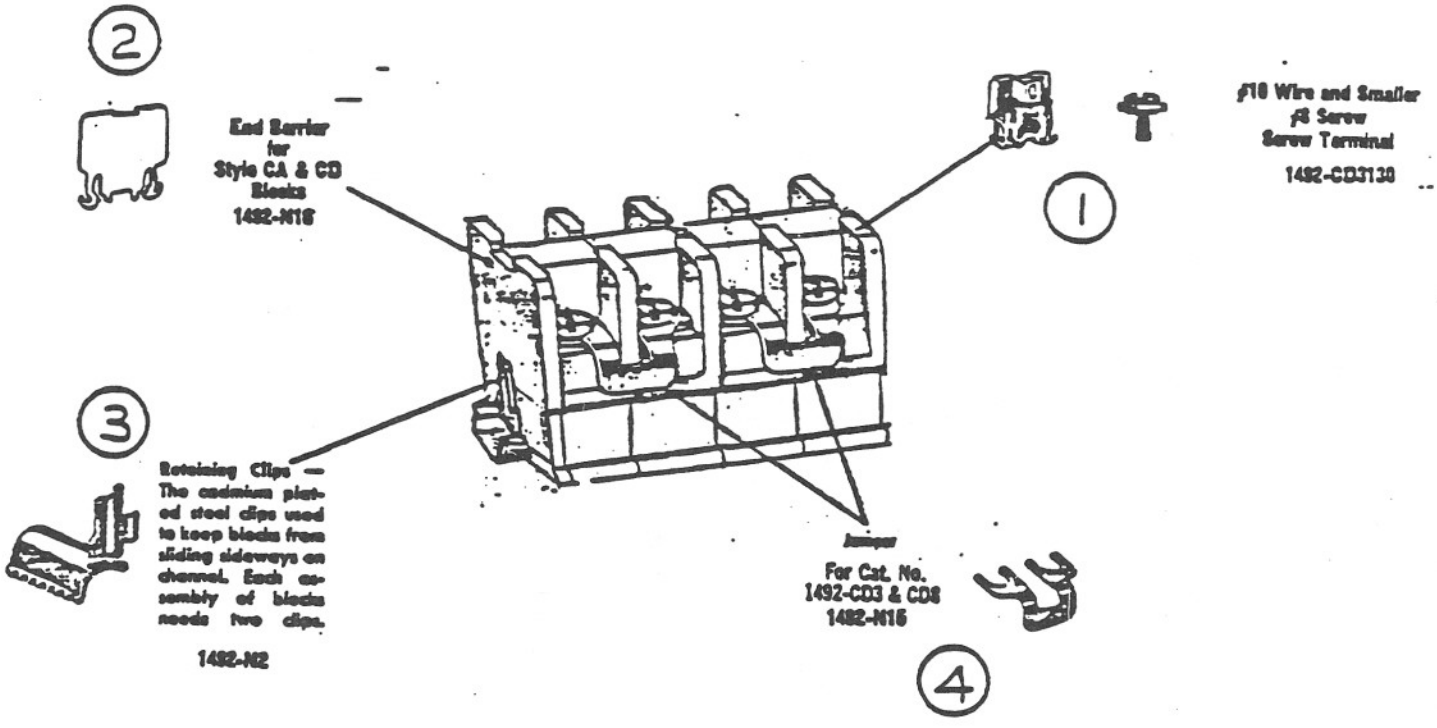
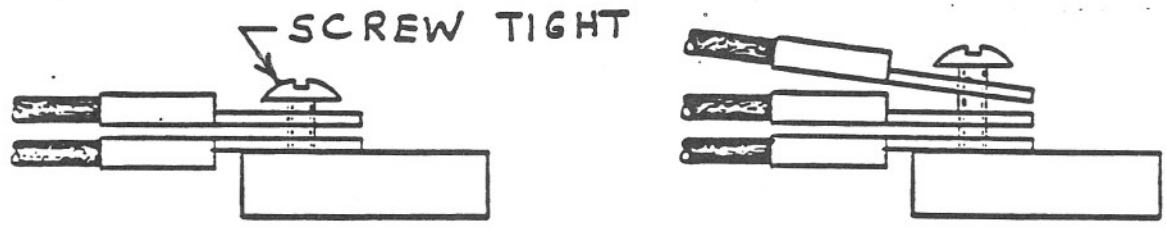
# FIGURE 6.2
## 1492 SERIES TERMINAL BLOCKS




# FIGURE 6.3
## TERMINAL BLOCK CONNECTIONS




CORRECT:
2 LUGS, ONE RIGHT SIDE UP, ONE INVERTED

INCORRECT:
3 LUGS, BAD CONTACT & OVERHEATING LIKELY

JUMPER

BRIDGED TERMINALS ON A BARRIER STRIP

TO COMMON ADJACENT TERMINALS ON A TERMINAL STRIP, USE A JUMPER. IT DOES NOT COUNT AS A LUG IN THE 2 LUGS PER SCREW COUNT.

Figure 6.4
TERMINAL BLOCK PART LIST

| ITEM | QTY | DESCRIPTION | MFG | MFG # | AMI # | AMS # |
|---|---|---|---|---|---|---|
| 1 | | Terminal Block Strip, Series B 600V #10-22 Wire | Allen Bradley | CD 1492-CD3-130 | 25A9003953 | |
| 2 | | End Barrier for Item 1 | Allen Bradley | 1492-N16 | 25E9010171 | |
| 3 | | Retaining Clip for Item 2 | Allen Bradley | 1492-N2 | 23E9007470 | |
| 4 | | Jumper | Allen Bradley | 1492-N15 | | |
| 5 | | Power Terminal Block 3Pole, 3/8-16 x 1 3/16 stud | Marathon | 1433563 | 25A7004463 | |
| 6 | | Terminal Block, 10 Pole | Strauss Engineering | | 25P4010702 | |
| 7 | | Terminal Strip 2 Point, 150V 15A Closed Back<br>6 - 32 x 3/16 Binder Screw (Exhaust Fan)<br>57000 & 11362 | | | 25K9012145 | |
| 8 | | Terminal Block, for 27 Point J-box Marathon 1600 Series OR AMTRAK-APPROVED EQUAL | | | | |

C

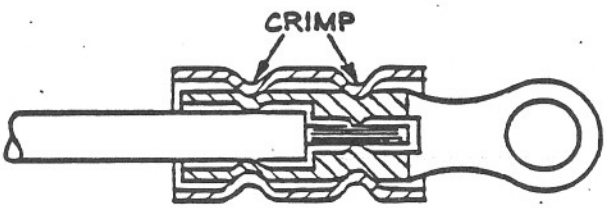
## 6.1.3 Electrical Lugs

Crimp-on type electrical lugs are used in large numbers throughout the car. They come in a variety of sizes to accommodate different wire gauges. The color of the lug indicates the wire gauge of which the lug can be used:

Yellow - 10 & 12
Blue - 14 & 16
Red - 18 - 22

Always use the correct lug for the wire gauge you are using. Too large a lug can not be properly crimped and will be loose; too small a lug requires a few strips of the wire to be cut off, which invites a burned off wire or lug.

Because of the severe vibration problems which a railway vehicle encounters, insulation-gripping lugs are a must. This type of lug is crimped onto each wire in two places: the wire itself and the insulator. This results in a much stronger connection which greatly reduces pullout and fatigue when the wire meets the lug.




Do not use economy-priced lugs. They are likely to fail in the rough railroad environment.

Different jaws or crimpers are required for different lug sizes. The correct crimping tool is as important as the lug. The plier-type tools produce poor quality crimps because there is no control of how tight the tool is squeezed. Rachet-type tools are highly recommended despite their greater cost because a proper crimp is virtually certain. Most burned lugs and intermittent connections can be blamed on poor crimps.

Crimp-on lug types:

A variety of lugs are available for different jobs:
See figure 6.5 and 6.6.

Ring Tongue

This lug is used to attach a wire to a stud or screw terminal. It comes in an assortment of sizes for both wire size and screw hole size. Always use a lug which fits the screw snuggly. Too large a hole results in 1) a poor electrical connection,. which can burn off a lug 2) a weak mechanical connection in which the lug may rip off the screw.

Do not use a spade lug in place of a ring tongue lug. The ring tongue cannot fall off if the screw or nut is loose, but a spade lug will, and is likely to hit something it shouldn't.

When ring tongue lugs are used on a terminal block, only two lugs can be secured by each screw or stud; one right side up, one inverted. Stacking more lugs results in bad connections and often broken lugs or terminal strips. See figure 6.4.

Butt or Barrel Splice Flexible conduit

This splice comes in a variety of wire sizes and is used to join two wires end to end. Note that both wires must be the proper gauge for the lug to be used. When using this part, be careful to insert the first wire only half way into the lug so both wires are properly crimped into place.

3-Way or T-Splice

This splice is used to connect three wires. Note all three wires must be the correct gauge for the splice to be used. This part is handy for floor heat and lighting circuit, where a string of heaters or fixtures is to be connected.

High Temp Ring Tongue

This lug is similar to the regular ring tongue except it is meant for high temperature use on heater elements, etc. The lug is not insulated because of the heat. Only high temperature lugs should be used on heater elements - not only because of the insulation, but the base metal differs as well, and a regular lug may break. Note that when electrical tape is needed in a high temperature application, only high temperature tape should be used; ordinary tape will burn and give off toxic fumes.

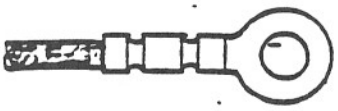
Pig Tail

Limited Use Only - not recommended. These lugs are used to join two wires side by side. The problem with these lugs is that often only one wire is securely gripped, and it is not evident. This is especially true if the wire sizes differ.

Faston

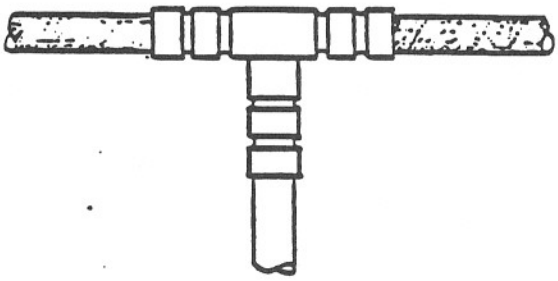
Limited Use Only - these lugs are to be used only on vendor supplied items on short leads, such as connections to relays or bridge rectifiers. FASTON's get loose easily.

# LUGS & THEIR USE

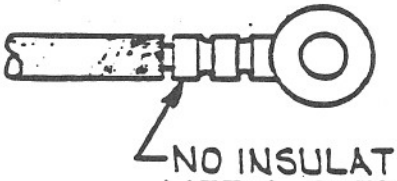


RING TONGUE

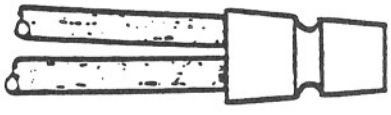
BUTT OR BARREL SPLICE



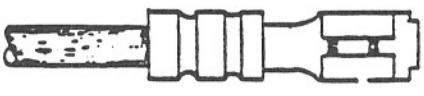
3 WAY OR T-SPLICE




HIGH TEMP-RING TONGUE



PIG TAIL LUG



FASTON

Figure 6
ELECTRICAL LUGS
PART LIST

Note: All Lugs are Insulation Grip Type

| ITEM | QTY | DESCRIPTION | | | MFG | MFG # | AMT # | AMS # |
|---|---|---|---|---|---|---|---|---|
| 1 | | Ring Tongue Lug, Yellow Insulation (.165-.200 wire size) | 5/16", Stud, AWG 12-10 | | AMP | 32546 | | |
| 2 | | | 1/4", Stud, AWG 12-10 | | AMP | 32545 | | |
| 3 | | | #10, Stud, AWG 12-10 | | AMP | 32544 | | |
| 4 | | | # 8, Stud, AWG 12-10 | | AMP | 32543 | | |
| 5 | | | # 6, Stud, AWG 12-10 | | AMP | 321500 | | |
| 6 | | Ring Tongue Lug, Blue (.130-.145 wire size) | 3/8", Stud, AWG 14-16 | | AMP | 31908 | | |
| 7 | | | 5/16", Stud, AWG 14-16 | | AMP | 31905 | | |
| 8 | | | 1/4", Stud, AWG 14-16 | | AMP | 31904 | | |
| 9 | | | #10, Stud, AWG 14-16 | | AMP | 51861-2 | | |
| 10 | | | # 8, Stud, AWG 14-16 | | AMP | 51861-1 | | |
| 11 | | | # 6, Stud, AWG 14-16 | | AMP | 51861 | | |
| 12 | | Ring Tongue Lug Red Insulation (.?-.130 wire size) | 5/16", Stud, AWG 22-20-18-16 | | AMP | 31895 | | |
| 13 | | | 1/4", Stud, AWG 22-20-18-16 | | AMP | 31894 | | |
| 14 | | | #10, Stud, AWG 22-20-18-16 | | AMP | 31891 | | |
| 15 | | | # 8, Stud, AWG 22-20-18-16 | | AMP | 31890 | | |
| 16 | | | # 6, Stud, AWG 22-20-18-16 | | AMP | 31885 | | |
| 17 | | | # 4, Stud, AWG 22-20-18-16 | | AMP | 31880 | | |
| 18 | | Butt Splice (Yellow) | AWG 12-10 | | AMP | 320570 | 49A9000220 | |
| 19 | | Butt Splice (Blue) | AWG 14-16 | | AMP | 320562 | 49A9000227 | |
| 20 | | Butt Splice (Red) | AWG 22-20-18-16 | | AMP | 320559 | | |
| 21 | | 3-Way Splice (Yellow) | AWG 12-10 | | AMP | 34074 | | |
| 22 | | 3-Way Splice (Blue) | AWG 14-16 | | AMP | 53222-1 | | |
| 23 | | 3-Way Splice (Red) | AWG 22-20-18-16 | | AMP | 50884 | | |
| 24 | | High Temp Ring Tongue | #10 Stud | 12-10 | AMP | 323750 | 25P9000660 | |
| 25 | | High Temp Ring Tongue | #10 Stud | 16-14 | AMP | 322338 | | |
| 26 | | Faston Lug, Female | .250 x .032 | #12-10 | AMP | 160314-2 | | |
| 27 | | | | #16-14 | AMP | 42332-2 | | |
| 28 | | | | #22-18 | AMP | 42599-2 | | |
| 29 | | Faston Lug, Female | .205 x .020 | #16-14 | AMP | 42742-2 | | |
| 30 | | | | #22-18 | AMP | 42888-1 | | |
| 31 | | Faston Lug, Female | .187 x .020 | #16-14 | AMP | 61697-1 | | |
| 32 | | | | #22-18 | AMP | 60972-2 | | |
| 33 | | Certi-Crimp Tool, Long Handle | | 12-10/16-14 | AMP | 59239-4 | | |
| 34 | | Certi-Crimp Tool, Long Handle | | 16-14/20-16 | AMP | 47387 | | |
| 35 | | Certi-Crimp Tool, Long Handle | | | | | | |

### 6.1.5 Ground Straps

Many electrical devices are equipped with ground straps to prevent the possibility of electrical shock. It is very important that all motors, compressors, water heaters and food service appliances be grounded to the carbody through a firm electrical connection. Make certain that the carbody ground is really that - not something which looks to be grounded and is not. For example, the water cooler should not be grounded to the floor (it is plywood on most cars), but rather a piece of car structure, such as a side post.

Grounding is an important safety feature, because the case of a non-grounded electrical device can go to line voltage if there is an insulation failure. The circuit breaker may not trip, either, because an excessive current may not be present. The faulty device may operate for months with this condition, waiting for someone to touch it.

A good safety rule is to assume that the case of something is live unless proven safe. When beginning work on a device which could be live, first tap it with one finger. Thus if it is live, the shock will be brief and not severe (as opposed to grabbing it solidly). If there is no shock, the device can be grabbed with relative safety.

### 6.1.6 Electrical Tape and Heat Shrink Tubing

Several types of electrical tape and heat shrink tubing are used throughout the cars. Refer to figure 6.8. Adhesive heat shrink tubing is used to produce water proof connections, important where corosion is possible. The minimum shrink size of heat shrink tubing is about 1/2 of the unshrunk size.

### 6.1.7 Ty-Raps and Clamps

The ty-raps used to secure wire and cable as well as cable clamps are given in figure 6.9. In using ty-raps, avoid, where possible, installations where the strap must support weight.

### 6.1.8 Cleaning Materials

In cleaning electrical components, especially contacts, care must be used to use materials which will not cause future problems. See figure 6.10.

NOTE: Before filing contactor or relay contacts, refer to manufacturer's instructions first. Many contacts are coated with a thin metal film, and filing will remove it and cause contact destruction. Refer to figure 6.43-6.45.

## ..2 480 Volt Main Power Distribution and Cable System

480 Volt AC, 3 Phase, 60 Hertz power as supplied directly from the locomotive is used to provide power for the lighting, air conditioning, heating, and the battery charging.

The power trainline is made up of four sets of cables. Each set consists of three 4/0 cables for the 480 Volt circuits. The cables run the full length of the car, terminating in four receptacles at each end of the car. See figure 6.11.

Four jumper cables are used across each car to car or car to locomotive coupling for transmission of power. Refer to Chapter 2.6. On the rear of the last car, adjacent receptacles are also connected together. Known as looping, this protects the live 480 pins and establishes part of the 480V control circuit.

A 3 conductor control cable is used in conjunction with each 480V cable set. Each cable carries one circuit to a common ground on each end of the car, a 2nd circuit safety loop (future use) and the 3rd is a loop circuit from the locomotive through the consist back to the locomotive which controls the 480 Volt power circuit. All intercar and end car jumper cables must be connected before 480 V power can be supplied to the consist. For tests, refer to test spec. °C-79-1, Tests 2.3, 2.7 and 2.8.

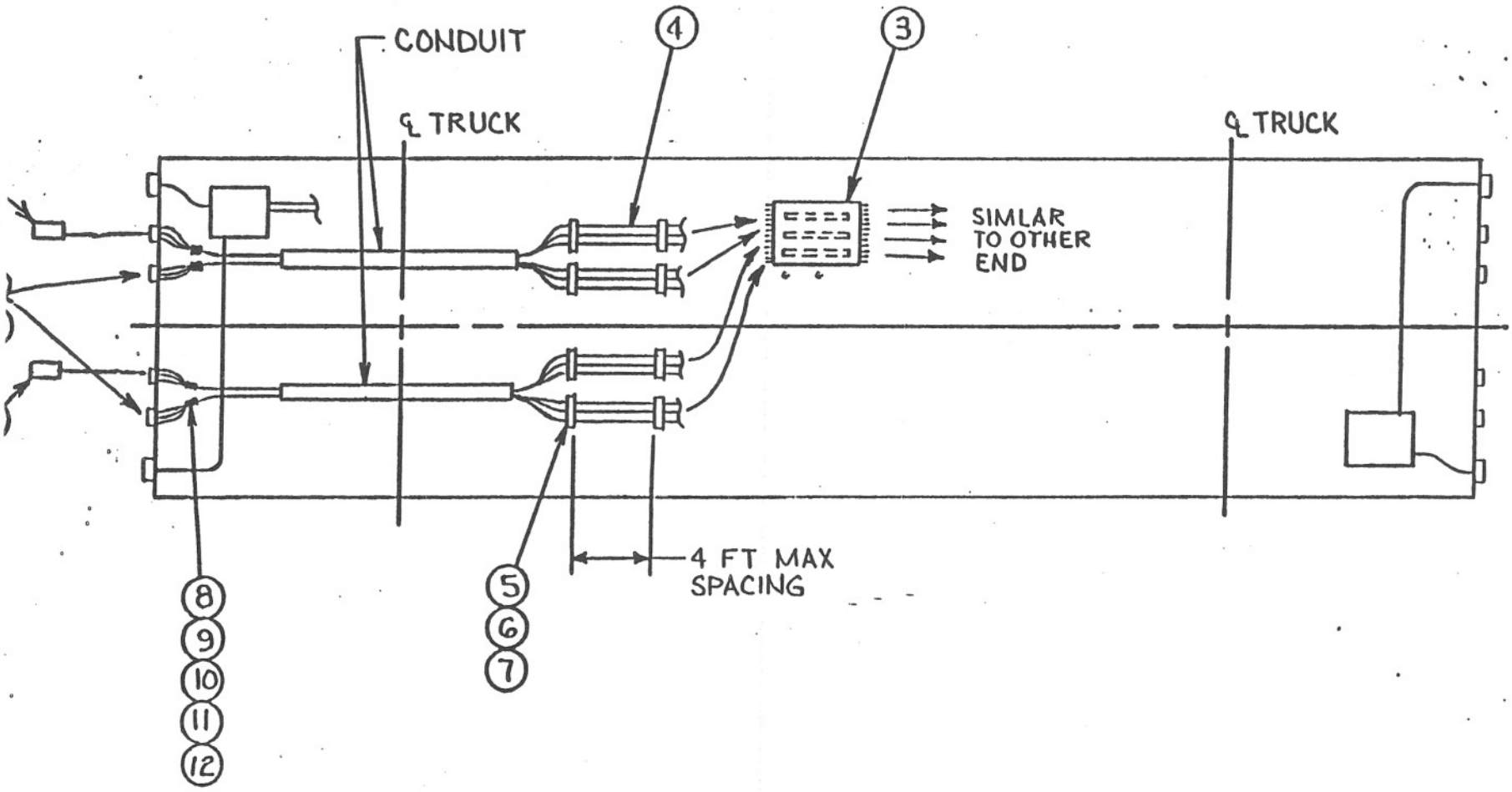



FIGURE 6.11
480 VOLT UNDERCAR COMPONENTS

Figure 6.11
480 VOLT UNDERCAR COMPONENTS

| M | QTY | DESCRIPTION | MFG | MFG # | AAR # | AHMS # |
|---|---|---|---|---|---|---|
| | 4 | 480V Receptacle Housing | Pyle National / Anderson | | | |
| | 4 | 480V Receptacle Insert, 24" Pigtail | ↓ | | | |
| 1 | 1 | 480V Junction Box | | | | |
| 1 | -- | Cable, 4/0 600V Exane or AAR 591 | | | | |
| 5 | -- | Cable Cleat | Ure | | | |
| 5 | 2ea | Elastic Stop Nut | | | | |
| 7 | 2ea | Bolt | | | | |
| 3 | 24 | Lug 4/0 | Amp | 326803 | | |
| 9 | 2ea | Bolt, Hex Head, 3/8 - 16 x 1" Steel Cadmium Plated | | | | |
| 0 | 2ea | Locknut, Esna Hex, 3/8 - 16 Steel Cadmium Plated | | | | |
| 1 | 24 | Insulating Sleeve with Clamps | Mark Equipment | M-105-A | | |
| 2 | 24 | Lug, #10 AWG Barrel Splice | AMP | 320570 | | |
| 3 | 4 | 480V Fixed Jumper, 85" | Pyle National / Anderson | | | |

### 6.2.1 480 V Receptacles

Four 480 Volt Receptacles are provided at each end of each car (figure 6.12). The cover of each receptacle is spring loaded closed for two purposes:

1. To hold the inserted jumper cable in place, and
2. To close the cover when no jumper is inserted.

NOTE: Whenever one 480 V receptacle on the car is live, all are live.

The six receptacle pins should be kept clean and dry. If dirty, the receptacle may burn, or the control circuit open and cause a power outage. The pins can be cleaned with the solvent listed in figure 6.10. The caps and cap springs must be kept in good condition, or the 480 jumper cables can work out on the road.

Figure 6.13 details the splice between the 480 receptacle and the car wire. When this splice is made, make certain the cables are secured so they will not abrade, and that they will not interfere with truck or coupler motion.

### 6.2.2 480 Volt Junction Box

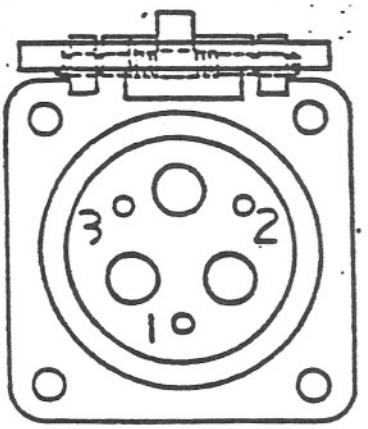
The 4 cable sets of 480 cables from each end of the car meet at the 480 Junction box, figure 6.14. Inside the cables of each phase attach to a common bus bar. This causes load sharing between each of the 4 receptacles and cables on each end of the car as well as providing a point from which to tap off car power to the main 480 breaker.

### 6.2.3 480 Cables and Cleats

The 480 trainline cables are composed of 4 three phase sets, each of 4/0 wire. Over the trucks, the cables are protected from impact by heavy wall conduit.

The cables are supported by cable cleats at approximately 4 foot intervals. Care must be taken not overtighten the cleat bolt and crush the cables, as insulation failure can result.

FIGURE 6.12
480 V. RECEPTACLE




TORQUE BOLTS TO: 1/4-20 6 FT LBS
5/16-18 11 FT LBS
3/8-16 19 FT LBS
1/2-13 45 FT LBS

FIGURE 6.13
480 V RECEPTACLE PIGTAIL SPLICE

NOTE: ESNA NUTS SHOULD ONLY BE USED TWICE; OTHERWISE THEY MAY WORK LOOSE.

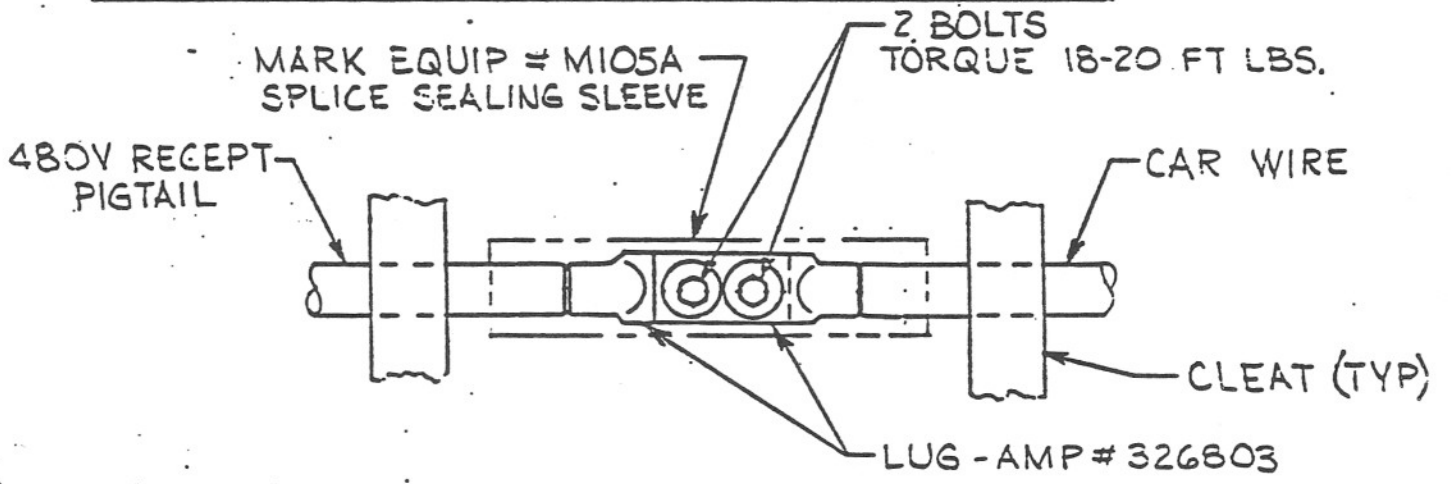
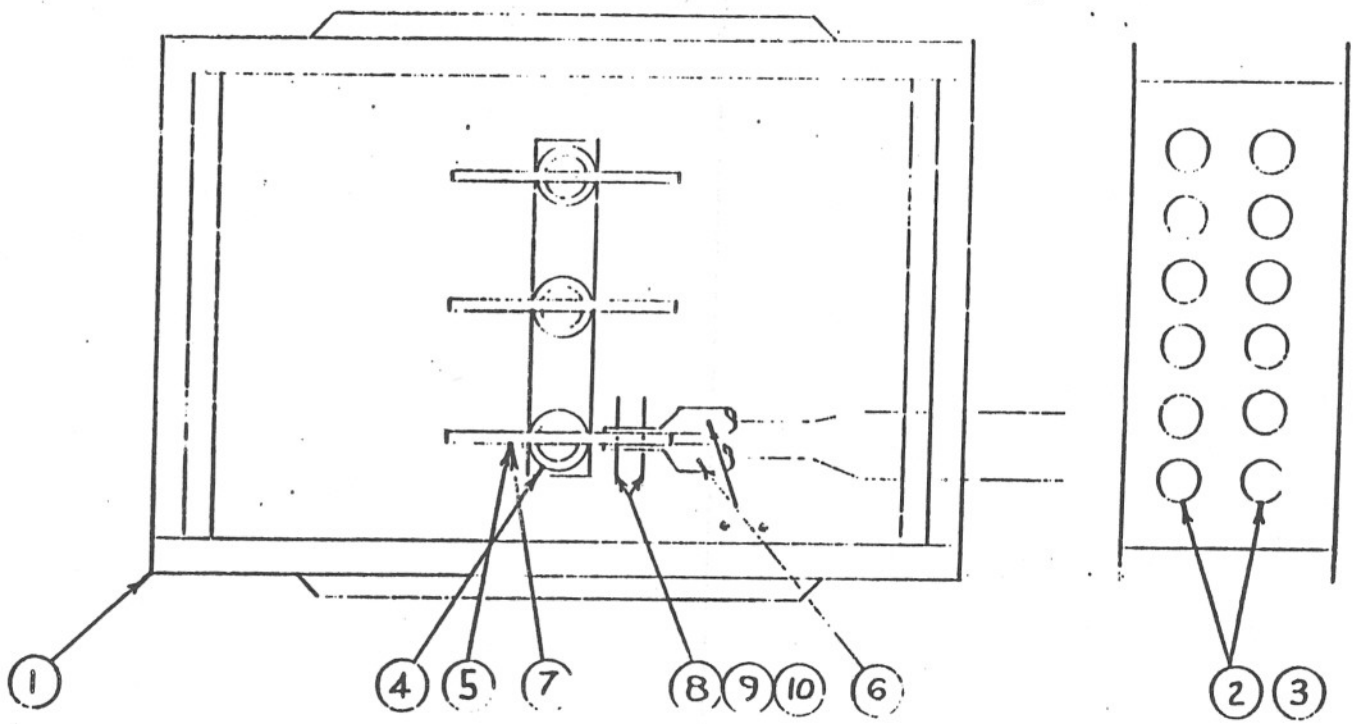


Figure 6.14
480 VOLT J-BOX




| ITEM | QTY | DESCRIPTION | MFG | MFG # | AMP # | AMIS # |
|---|---|---|---|---|---|---|
| 1 | 1 | 480V Junction Box Complete | Beech Grove | [illegible] | --- | |
| 2 | 24 | Strain Relief Bushing, Aluminum .687/.812 (EXANE) | Pyle National | PD1413 | 23X6005950 | |
| 3 | 24 | End Bushing, Insulated 1" | Thomas & Betts | 1224 | | |
| 4 | 3 | Support, T Bar Conductor | Red Seal Electric | B8778887 | 25X9008579 | |
| 5 | 3 | Bus Bar, Copper 2 1/2 x 3/8 x | -- | | 25E9008680 | |
| 6 | 24 | Lug, 4/0 .23 MCM Wire | Amp | 326803 | 25K4000441 | |
| 7 | 3 | Lug, 1/0 Wire | Amp | 36917 | 49A9000218 | |
| 8 | 27 | Bolt 3/8 - 16 x 1 1/2 Hex Grade 5 Steel Cadmium Plated | -- | | | |
| 9 | 27 | Nut 3/8 - 16 Lock Nut Grade 5 Steel Cadmium Plated | | | | |
| 10 | 27 | Lock Washer 3/8" Cadmium Plated | | | | |

## 6.2.4 480 Cable Repair Procedures

### 1. Scope

This specification covers the procedures for repair of External power cables on Head End power equipment, namely the 480 Volt exposed power trainline integral to car wiring to this specification and the 480 Volt power jumpers.

Splicing of the car power jumper is not permitted. Insulation repair will be acceptable when done in accordance with these procedures.

### 2. Material and Tools Required

Refer to figure 6.18.

### 3. Extent of Damage Determination

Inspect damaged cable area and determine method of repair required. Refer to figure 6.15.

Type A Repair: Insulation damage and limited conductor only. Length of individual repair is not limited, but must meet the following conditions:

1) No more than 30 inches of repair sleeve is allowed in any 10 feet (25%) of exposed cable.

2) No insulation repairs allowed inside conduit.

3) No insulation repairs allowed within one foot of 480 volt junction box.

4) If proposed repair violates above, use Type C Repair.

Type B Repair: Excessive Damage to Conductor

If conductor damage exceeds that allowed in figure 6.15, the cable must be cut and spliced. Depending upon available slack in cable and length of damage, a single splice, or a short piece of new cable with 2 splices must be used. Repair must meet the following conditions:

1. No more than 5 splices allowed in car length run of a single wire.

2. No splices allowed inside conduit or J-box.

3. No splice repairs allowed within 10 feet of end of car.

4. No splice repairs allowed within 5 feet of 480 volt junction box.

5. No splice repairs allowed in an area with sharp curves in the cable.

6. If proposed repair violates above, use Type "C" repair.

Type C Repair: Excessive Previous Repairs to Cable

If proposed repair violates restrictions on the number of patches or splices given above, that piece of cable is to be cut out and replaced so that the restrictions are obeyed.

4. Repair Procedures

Type A Repair: Insulation Repair Procedure (figure 6.16)

Step 1 Select size of Raychem repair sleeve for particular cable being repaired.

Use:

| | | |
|---|---|---|
| JRS-200-G-00 | For Trainline: | Car Wire |
| JRS-200-G-00 | For Pigtail: | Control Cable |
| JRS-400-G-00 | For Pigtail: | 480V Power |

Step 2 Cut selected sleeving so that it extends a minimum of 1½" beyond sides of exposed cable area. (Refer to Figure 6.16.)

Step 3 Clean and dry cable of all oil, grease, dirt and water.

Step 4 Wrap sleeving around exposed cable area. The area to be sealed is to be preheated with a torch before sleeve is applied.

Step 5 Close and lock sleeve wrapping with slide-on channel lock.

Step 6 Shrink entire length of sleeve wrapping with standard propane torch or heat gun.

Step 7 NOTE: As heat is applied the heat sensitive paint changes in color from blue to brown. This indicates that shrinkage is complete, the adhesive has fully melted and the sleeve is permanently bonded to the cable.

Step 8 After sufficient cooling time, carefully cut away channel lock from cable. Cut as close to sleeve as possible.

Step 9 Tape ends of wrapping making a smooth joint with the original cable insulation to seal ends.

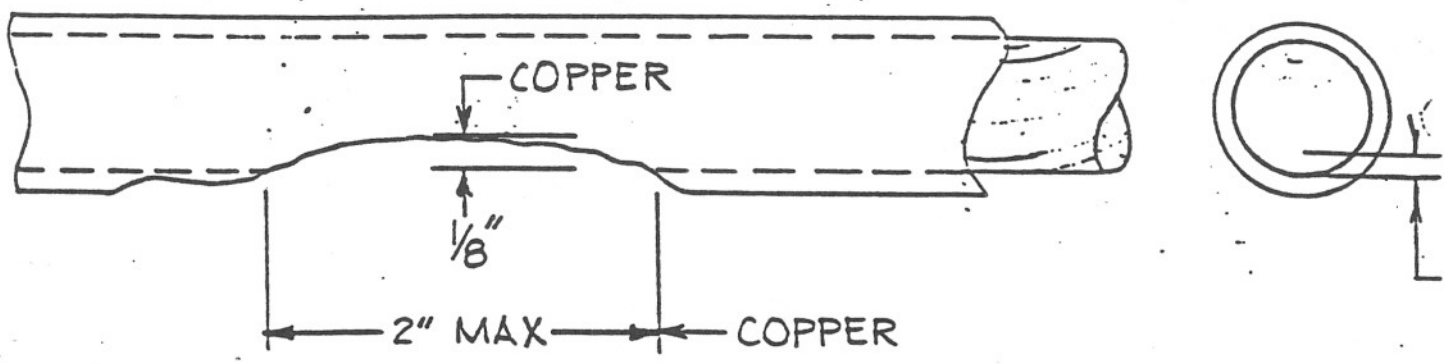



FIGURE 6.15
MAXIMUM ALLOWABLE CONDUCTOR DAMAGE TYPE-A REPAIR

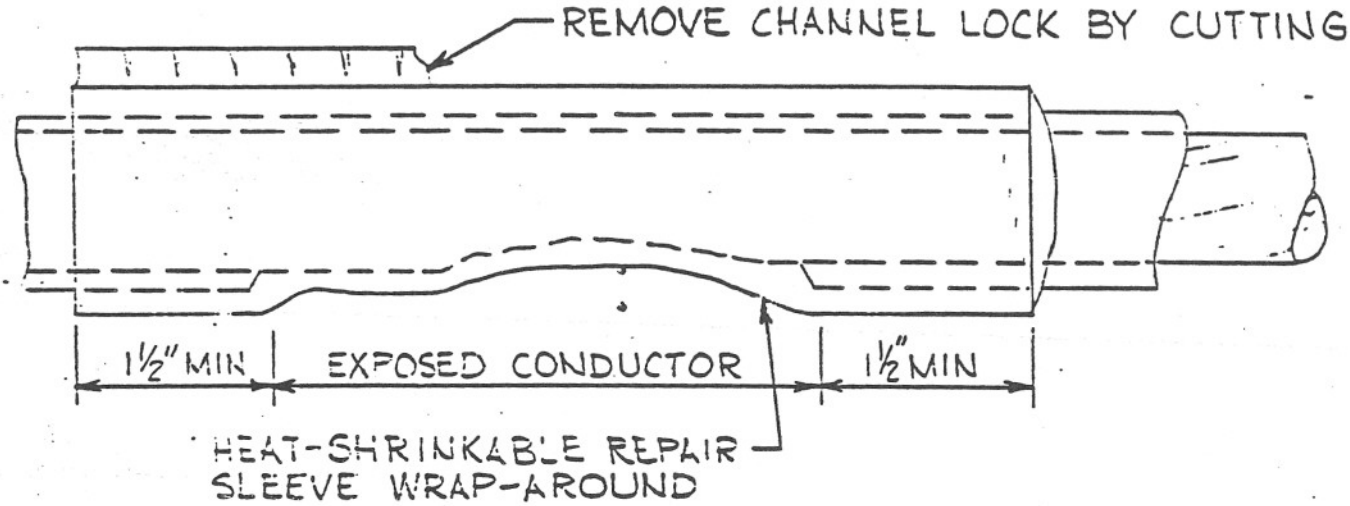
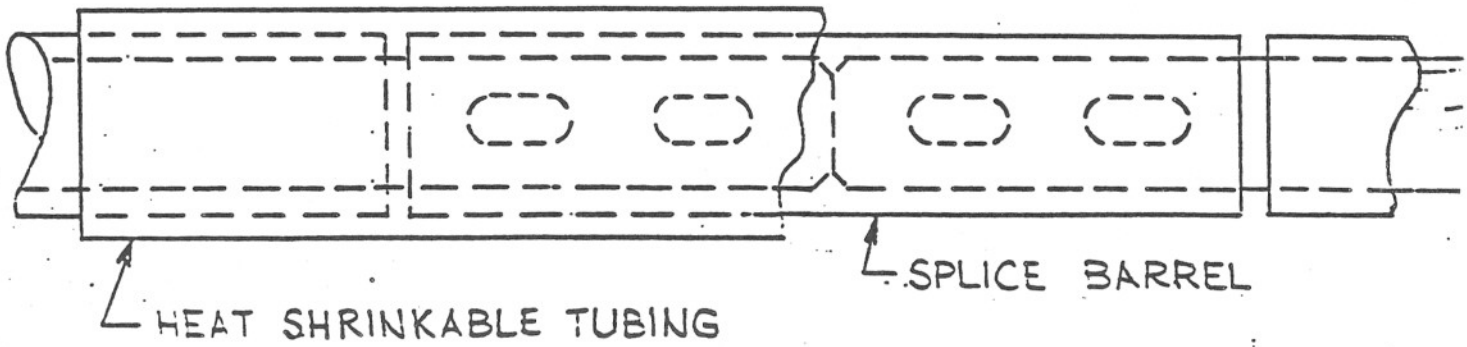



FIGURE 6.16
TYPE B & C REPAIR



Type B or C: Splice Repair Procedure (figure 6.17)

Step 1 Cut through cable where wire is exposed (cut cable section out if badly damaged, remove damaged section and add additional piece of cable using 2 splices if slack is not available).

Step 2 Clean and dry cable of all oil, grease, dirt and water.

Step 3 Cut sleeving Burndy #RYA31-2 length of 9" to cover cable splice, apply over cable prior to splicing.

*Step 4 Strip 2-1/8" of insulation from cables where joint is to be made.

Step 5 Insert cable end into Burndy #YS30 long barrel splice.

Step 6 Using Burndy #Y39 hydraulic press with #U30D-1 Nest Die, #Y34PR-5 Indentor Die and #Y35P3 Adapter Die, crimp end of long barrel splice with press two times. Check to make sure of tight crimp. Refer to figure 6.17.

Step 7 Insert other cable end into #YS30 long barrel splice.

Step 8 Repeat Step 6.

Step 9 Slide sleeving around exposed connector.

Step 10 Shrink entire length of sleeve wrapping with standard torch or heat gun.

Step 11 Tape ends of wrapping making smooth joint with original cable insulation to seal ends.

5. Tests

No tests are specifically required after a cable repair, however if insulation problems are suspected, do test 6.8 of Test Spec PQ-79-1.

## 6.3 27 Point Trainline Circuits

A 27-conductor cable system runs the length of the train. Also known as the communications cable, it contains tape music, PA, intercom, radio, door controls, brake applied and released lights and conductor signal circuits.

Each car is provided with 4 - 27 point receptacles, 2 per car end. The cover is painted blue and identified as "CAR CNT". See figure 6.19.

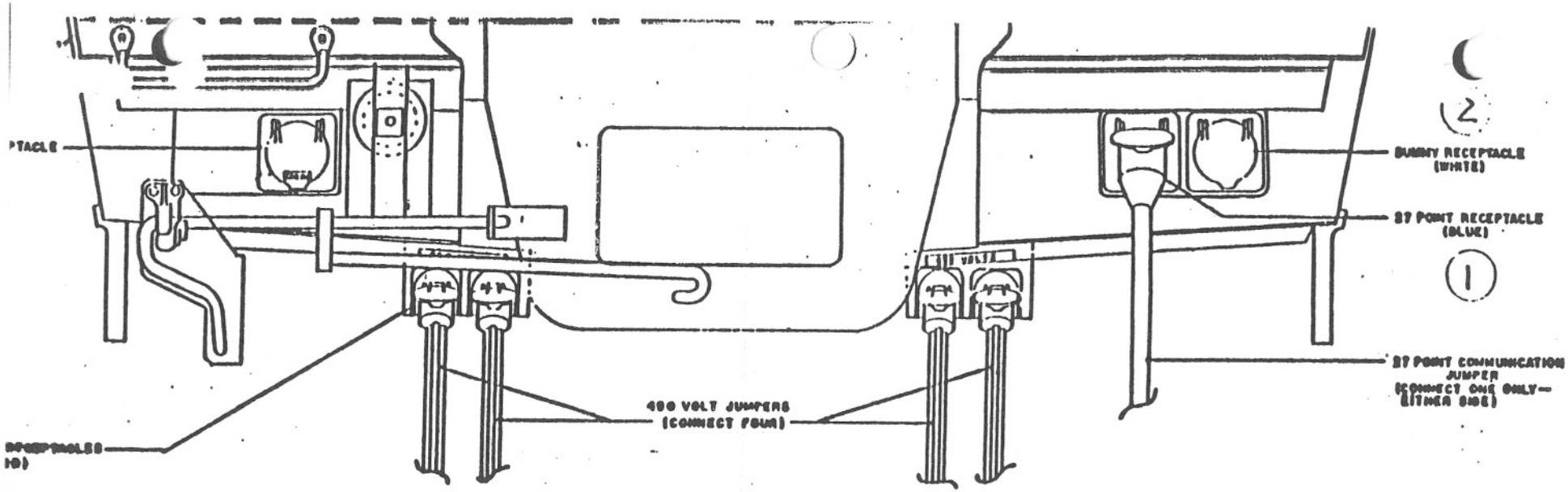
Car-to-car connection is via a single jumper cable, which can be connected to either side of the car. Refer to chapter 2.6 for procedure.

A dummy receptacle, painted white, is also provided on one side of the car. The jumper must be inserted into the blue receptacle and adjacent white receptacle at the end of the train. This activates the loop relay at that point, on the rear, providing power for the locomotive door closed, brake applied and released light trainlines.

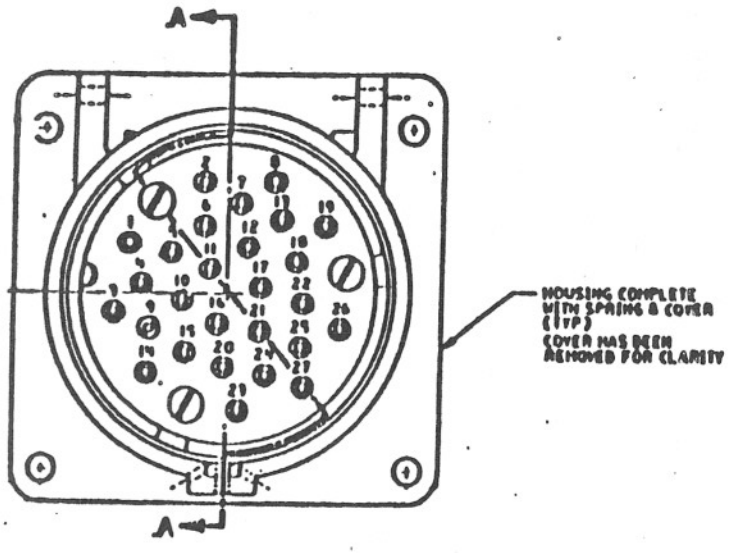
Figure 6.20 gives the function of each wire of the communications cable system. Note that many of the wires merely run through the car without connecting to any car equipment; they are, however, required for Amfleet and Superliner cars.

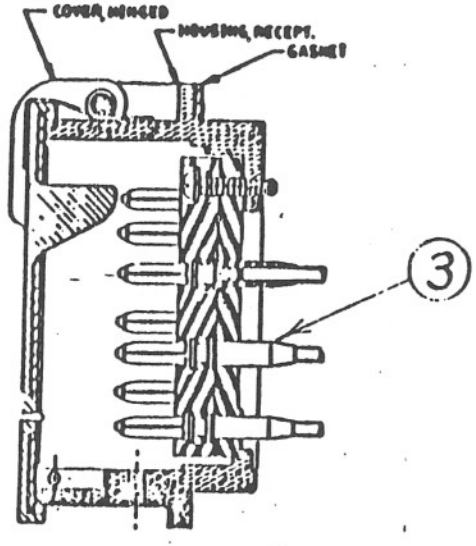
Connections between the receptacle pigtails and car wiring are made in a 27 point junction box, located underneath each end of the car.

For tests of the communications system, refer to test spec. PO-79-1 tests 2.4 and 2.9




TRAINLINE JUMPER ARRANGEMENT BETWEEN CARS, OR CARS AND LOCOMOTIVE




6-36

# FIGURE 6.19

27 POINT TRAINLINE CONNECTIONS

Figure 6.19
27 POINT RECEPTACLE PART LIST

| ITEM | QTY | DESCRIPTION | MFG | MFG # | AMT # | AMIS # |
|---|---|---|---|---|---|---|
| 1 | | 27 Point Communication Receptacle w/180" Leads | Pyle-National | WWRF-27 AMTR-L-180 | 25A4000077 | |
| 2 | | 27 Point Communication Receptacle, Dummy, 180" Leads | Pyle-National | WWRF-27 AMTR-XL-180 | 25A4000079 | |
| 3 | | Cover | Pyle-National | WWR5 | 23D4001300 | |
| 4 | | Spring, Cover | Pyle-National | WWR7A | 12H4000529 | |
| 5 | | Pin, Electrical | Pyle-National | 14017BSTZ | 11X4000527 | |
| 6 | | Casket | Pyle-National | ECS405 | 23X4001301 | |

Wire Functions, 27 Point Cable
Figure 6.20

| PIN # | SYMBOL | FUNCTION |
|---|---|---|
| 1 | SHLD | PA Wire Shield |
| 2 | TB-- | Battery Negative (Car) |
| 3 | PA1 | Tape Music No. 1 |
| 4 | PA2 | Tape Music No. 1 |
| 5 | PA3 | PA & Intercom |
| 6 | PA4 | PA & Intercom |
| 7 | PA5 | PA Control |
| 8 | PA6 | PA Control |
| 9 | RA1 | Radio (Future Use) |
| 10 | RA2 | Radio (Future Use) |
| 11 | EP1 | Brake Application |
| 12 | EP2 | Brake Release |
| 13 | EP3 | Brake Negative |
| 14 | D1 | Door Control - Right Open |
| 15 | D2 | Door Control - Left Open |
| 16 | D3 | Door Control - Right Close |
| 17 | D4 | Door Control - Left Close |
| 18 | DC1 | Engineman's Door Close Light |
| 19 | BR | Engineman's Brake Release Light |
| 20 | BA | Engineman's Brake Applied Light |
| 21 | HJ | Hot Journal Box |
| 22 | CS | Conductor's Signal |
| 23 | DC2 | Conductor's Door Close Light |
| 24 | PA7 | Tape Music No. 2 (future) |
| 25 | PA8 | Tape Music No. 2 (future) |
| 26 | BLS | Conductor's Door Close Light |
| 27 | AN | Attendant Call (future) |

## 2.6.1 Power Trainlines - 480 Volt

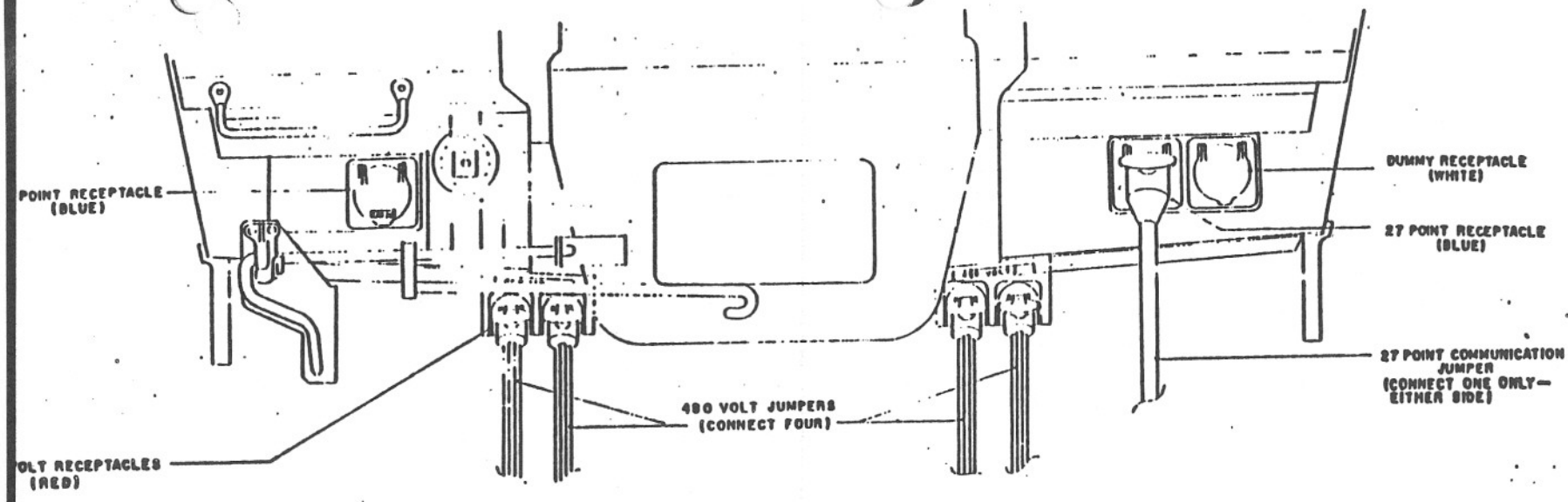
These cars are equipped with a 480 volt trainline jumper system, for transmitting 480 volt, 3-phase power from locomotive or yard power throughout the train. Four red "480 volt" receptacles are provided at each end of each car for these connections. All four jumpers must be used across each car-to-car, locomotive-to-locomotive and locomotive-to-car coupling. This is required for safety as well as the current capacity. See figures 2.36-2.37 for cabling details.

These cars are equipped with an interlock circuit that requires that all jumpers between cars be connected; plus, on the last car of a train, each of the two adjacent receptacles must be interconnected with jumpers in order that the 480 Volt trainline becomes energized. If any one of the 480 Volt jumpers is disconnected, the power to all cars will be shut off. When making up a train to the locomotive with 480 jumper cables, once all cables are secure in the receptacles, the Green "trainline complete" light on the locomotive HEP controls should light. (FL-9, E-60 and AEM-7 locomotives have one trainline complete light for each side of the train; both must be on for the system supply power to the train.) Until this circuit is complete, HEP cannot be applied to the train. All four 480 Volt jumpers must be connected before power is applied.

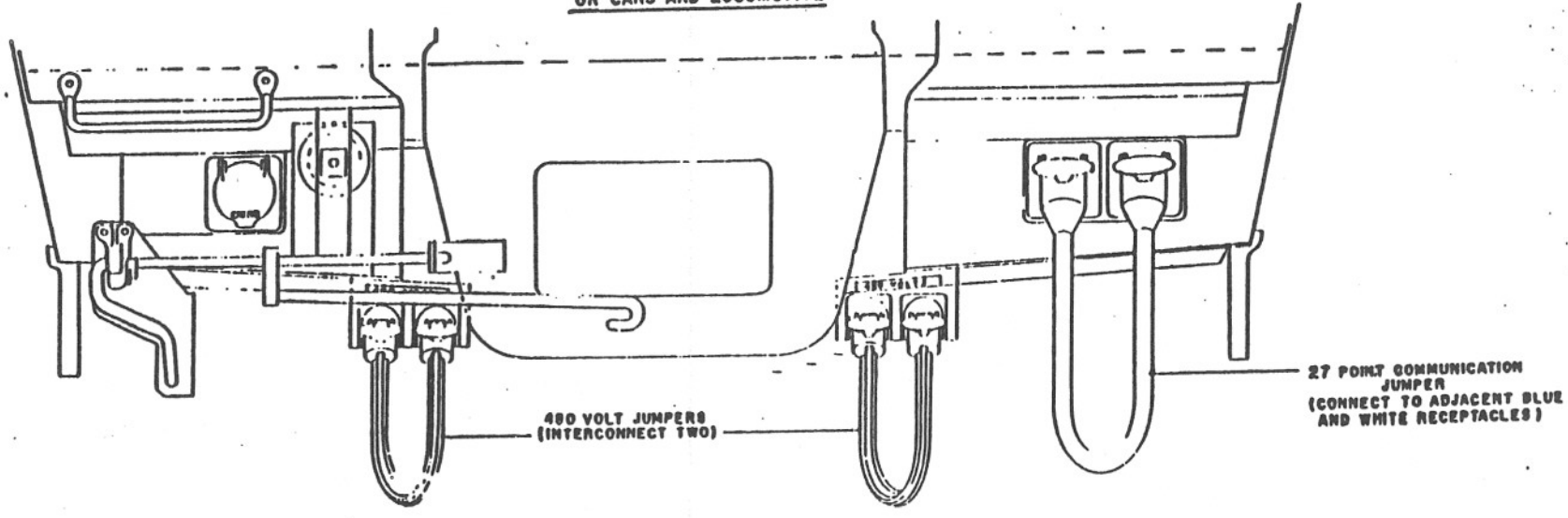
NOTE: When disconnecting any 480 jumpers, make sure the 480 power is turned off at the Source before attempting to remove the cables. DO NOT RELY ON THE LOOP CIRCUIT TO TURN OFF THE POWER FOR YOU. It must be turned off manually. Refer to fig. 2.35.

NOTE: If any of the 8-480 volt receptacles are live, all 8 are live. Never insert any metallic objects, hands, etc. into any of these receptacles unless you know for a fact all power is off on that car. Don't trust, Check.

NOTE: "Short Looping" is a very dangerous practice. Not only is it then possible to overload a pair of cables, but the safety features of the loop circuit are then bypassed, inviting accidents.




TRAINLINE JUMPER ARRANGEMENT BETWEEN CARS, OR CARS AND LOCOMOTIVE



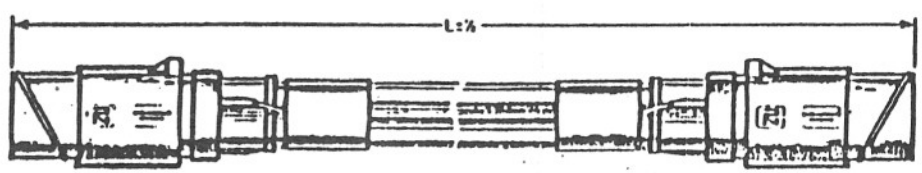

TRAINLINE JUMPER ARRANGEMENT AT END OF TRAIN

FIGURE 2.30 TRAINLINE CONNECTIONS

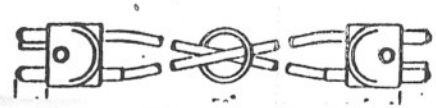
Figure 2.31
ELECTRICAL JUMPER CABLE PART LIST

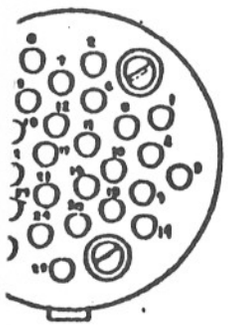
| M | QTY | DESCRIPTION | MFG | MFG # | AMT # | AMHS # |
|---|---|---|---|---|---|---|
| 1 | | 480 Volt Power Jumper 51" (Car to Car) | Pyle National | RPC-10-51 | 25A4000083 | |
| 2 | | 480 Volt Power Jumper 84" (Loco to Car & Loco to Loco) | Pyle National | RPC-10-84 | 25A4000081 | |
| 3 | | 480 Volt Power Jumper 10' (Loco to Loco) | Pyle National | RPC-10-120 | 25T4013851 | |
| 4 | | 480 Volt Power Jumper 25' Yard Standby | Pyle National | RPC-10-300 | 25A4000186 | |
| 5 | | 480 Volt Power Junper 50' Yard Standby | Pyle National | RPC-10-600 | 25X9010245 | |
| 6 | | 480 Volt Power Jumper 100' Yard Standby | Pyle National | RPC-10-1200 | 25A4000269 | |
| 7 | | 27 Point Communication Jumper 60" (Car to Car) | Pyle National | WHPCJ 2746 AMTR | 25A4000217 | |
| 8 | | 27 Point Communication Jumper 71" (Loco to Car Loco to Loco) | Pyle National | WHPCJ 2757 AMTRLO | 25A4000076 | |
| 9 | | Battery Trainline Jumper 50" | Pyle National | TLPJ-21050 | | |
| 10 | | Ring, Rubber for Item #9, 3 3/4 OD x 3/8 | Pyle National | TPR-15 | | |

NOTE: 480 Volt Cable Length includes entire plug.









END DETAIL

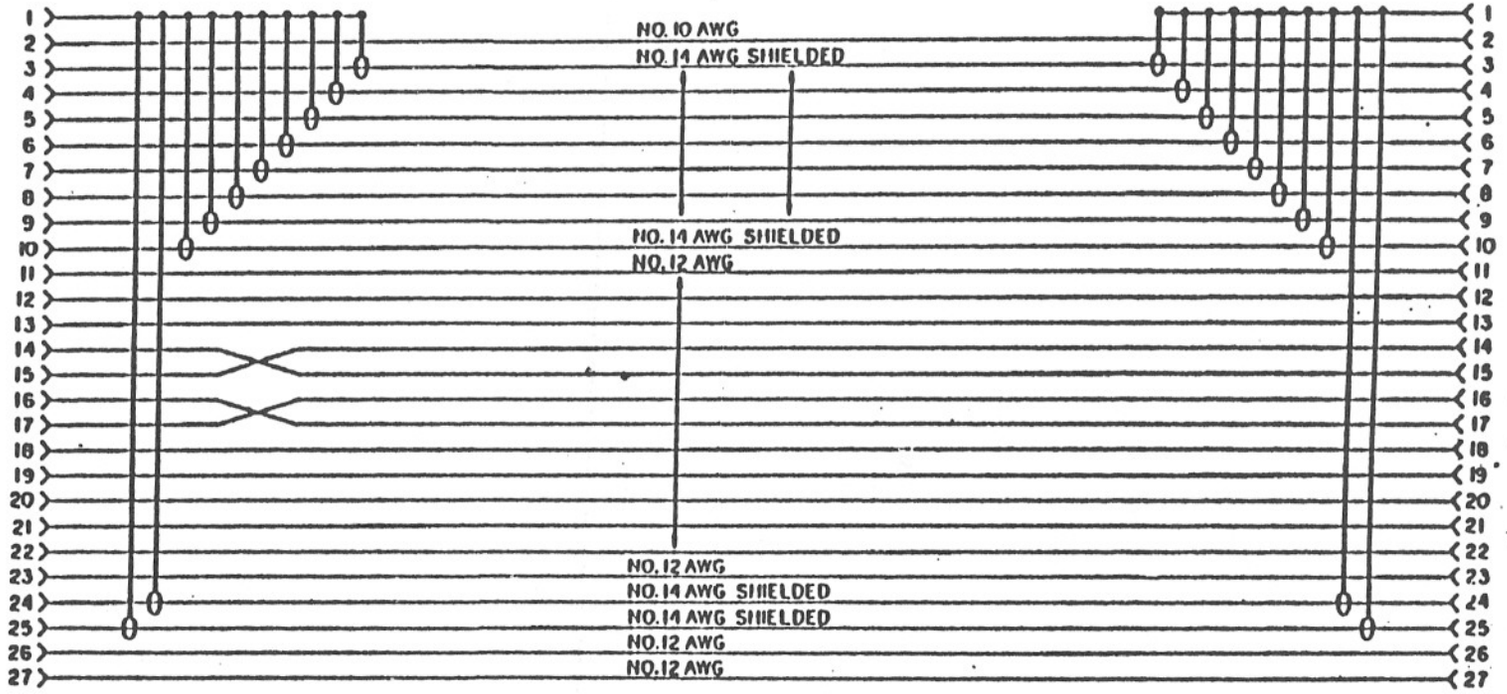



FIGURE 2.31 B - WIRING DIAGRAM - 27 POINT
COMMUNICATION JUMPER CABLE, LOCO - LOCO - CAR

# POWER PARTS COMPANY

1860 NORTH WILMOT AVENUE • CHICAGO, ILLINOIS 60647 • 312-772-4600

TWX 910-221-5507
TLX 20-6107


## PRIVATE CAR KIT
## CONVERSION FOR HEAD END POWER (H.E.P.)
## COMPATIBLE WITH AMTRAK

| IT. | Ordering Ref. PPC 16300 FULL | PPC 16298 1/2 | PPC 16297 1/4 | PPC No. | DESCRIPTION |
|---|---|---|---|---|---|
| 1 | 4 | 2 | 1 | 16284 | 480V FIXED JUMPER |
| 2 | 4 | 2 | 1 | 16286 | 480V RECEPTACLE |
| 3 | 4 | 2 | 1 | 12977 | RECEPTACLE HOUSING |
| 4 | 4 | 0 | 0 | 16287 | 27 PT. RECEPTACLE |
| 5 | 1 | 0 | 0 | 16288 | 27 PT. JUMPER |
| 6 | 1 | 1 | 1 | 16289 | 480V JUNCTION BOX |
| 7 | 2 | 0 | 0 | 16290 | 27PT. JUNCTION BOX |
| 8 | 24 | 12 | 6 | 16291 | INSULATING SLEEVE |
| 9 | 100 | 50 | 25 | 16292 | NEOPRENE CLEAT |
| 10 | 24 | 12 | 6 | 16293 | CORD GRIP |
| 11 | 48 | 24 | 12 | 16294 | # 4/0 LUGS |

| | | | |
|---|---|---|---|
| FULL | H.E.P. | PPC 16300 | $5,800.00 |
| 1/2 | H.E.P. | PPC 16298 | $2,130.00 |
| 1/4 | H.E.P. | PPC 16297 | $1,390.00 |

WIRE AVAILABLE SEPARATELY (APPROXIMATE QUANTITY REQUIRED SHOWN)

| | FULL | 1/2 | 1/4 | PRICE | DESCRIPTION |
|---|---|---|---|---|---|
| 12 | 1100' | 500' | 250' | $ .17/ft | #10, 27/24, 600V. |
| 13 | 1600' | 0 | 0 | $ .11/ft | #12, 19/25, 600V. |
| 14 | 500' | 0 | 0 | $ .57/ft | #14/2, Shielded Wire |
| 15 | 1000' | 500' | 250' | $4.71/ft | #4/0, 600V, AAR 591 |

F.O.B.: CHICAGO, ILLINOIS

TERMS: 2% 15 Days NET 30.

(4/25/86)

# POWER PARTS COMPANY

1860 NORTH WILMOT AVENUE • CHICAGO, ILLINOIS 60647 • 312-772-4600

TLX 20-6107

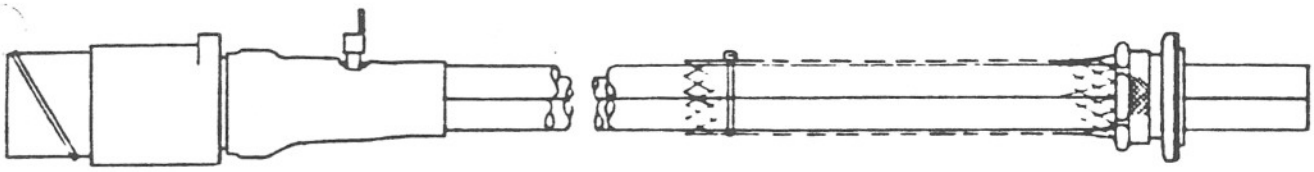

PRIVATE CAR KIT
CONVERSION FOR HEAD END POWER (H.E.P)
COMPATIBLE WITH AMTRAK

| IT. | PPC 16300 FULL | PPC No. | DESCRIPTION |
|---|---|---|---|
| 1 | 4 | 16284 | 480V FIXED JUMPER |
| 2 | 4 | 16286 | 480V RECEPTACLE |
| 3 | 4 | 12977 | RECEPTACLE HOUSING |
| 4 | 4 | 16287 | 27 PT.RECEPTACLE |
| 5 | 1 | 16288 | 27 PT.JUMPER |
| 6 | 1 | 16289 | 480V JUNCTION BOX |
| 7 | 2 | 16290 | 27 PT.JUNCTION BOX |
| 8 | 24 | 16291 | INSULATING SLEEVE |
| 9 | 100 | 16292 | NEOPRENE CLEAT |
| 10 | 24 | 16293 | CORD GRIP |
| 11 | 48 | 16294 | # 4/0 LUGS |
| 12 | 3 | 16403 | BUSS BAR |
| 13 | 3 | 16402 | INSULATOR |

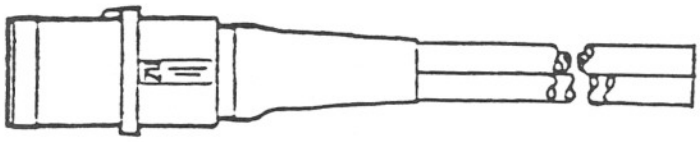
NOTE: PPC 16289 - 480V JUNCTION BOX
INCLUDES: 3- PPC 16403 BUSS BAR
3- PPC 16402 INSULATOR

F. O. B.: CHICAGO, ILLINOIS

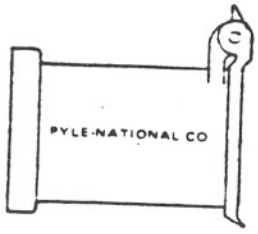
TERMS: 2% 15 DAYS, NET 30



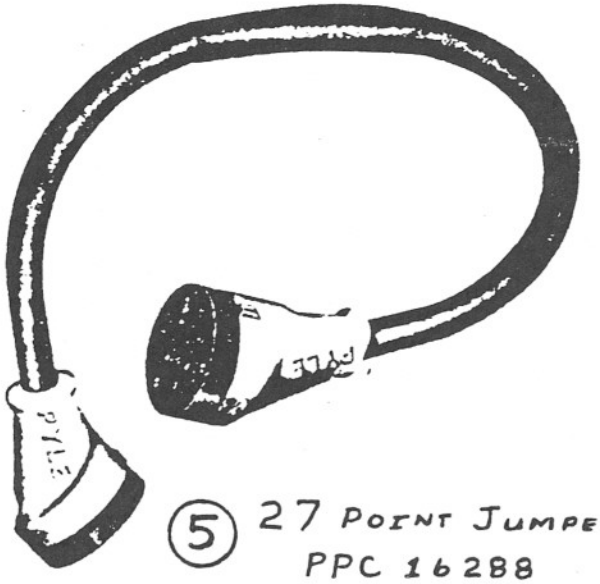
(1) 480 VOLT FIXED JUMPER
PPC 16284



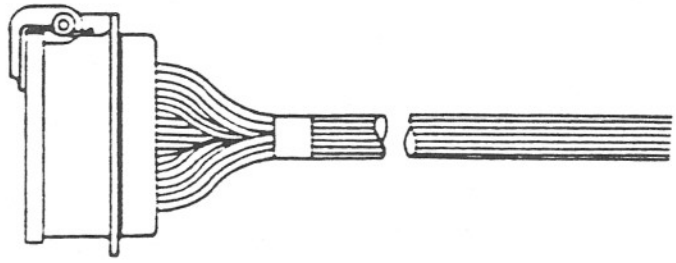
(2) 480 VOLT RECEPTACLE
PPC 16286




(3) 480V. RECEPTACLE HOUSING
PPC 12977



(5) 27 POINT JUMPER
PPC 16288

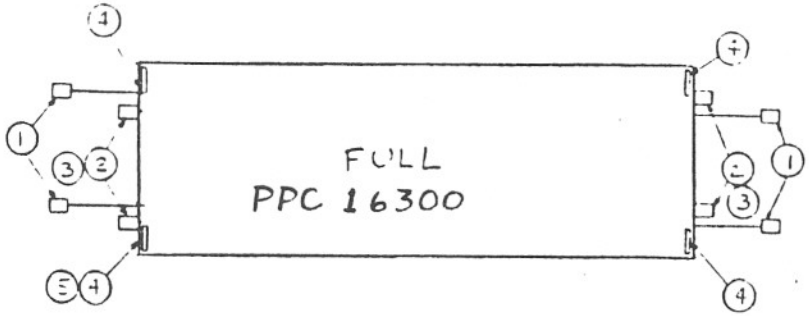


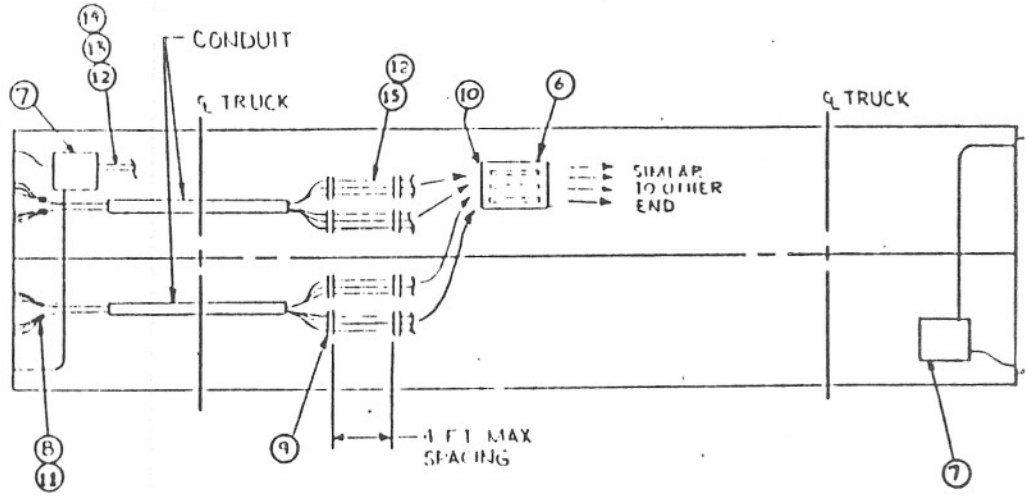
(4) 27 POINT RECEPTACLE
PPC 16287

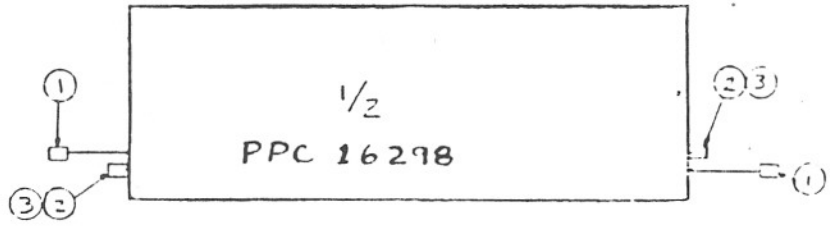
POWER PARTS CO.
1860 NORTH WILMOT AVENUE • CHICAGO, ILLINOIS 60647
Area Code 312 / 772-4600 • TWX 910-221-5507

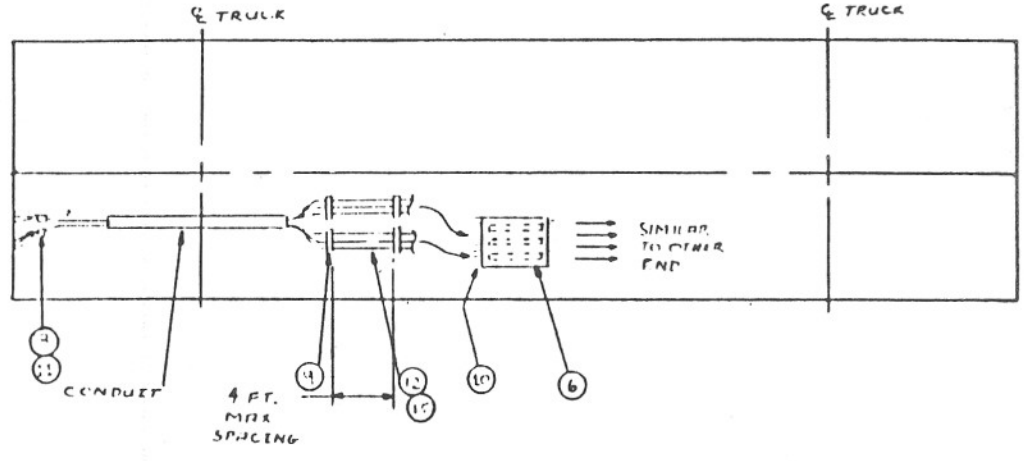
TYPICAL

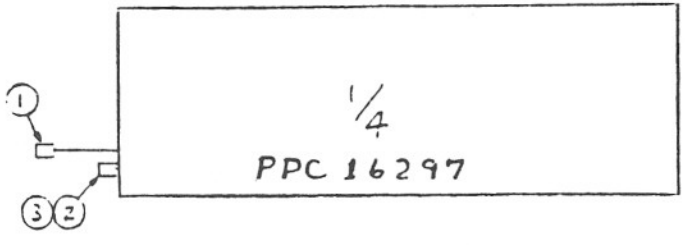
# 480 VOLT UNDERCAR COMPONENTS

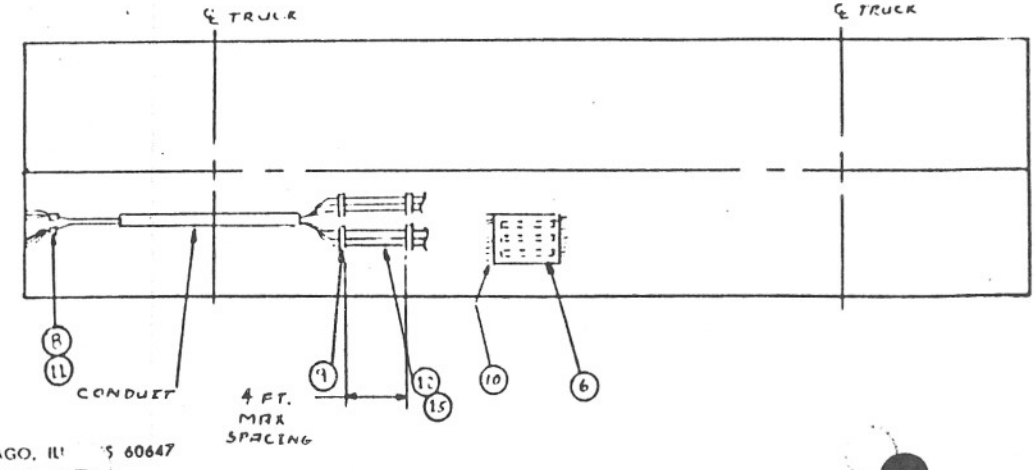
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Area Code 312 / 772-4600 • TWX 9[illegible]

Figure 6.11
480 VOLT UNDERCAR COMPONENTS

| ITEM | QTY | DESCRIPTION | MFG | MFG # | AMT # | NAMS # |
|---|---|---|---|---|---|---|
| 1 | 4 | 480V Receptacle Housing | Pyle National / Anderson | | | |
| 2 | 4 | 480V Receptacle Insert, 24" Pigtail | ↓ | | | |
| 3 | 1 | 480V Junction Box | | | | |
| 4 | -- | Cable, 4/0 600V Exane or AAR 591 | | | | |
| 5 | -- | Cable Cleat | Ure | | | |
| 6 | 2ea | Elastic Stop Nut | | | | |
| 7 | 2ea | Bolt | | | | |
| 8 | 24 | Lug 4/0 | Amp | 326803 | | |
| 9 | 2ea | Bolt, Hex Head, 3/8 - 16 x 1" Steel Cadmium Plated | | | | |
| 10 | 2ea | Locknut, Esna Hex, 3/8 - 16 Steel Cadmium Plated | | | | |
| 11 | 24 | Insulating Sleeve with Clamps | Mark Equipment | M-105-A | | |
| 12 | 24 | Lug, #10 AWG Barrel Splice | AMP | 320570 | | |
| 13 | 4 | 480V Fixed Jumper, 85" | Pyle National / Anderson | | | |

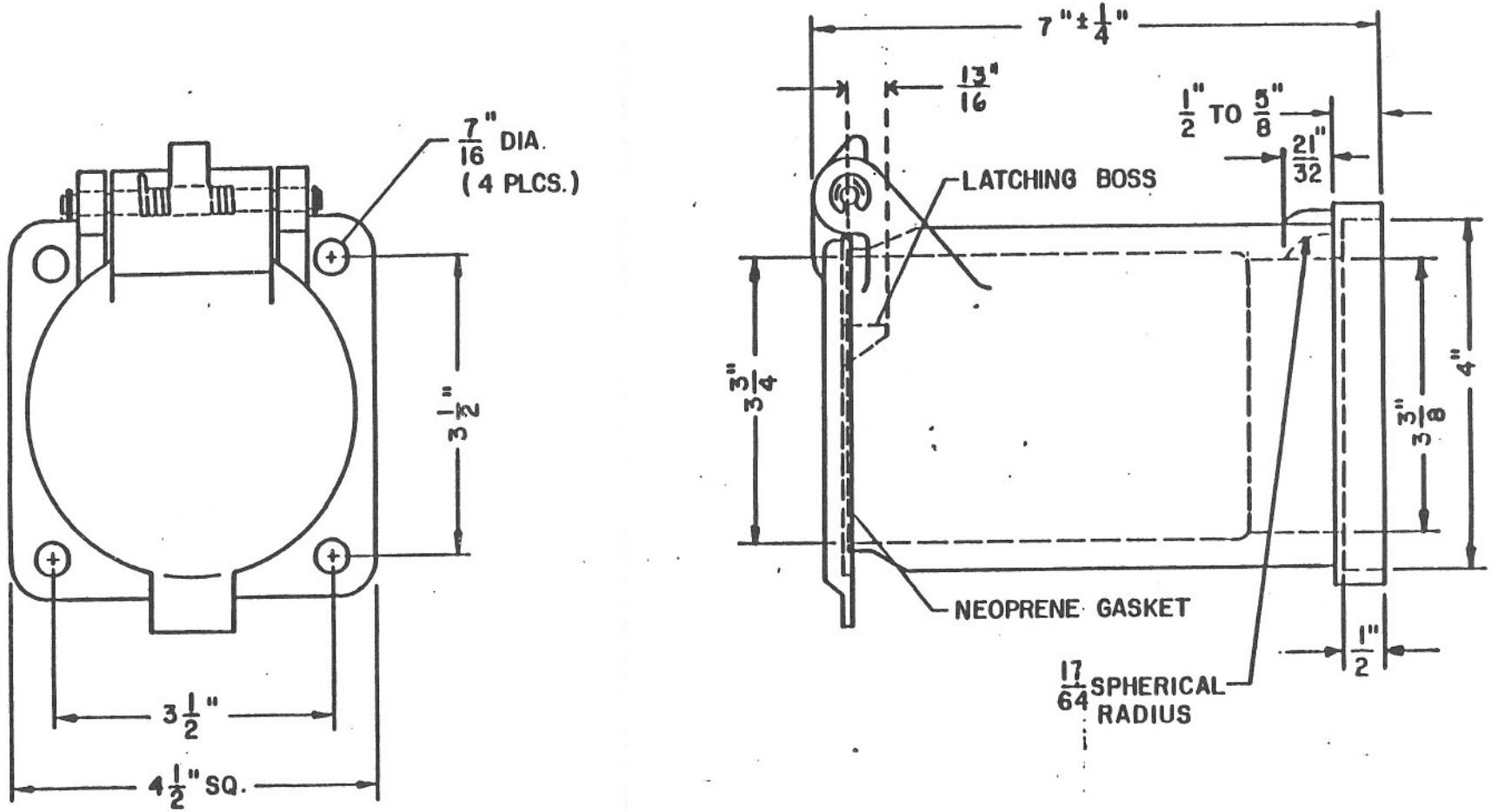


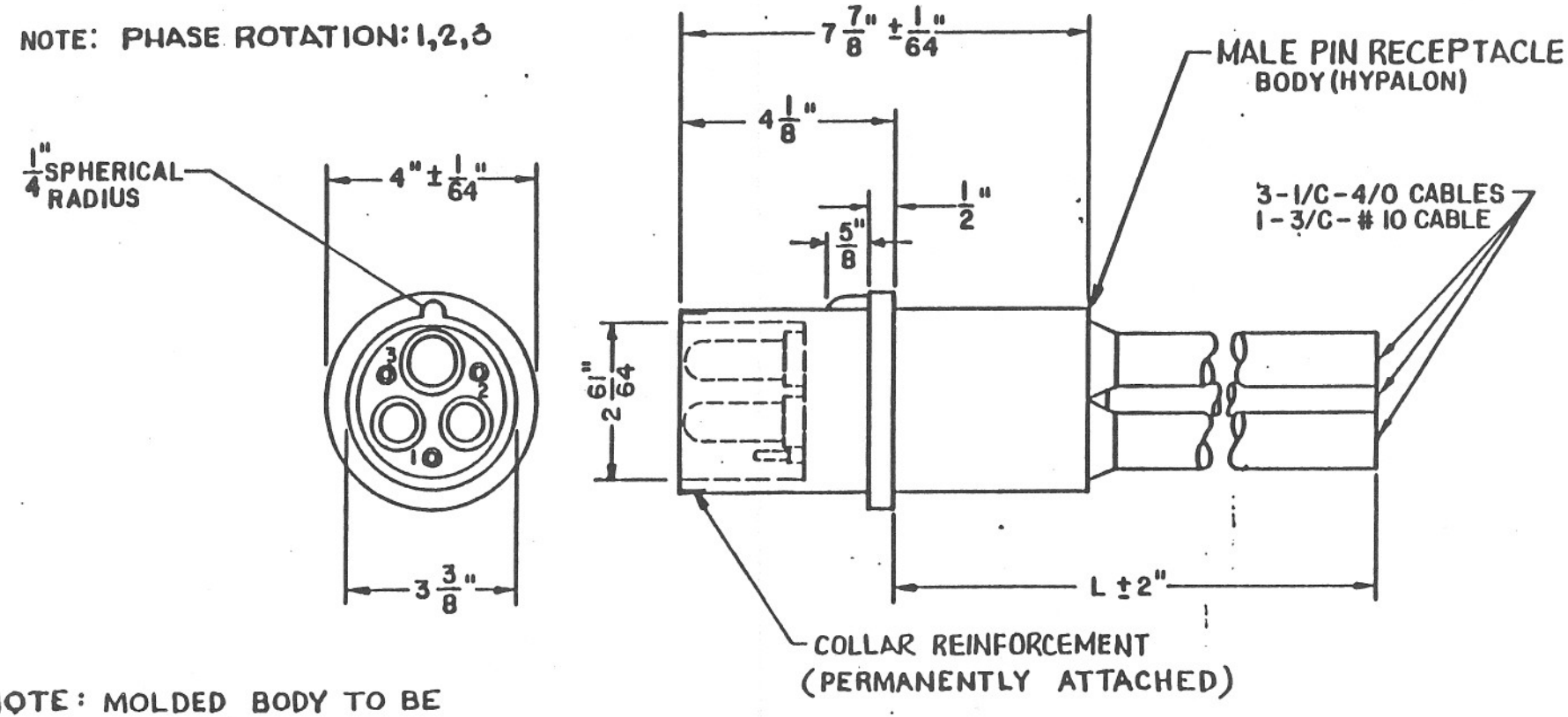

FIGURE 1
480 VOLT - 400 AMP
OUTLET HOUSING

NOTE: 1. HOUSING TO BE PAINTED
AMTRAK RED (SW F-42-R-C20)
2. AMTRAK PART NO. 25A4000080

9-6-1977

REV. B

NOTE: PHASE ROTATION: 1,2,3




NOTE: MOLDED BODY TO BE RED IN COLOR

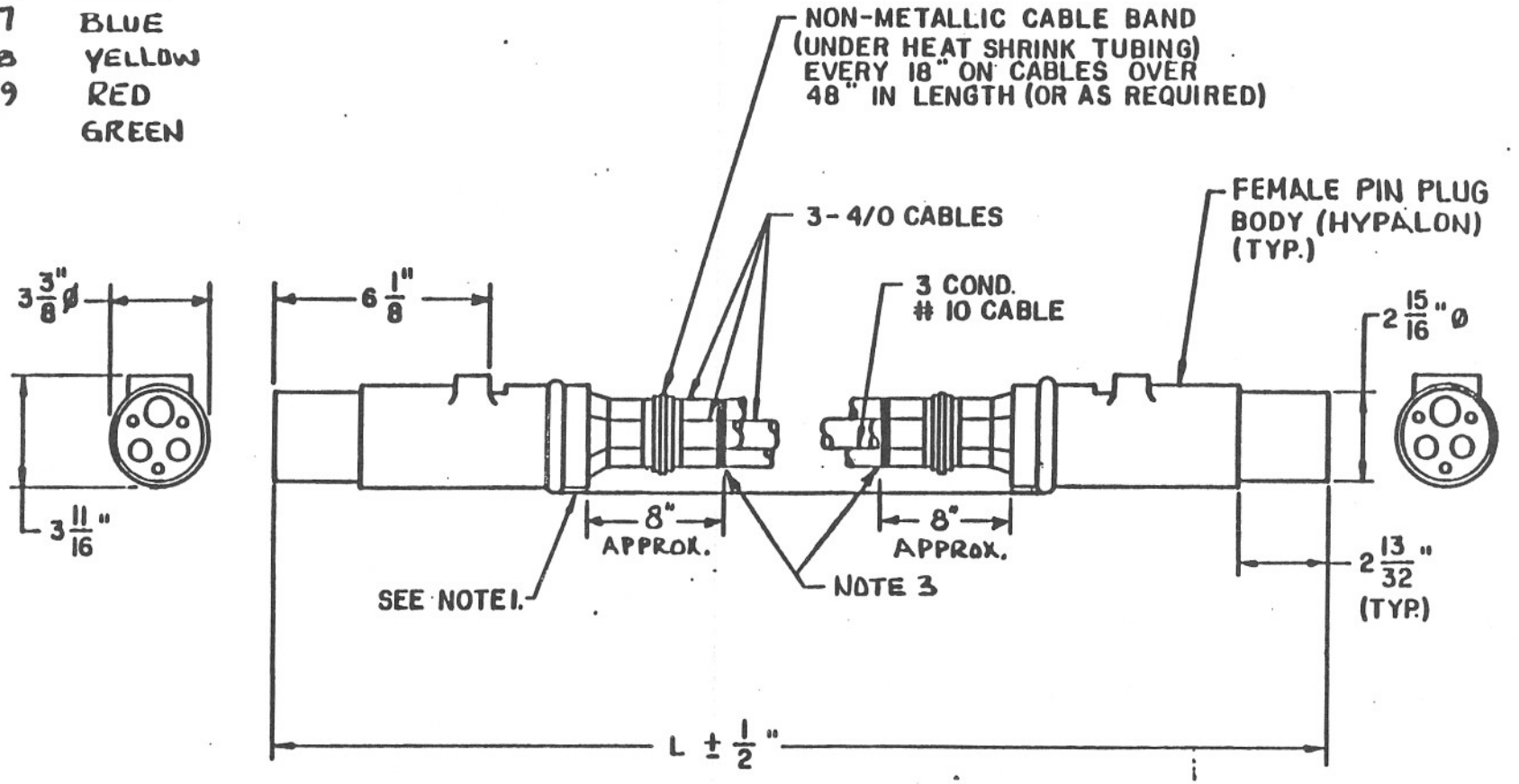
| DIM. L | AMTRAK PART NO. | REFERENCE |
|---|---|---|
| 24" | 25A4000082 | |
| 36" | | |
| 48" | 25T5000001 | |
| | | |

FIGURE 2

480 VOLT - 400 AMP
OUTLET CABLE ASSEMBLY

REV. B 6-80
REV. C 8-81

| YEAR ENDING IN | COLOR |
|---|---|
| 1,4,7 | BLUE |
| 2,5,8 | YELLOW |
| 3,6,9 | RED |
| 0 | GREEN |




NOTE: 1. WHEN SPECIFIED; PLASTIC COATED STRAIN RELIEF WIRE OR CHAIN IS TO PROVIDE SLACK IN CABLE.
2. MOLDED BODIES ARE TO BE RED IN COLOR.
3. MINIMUM OF THREE WRAPS 1½" WIDE PVC TAPE COLORED (OSHA COLORS) AS SHOWN ABOVE

| DIM. L | AMTRAK PART NO. | REFERENCE |
|---|---|---|
| 51" | 25A4000083 | CAR TO CAR |
| 84" | 25A4000081 | LOCO TO CAR |
| 25' | 25A4000186 | STDBY TO CAR |
| 50' | 25X9010245 | STDBY TO CAR |
| 100' | 25A4000269 | STDBY TO CAR |

# FIGURE 4

## 480 VOLT – 400 AMP PORTABLE JUMPER CABLE ASSEMBLY

9-6-1977

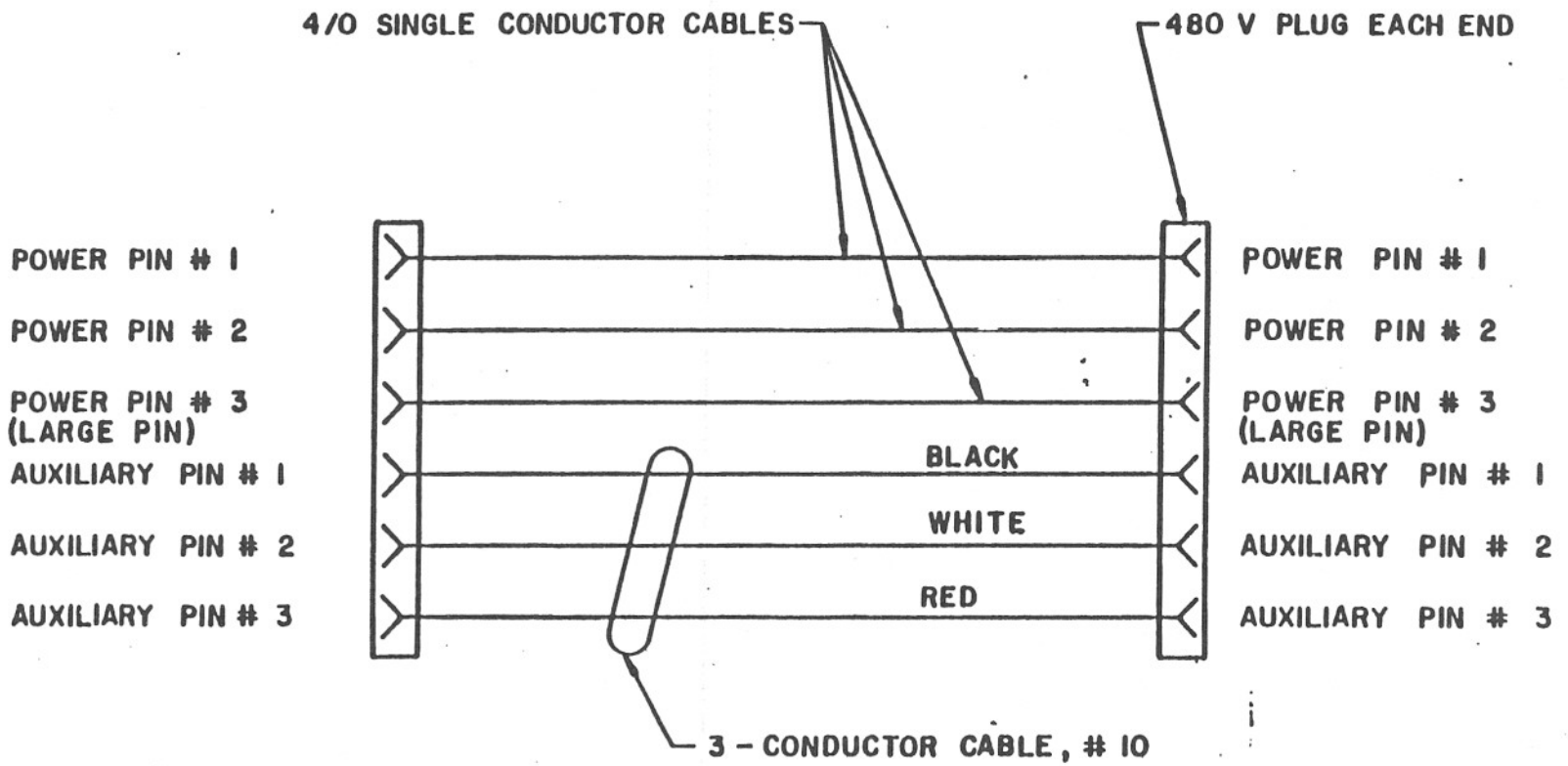
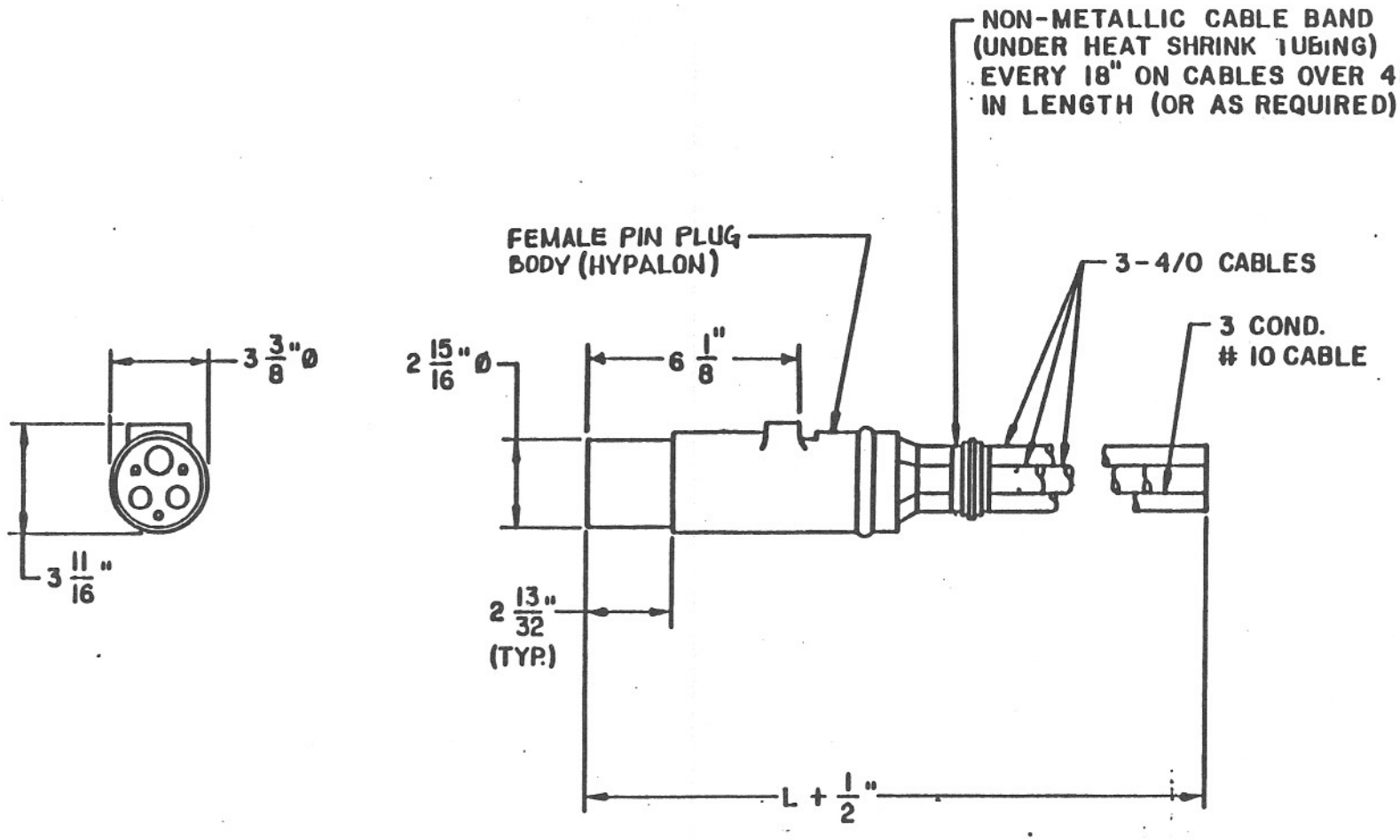



FIGURE 5

JUMPER CABLE ASSEMBLY WIRING SCHEMATIC

REV. B



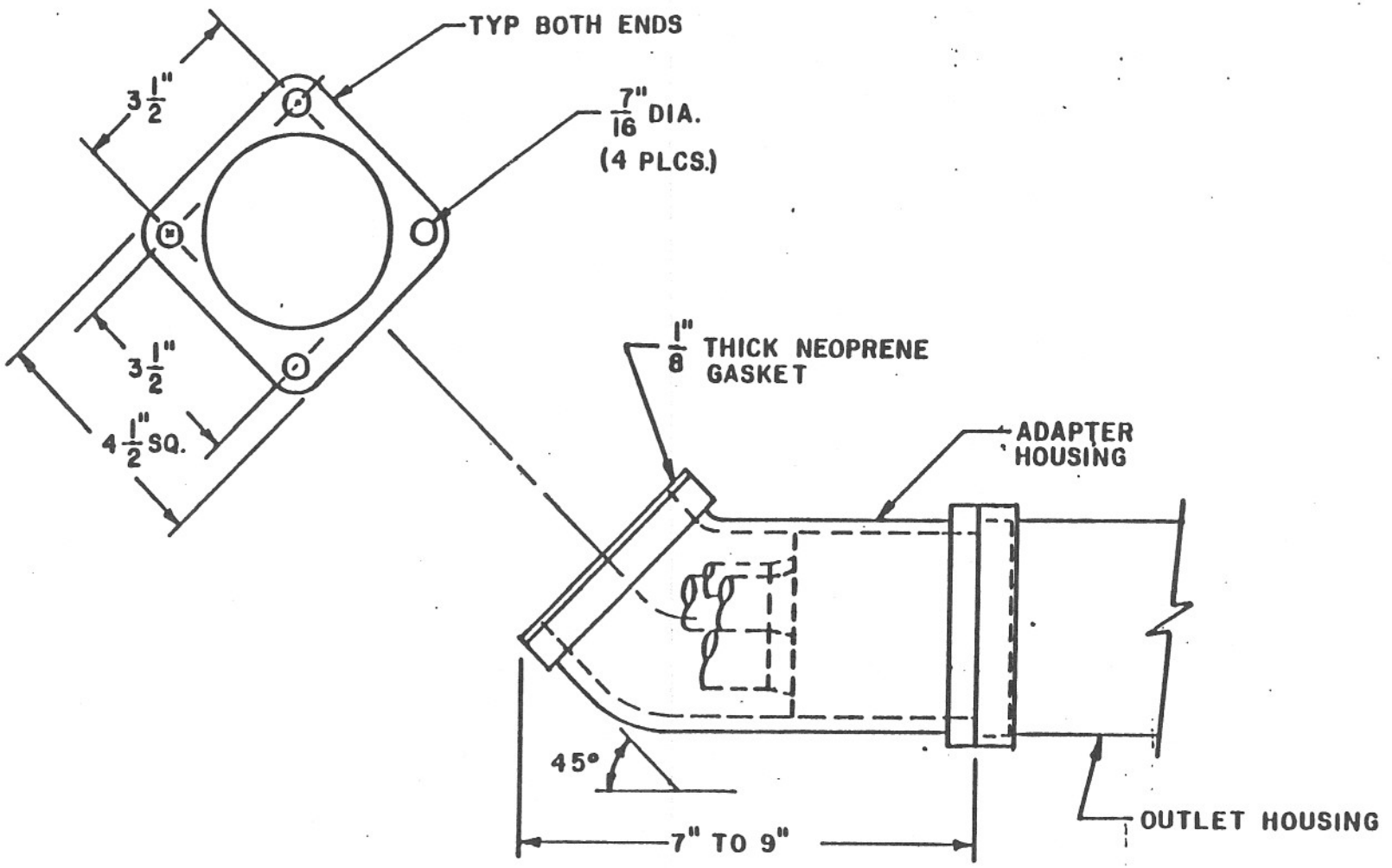

NOTE: MOLDED BODY TO BE RED IN COLOR.

| IM.L | AMTRAK PART NO. | REFERENCE |
|---|---|---|
| 4.5" | 25N5000002 | |
| | | |
| | | |
| | | |

FIGURE 6

480 VOLT – 400 AMP

FIXED JUMPER CABLE ASSEMBLY

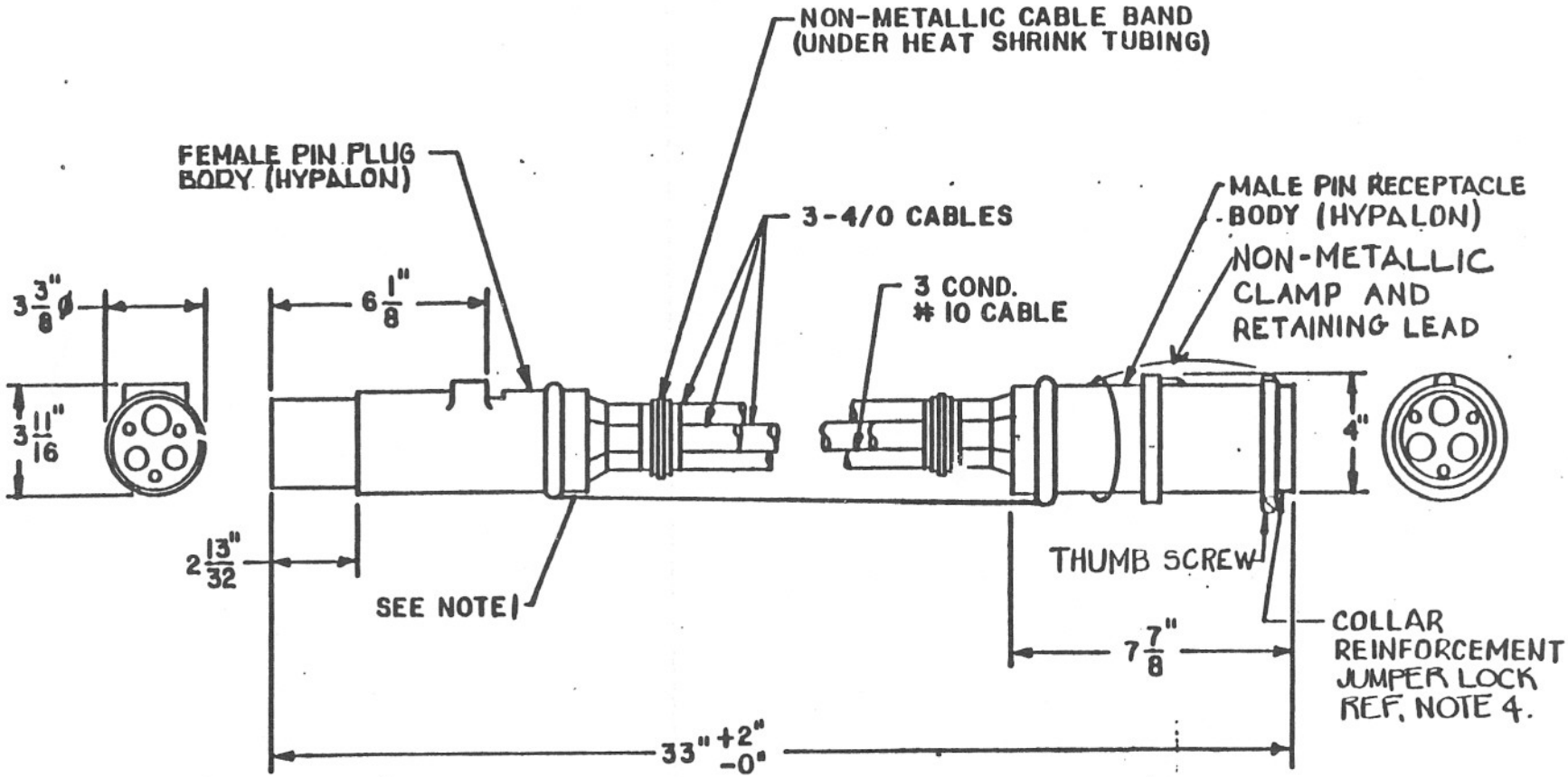



NOTE: 1. HOUSING TO BE PAINTED AMTRAK RED (SWF-42-R-C20)
2. AMTRAK PART NO.

# FIGURE 7

480 VOLT - 400 AMP
OFFSET ADAPTER

6-27-1980

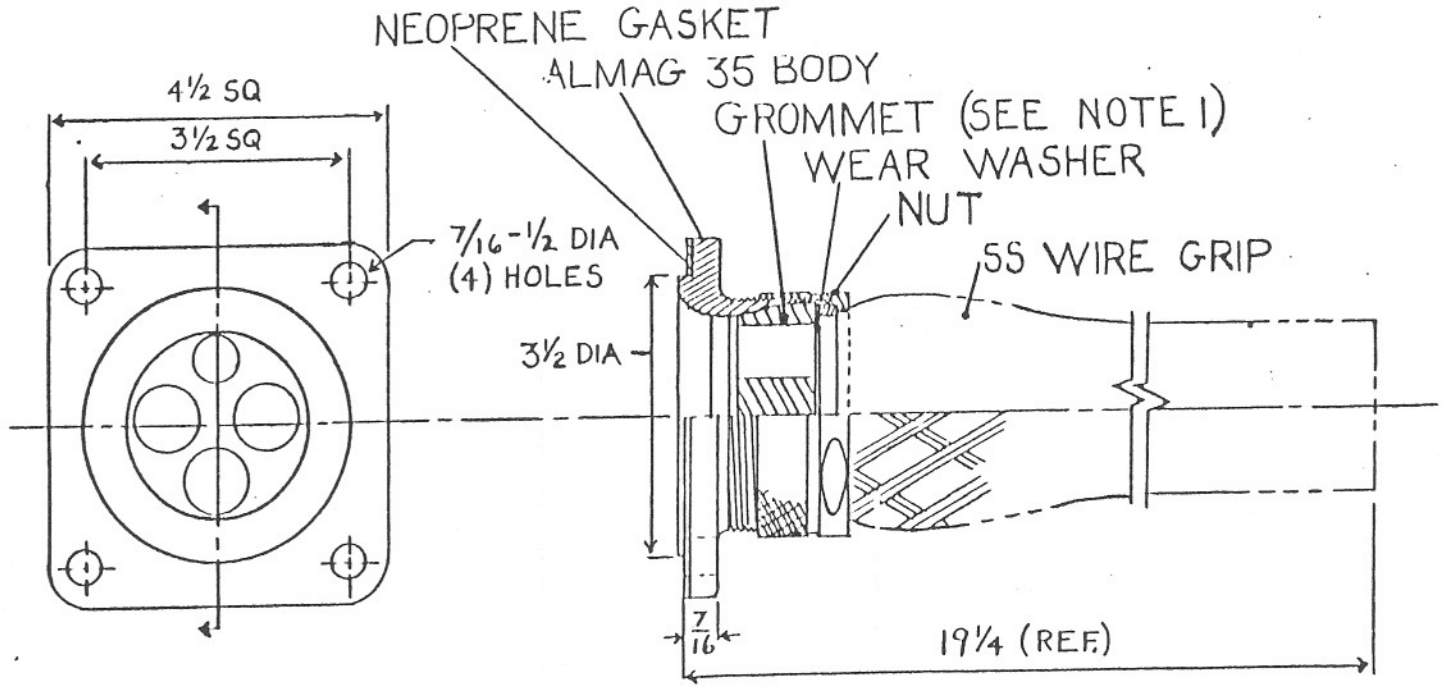



NOTE:

1. WHEN SPECIFIED:
   THE PLASTIC COATED STRAIN RELIEF WIRE OR CHAIN IS TO PROVIDE SLACK IN CABLE.
2. MOLDED BODIES ARE TO BE RED IN COLOR.
3. AMTRAK PART NO., 25E6001105.

## FIGURE 8

480 VOLT – 400 AMP
ADAPTER JUMPER CABLE ASSEMBLY




NOTES: 1. WHEN INSTALLED, THE GROMMET MUST FORM A WATERTIGHT SEAL BETWEEN ITSELF AND THE BODY AS WELL AS ITSELF AND THE CABLES UTILIZED IN THE ASSEMBLIES SPECIFIED IN PARAGRAPH III. B.3. (FIGURE 6)

FIG. 9 FIXED JUMPER CABLE GRIP / ADAPTER