11</td>
<td>RELY</td>
</tr>
<tr>
<td>Relay 2-Ohm Based Neutral Regular</td>
<td>B1</td>
<td>7</td>
<td>4RF</td>
<td>4RF-24-11</td>
<td>RELY</td>
</tr>
<tr>
<td>Relay 2-Ohm Based Neutral Regular</td>
<td>B1</td>
<td>8</td>
<td>4RF</td>
<td>4RF-24-11</td>
<td>RELY</td>
</tr>
<tr>
<td>Relay 2-Ohm Based Neutral Regular</td>
<td>B1</td>
<td>9</td>
<td>4RF</td>
<td>4RF-24-11</td>
<td>RELY</td>
</tr>
<tr>
<td>Relay 2-Ohm Based Neutral Regular</td>
<td>B1</td>
<td>10</td>
<td>4RF</td>
<td>4RF-24-11</td>
<td>RELY</td>
</tr>
<tr>
<td>Relay 2-Ohm Based Neutral Regular</td>
<td>B1</td>
<td>11</td>
<td>4RF</td>
<td>4RF-24-11</td>
<td>RELY</td>
</tr>
<tr>
<td>Relay 2-Ohm Based Neutral Regular</td>
<td>B1</td>
<td>12</td>
<td>4RF</td>
<td>4RF-24-11</td>
<td>RELY</td>
</tr>
</tbody>
</table>

**VITAL PLUG-IN RELAYS**

- **D.C. Based Neutral Relay**
  - 20 kOhm per coil
  - Code: 20 kOhm N

- **D.C. Neutral Relay**
  - 20 kOhm per coil
  - Code: 20 kOhm N

- **D.C. Based Neutral Relay**
  - 30 kOhm per coil in parallel
  - Code: 30 kOhm N

**SHELF RELAY SYMBOLS**

- **D.C. Neutral Relay---Ordinary Release**
- **D.C. Neutral Relay---Slow Release**
- **D.C. Normal Neutral Relay---Arrow* Identifies Individual of Current to Operate Relay**
- **D.C. Polarized Relay**
- **D.C. Flasher Relay**
- **D.C. The Element Relay**

**RELAY CONTACTS - TWO POSITION RELAYS**

<table>
<thead>
<tr>
<th>Relay Contact Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front Contact</td>
<td>Relay Normally Energized</td>
</tr>
<tr>
<td>Back Contact</td>
<td>Relay Normally De-Energized</td>
</tr>
</tbody>
</table>

**RELAY CONTACTS - THREE POSITION RELAYS**

<table>
<thead>
<tr>
<th>Relay Contact Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front and Back Contact</td>
<td>Relay Normally Energized</td>
</tr>
<tr>
<td>Front and Back Contact</td>
<td>Relay Normally De-Energized</td>
</tr>
</tbody>
</table>

**TYPICAL CIRCUIT**

```
+-------------+-------------+
| N           | F           |
| P           |             |
|             |             |
+-------------+-------------+
```

**NOTE:** Refer to EN-3054 for contact arrangement.

---

**RELAY CONTACTS WITH SPECIAL CHARACTERISTICS**

- **Magnetic Slow-Out**
- **High Current (Heavy Duty) Front Contact**
- **High Current (Heavy Duty) Back Contact**
- **Close Before Open Contact**
- **Push Button-Push to Open**
- **Push Button-Push to Close**
- **Spring Return Push Button**

**SWITCH CIRCUIT CONTROLLER WIRING**

![Wiring Diagram]

**STANDARD DRAWINGS**

- **SIGNAL AND COMMUNICATION GENERAL SIGNAL RELAYS & RELAY CONTROLLERS SHELF & VITAL RELAYS**

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**PENDIN CORRIDOR JOINT POWERS BOARD**

<table>
<thead>
<tr>
<th>Descriptive Code</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

---

*Legend: N = Normal, F = Flasher, P = Polar*
Searchlight Signal Contacts and Terminal Post Numbering

Signal Houses

Wayside Signal Symbols

Controlled Signal

Automatic Signal

Notes:
- Types of Signals
  - CL = Colored Light
  - SL = Searchlight
  - WL = Warning
  - LD = Light Emitting Diode
- CL and SL designations given only when more than one type of signal is shown on a diagram. Otherwise, all signals are colored.

Peninsula Corridor Joint Powers Board

Standard Drawings

Signal and Communication General Signal Signals & Housing Graphic Symbols
NOTES:

1. POLARITY JOINTS SHALL HAVE A MAXIMUM SPACING OF 4'-6"
2. DISTANCE MEASURED BETWEEN END POSTS OF INSULATED JOINTS, EXCEPT POLARITY JOINTS, SHALL BE 4'-6" MIN AND 10' MAX
3. DISTANCE FROM POINT OF SWING TO FIRST INSULATED JOINT SHALL BE APPROXIMATELY 50', IN NO CASE SHALL THE DISTANCE BE LESS THAN 20'. INSTALLATIONS LESS THAN 50' MUST BE APPROVED BY CALTRAI DEPUTY DIRECTOR OF ENGINEERING
4. SIGNAL SHALL BE CENTERED BETWEEN INSULATED JOINTS
5. INSULATED JOINT SHALL BE PLACED APPROXIMATELY 50' BEYOND CLEARANCE POINT (0.7 CENTERS) EXCEPT WHERE THE CLEARANCE POINT IS ON TARGET TRACK PARALLEL TO THE MAIN TRACK, IN WHICH CASE INSULATED JOINTS MAY BE PLACED AT CLEARANCE POINT PLUS 10'
6. SIGNALS ON CARTWHEELS AND BRIDGES SHALL BE LOCATED DIRECTLY ABOVE CENTERS OF TRACK CARTWHEELS AND BRIDGE MOUNTED SIGNALS SHALL BE CENTERED BETWEEN INSULATED JOINTS
7. TC PLATES UNDER POLARITY JOINTS SHALL HAVE A MINIMUM 1" CLEARANCE FROM THE PLATE OF OPPOSITE POLARITY
NOTES:

1. Preferred distance for wayside signal house is 25' from C/L of track or as directed by the engineer.

2. Preferred distance for crossing signal house is 25' from C/L of track and 30' from face of curb or as directed by the engineer.

3. Preferred distance is UT signals shall not be placed less than 12' without the approval of the engineer.

4. Ensure equipment is placed within property boundary and signal is easily viewed from preferred distance of 2500.

5. Top of signal foundation shall not be higher than top of rail or lower than base of rail.

6. The railway consists of minimum 6" thick layer of crushed rock, 3/4" x 1/4".

7. Ample A slope equal to the main line gradient cannot be maintained, retaining wall is required and designed to maintain appropriate railway around signal house.
NOTES:

2. DO NOT CONNECT COMMERCIAL "AC" POWER GROUND WIRE AND SIGNAL GROUND TO THE SAME GROUND GRID.

3. GROUND WIRE SHALL HAVE MINIMUM 6000 RADIO. NO SHARP BENDS PERMITTED.

4. GROUND ROds SHALL BE INSTALLED BETWEEN MAST AND LACED AT SIGNAL ASSEMBLY.
NOTES:
1. BONDS BETWEEN RAILS AT A, B, C AND D SHALL BE APPLIED TO RAIL WEB.
2. TURNOUTS SHALL BE DOUBLE BONDED USING ONE WEB TYPE BOND AND ONE RAILHEAD BOND, WITH EXCEPTION TO JOINTS MARKED WITH AN ( * ). THOSE JOINTS ONLY REQUIRE RAILHEAD BOND WHEN TURNOUT TERMINATES IN A TRACK RELAY.
3. ALL WEB BONDS SHALL BE 3/16" IN DIAMETER, 12" LONG WITH STEEL TERMINALS WELDED TO THE WEB OF THE HELD TYPE.
4. ALL RAILHEAD BONDS SHALL BE 3/16" IN DIAMETER WITH STEEL TERMINALS WELDED TO CONDUCTORS OF THE HELD TYPE. THEY SHALL HAVE A NOMINAL LENGTH OF 6 1/2".
5. LOCATION OF THE INSULATED JOINTS MAY BE MODIFIED ONLY WITH THE ENGINEER'S APPROVAL.
6. PLACEMENT OF BOND WIRES SHALL WAVE AS BROKEN RAIL DETECTION.
7. WIRES TO FOLLOW CONTOUR OF RAIL AND TIE WITH NO EXCESS SLACK.
8. ALL BONDS AND TRACK CONNECTIONS UTILIZING 3/16" BOND STRAND SHALL BE WITH STEEL TERMINALS WELDED TO THE RAIL.
9. WHERE THE 2 RAIL RAILS ARE WELDED AS ONE PIECE BONDS ARE NOT REQUIRED.
10. ON ROAD FROG, BONDS SHALL BE INSTALLED ON THE SIDE OF THE FROG ON WHICH THE HEADS OF BOLTS ARE LOCATED. ON SPRING RAIL FROG BONDS ARE NOT REQUIRED ON MOBILE SIDE.
11. DISTANCE BETWEEN TERMINALS IS SHOWN AS 17. THIS DIMENSION MAY DECREASE, WHEN NECESSARY, DUE TO LIMITED DISTANCE FROM BOLT TO THE END OF THE RAIL.
12. WHEN A PLATE CLIP (ON SPRING RAIL FROGS) IS REQUIRED WITH APPLICATION OF BONDS AS SHOWN HEREON, THE PLATE CLIP SHALL BE ARRANGED TO PERMIT PROPER INSTALLATION OF THE BONDS.
NOTES:
1. Use two stranded insulated track wires installed with red and black insulation attached from opposite sides.
2. Fouling wires shall be installed on side of adjacent tie.
3. Fouling wires shall be maintained free of spikes and be avoided for visual inspection.
4. Avoid placing fouling wire where they may come in contact with rail anchors.
5. Long spans for fouling wires shall be 3/16" single strand with 1/16" black PVC insulation.
6. Straps to be used on concrete ties. Use insulated wire clamps. As shown in Sec-6030. On wood ties - straps shall be evenly spaced.
NOTES:
1. FOUNDATIONS SHALL BE HOT DIPPED GALVANIZED.
2. TYPICAL ARRANGEMENT FOR LEVELING BOLTS: 1-1/16" X 8" BOLTS WITH HEA HEADS, 12 NUTS AND 16 FLAT WASHERS.
3. BOLTS SHALL BE TAPPED TO ALLOW FOR LEVELING.
4. BOLTS, WASHERS AND NUTS SHALL BE CARBON STEEL AND SHALL BE PACKAGED SEPARATELY IN A WATER TIGHT CONTAINER SECURELY ATTACHED TO THE FOUNDATION.
NOTES:

1. INSTALL ON TOP OF HMAO IN SCHEDULE 80 PVC CONDUIT OR GR6 CONDUIT.

2. WHERE HMAO UNDERLAY IS INSTALLED, ALL SIGNAL CABLES AND TRACK WIRES SHALL BE INSTALLED IN 4" SCHEDULE 80 PVC pipe除非 TRACK CENTERS ABOVE HMAO PIPE. SIGNAL AND TRACK INSTALLATION SHOULDN'T COORDINATE INSTALLATION OF CONDUIT UNDER TRACKS.

3. PRIOR TO INSTALLATION OF HMAO, FINAL SLOT SHALL BE IDENTIFIED, INCLUDING ANY DRAINAGE DEVICES WHICH SIGNAL CABLES TRAVEL. SIGNAL CABLES SHALL BE 36" BELOW BOTTOM OF THE DRAINAGE DEVICE UNLESS ITEMS IS LINED, OR VARIANCE APPROVED BY THE ENGINEER.

4. REMEDIES CONDITIONS PERMANEYE TRACK WIRES MAY BE INSTALLED AS SHOWN INSTEAD OF ON TOP OF HMAO.

5. REFER TO SD-5115 FOR CONDUIT ENTRANCE-EXIT REQUIREMENTS FOR FULL-HOSES.

ALSTOM (FORMERLY GR6)
ANSALDO (FORMERLY US65)
HIGHWAY GRADE CROSSING SIGNAL HOUSE

STENCIL LETTERING ON BOTH SIDES OF HOUSING TO BE VISIBLE FROM ROADWAY AND TRACK.

CONTROL POINT SIGNAL HOUSE

STENCIL LEGEND TO BE VISIBLE TO TRAIN TRAVELING IN EITHER DIRECTION.

NOTES:
1. EACH HIGHWAY GRADE CROSSING SHALL COMPLY WITH RULES AND BE EQUITABLE WITH A SIGN IDENTIFYING THE CROSSING BY NAME AND MILEPOST NUMBERED TO THE NEAREST TENTH OF A MILE AND A SIGN WITH AN ADDITIONAL NUMBER THAT WILL CONNECT THE CALLER TO THE PROPERTY AUTHORITIES TO STOP TRAFFIC IN CASE OF AN EMERGENCY AT THE CROSSING.

2. FOR HIGHWAY GRADE CROSSING HOUSE / CASE, SEE SD-5117 FOR EMERGENCY NOTIFICATION BOX DETAILS.

3. FOR CONTROL POINT SIGNAL HOUSE / CASE, LEGEND SHALL BE BLACK LETTERS OF WHITE EIGHTY POINTS, CENTERED ON SIDE OF SIGNAL HOUSE AND AT THE FRONT OF CASE.

PENINSULA CORRIDOR JOINT POWERS BOARD

STANDARD DRAWINGS

SIGNAL AND COMMUNICATION GENERAL SIGNAL
TYPICAL MARKING LEGEND HOUSE AND CASE
NOTES:
1. EMERGENCY NOTIFICATION SIGN (SBN 5-11x) SHALL COMPLY WITH THE REQUIREMENTS OF CALIFORNIA CODES CHAP. 88: SIGNS AND WRITINGS
2. SIGN PANEL SHALL BE 1/8" THICK ALUMINUM
3. BACKGROUND: BLUE, FEDERAL STANDARD P.S 150-B
4. LETTERS AND NUMBERS: WHITE, 1.75" HIGH Arial for Types 1A & 2A, 2.5" HIGH Arial for Others, Permanent
5. CALTRANS WILL PROVIDE GIMP CROSSING NUMBER, FOR THE STREET NAME USE THAT OF THE STREET CROSSING THE TRACKS
6. BORDERS: WHITE, 1/4" FOR TYPE 2C, 1/2" FOR OTHERS
7. MOUNTING HARDWARE (TYPE 1): HAPPER PROOF STAINLESS STEEL SS316
8. TYPE, PLACEMENT, AND LOCATION OF SIGN SHALL BE DETERMINED BY CALTRANS

<table>
<thead>
<tr>
<th>TYPE</th>
<th>LOCATION ON SIGNAL HOUSE/CASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>DOOR (1'  Turn)</td>
</tr>
<tr>
<td>1B</td>
<td>DOOR (2 1/2' AND WIDGET)</td>
</tr>
<tr>
<td>2A</td>
<td>7TH STREET SIDE (SF)</td>
</tr>
<tr>
<td>2B</td>
<td>TOWNSEND STREET SIDE (SF)</td>
</tr>
<tr>
<td>2C</td>
<td>LONG SIDE</td>
</tr>
</tbody>
</table>
NOTE:
TUNED JOINT COUPLER (TJC) SHALL BE INSTALLED 3'-6" POST NOS. CENTER. TOP OF BOX SHALL DECAY 12" FROM TRACK AND SHALL BE LEVEL WITH TOP OF THE ADD BALLAST AND GRAVEL AS NEEDED TO EXTEND TRACK SHOULDER 3'-6" BEYOND BOX.

FOR REFERENCE ONLY
NOTE 3
ALIGN PASS THROUGH CONDUITS
NOTE 1
CONDUIT WITH VELON PULL ROPE PER CONTRACT DRAWINGS
CAP UNLINED CONDUITS
NOTE 3
BLACK LOOP REQUIREMENTS
2 TO 5 BLACK LOOP MAGRARATED ON BASE PLATE BOX AND AT LEAST PULL BOX W/HOLE DRILLING FOR FIELD FITTED BLACK LOOP NOT REQUIRED FOR THROUGH CABLES
CABLES TO SIGNALS, LATCH ELECTRONIC, BRACKETS, ETC.
NOTE 1
90° OR 45°
1/2 FLAT WASHERS (6 PLACES)
3/8 X 4 PULL SCREW W/1/4 CENTER PIN (2 PLACES)
SEE DETAIL 1
1/2 FLAT WASHERS (8 PLACES)
SEE DETAIL 2
6X 3/8 THRU HOLE
W/1/4 X 1/2 DEEP COUNTERSUNK
1/2 UNC X 4 LUG
5/8 HEX HEAD CAPTIVE BOLT (8 PLACES)
SEE NOTE 4
NOTE
1. PLACE A LAYER OF GRANULAR ROCKS AT A MINIMUM OF 6" BELOW AND EXTENDING 12" FROM EACH SIDE OF THE PULL BOX. ROCKS SHALL BE COMPACTED PRIOR TO PLACEMENT OF PULL BOX.
2. NATIVE MATERIAL SHALL BE USED FOR BACKFILLING CONDUIT HOLE AND DEBRIS LARGER THAN 3 INCHES IN DIAMETER SHALL BE REMOVED. BACKFILL CONSTRUCTION SHALL BE PACKED IN 12" LAYERS.
3. PULL BOX SHALL BE DESIGNED FOR 20-25:1 BRIDGE LOADINGS AND EQUIPPED WITH COVER DESIGNED FOR VEHICULAR TRAFFIC. MINIMUM NON-LAID SIZE OF PULL BOX SHALL BE 2X2 LARGER PULL BOXES SHALL BE FURNISHED WHERE MINIMUM BEND RADIUS OF CABLE IS A FACTOR. TOP OF PULL BOX SHALL BE LEVEL WITH FINAL GRADE.
4. FOR CONTROL POINTS OR CROSSING SIGNAL HOUSE THE COVER ASSEMBLY SHALL BE DESIGNED WITH 4X4 X 4 PULL BOX WITH NOTE 3 DESIGN SPECIFICATIONS. COVER IS DESIGNED WITH AN OPENING FOR THE SIGNAL HOUSE CABLE CHUTE. THE SIZE OF THE COVER WITH THE CABLE CHUTE OPENING IS RATED FOR PEDESTRIAN TRAFFIC ONLY.
5. ALL PULL BOXES SHALL BE PROTECTED FROM DAMAGE UNTIL FINAL INSTALLATION IN SERVICE.
6. SEAL CONDUIT / CABLE HULLS WITH CEMENT OR OTHER SUITABLE MATERIAL.