

DIGITAL CLOCK DISTRIBUTOR

LOCAL PRIMARY REFERENCE CE MARK COMPLIANT

INSTALLATION

CONTENTS	PAGE	Figures (Contd)	Page
1. GENERAL	2	13. GTR Grounding Plate Connections (Dual Lightning Protector - Inside Installation)	23
2. GPS ANTENNA INSTALLATION	3	14. GTR Lightning Protector Connections (Dual Lightning Protector - Outside Installation)	26
A. Pre-installation Considerations	3	15. GTR Power Cable Connector Assembly	27
B. Cables Required.	3	16. Fiber Termination Test	29
C. Tools and Materials	5	17. Pulling Grip and Flange (for Strain Relief)	30
D. Unpacking	9	18. DCD-LPR/C Shelf Mounting Ears (Top View)	34
E. Assembly and Mounting	9	19. RS-422-to-RS-232 Converter and Connections	35
F. Lightning Protectors	17	20. Adapter Positioning and Connections ..	36
3. DCD-LPR/C INSTALLATION	31	21. DCD-LPR/C Shelf	38
A. Pre-installation Considerations	31	22. GTR to DCD-LPR/C Connections (Single Lightning Protector)	40
B. Cables Required.	31	23. GTR to DCD-LPR/C Connections (Dual Lightning Protectors)	41
C. Tools and Materials	32	24. GTR to DCD-LPR/C Power Cable Connectors	42
D. Unpacking	33	25. Example of a Snap Screw-Down Four-Position Connector	45
E. Assembly and Mounting	33	26. DCD-LPR/C Ground and Power Connections	47
F. GTR to DCD-LPR/C Connections	37		
G. DCD-LPR/C to DCD Shelf Connections	42		
H. Alarm and Status	43		
I. Ground and Power Connections	44		
J. Switch SW1	48		
4. TEST AND ACCEPTANCE	48		
Figures		Tables	
1. Junction Box Drain	10	A. Separately Ordered Cables	4
2. GTR Mounting	11	B. Customer Provided Tools and Materials (for GTR Installation)	6
3. Examples of GTR Mast Configurations ..	12	C. Customer Provided Tools and Materials (for DCD-LPR/C Shelf Installation)	32
4. DCD-LPR/C with GTR System Parts (for Single Lightning Protector)	13	D. Adapter DB9 Connector (J21 and J22) Pin Assignments	37
5. DCD-LPR/C with GTR System Parts (for Dual Lightning Protectors)	14	E. Converter DB9 Connector Pin Assignments	37
6. Metallic Conduit Bonding	16	F. Converter DB25 Connector Pin Assignments	37
7. GTR Lightning Protector and Grounding Plate	18	G. DCD-LPR/C Backplane	39
8. Shielded GTR Power Cable	18	H. GTI/C Timing Output Connections	42
9. Spade Lug Connector	18	I. DCD Clock to DCD-LPR/C Connections ..	43
10. GTR Lightning Protector Connections (Single Lightning Protector)	19	J. 25-pin J8 ALARMS OUTPUT Pin Assignments	44
11. GTR Grounding Plate Connections	20	K. Parts List	49
12. GTR Lightning Protector Connections (Dual Lightning Protector - Inside Installation)	22	L. Kit Details	50

1. GENERAL

1.01 This section provides installation procedures for the Symmetricom Digital Clock Distributor Local Primary Reference CE Mark Compliant (DCD-LPR/C) Shelf.

1.02 This section was reissued for the reasons listed below. Changes and additions are marked by change bars.

- Added a GTI/C card, part number 090-44140-18.
- Updated Figure 23.
- Updated Table K.
- Added Table L.

1.03 All product names, service marks, trademarks, and registered trademarks used in this document are the property of their respective owners.

1.04 The following abbreviations are used in this section:

DCD	Digital Clock Distributor
GPS	Global Positioning System
GTI/C	GPS Timing Interface
GTR	GPS Timing Antenna/Receiver
LOU/C	LPR Oscillator Unit
LPR	Local Primary Reference
MIS/C	Maintenance Interface, System
pps	pulses per second
TNC/C	Transit Node Clock
TNC-E/C	Enhanced Transit Node Clock
TOD	Time-of-Day
UTC	Universal Coordinated Time

Notes:

1. Where information is common to the TNC-E/C and TNC/C cards, these cards are collectively referred to as clock cards.
2. Where information is common to all GTI/C cards, these cards are collectively referred to as GTI/C cards.
3. Where information is common to both LOU/C cards, these cards are collectively referred to as LOU/C cards.

1.05 The installation steps included in this section assume that the DCD master shelf equipped with TNC-E/C or TNC/C clocks is installed, and providing timing. For additional installation information regarding the DCD master shelf, refer to the manual provided with the DCD Shelf.

Note: If using a rubidium and quartz clock combination (TNC-E/C and TNC/C) in the DCD Shelf, ensure that the rubidium clock card is installed, and its ACTIVE lamp is lit, prior to installing the quartz clock card. This ensures that the rubidium clock is the clock supplying the timing.

1.06 The installation procedures provided are intended as guidelines; actual techniques may be amended as required by local office code. If problems are encountered, contact Symmetricom Customer Technical Assistance Center (CTAC) at one of the following numbers for assistance:

- +44 1483 510300 (U.K.)
- +1 888 367 7966 (U.S.A.)

1.07 Reference to wire gauge is listed with its diameter in millimeters (mm), with the American Wire Gauge (AWG) equivalent in parenthesis.

2. GPS ANTENNA INSTALLATION

2.01 Prior to installing the GTR, a site survey should have been performed. The survey determines exactly what equipment and materials are needed for installation. The Installation Job Specification determines how the installation should proceed. For information on how to perform a site survey, refer to the Engineering Guidelines section of this manual.

A. Pre-installation Considerations

2.02 Prior to installation, verify the quality of ground within the building; consult with the office grounding specialist as to the quality of ground and grounding protection methods.

2.03 There are two methods of providing lightning protection:

Note: The single lightning protector method may be used whether or not a roof ring ground is available.

- A single inside lightning protector when the inside and outside grounds are not bonded to building steel or the Office Principal Ground Point (OPGP), or when the GTR is located in a high lightning area; this is the recommended Symmetricom lightning protector scheme
- Two lightning protectors, one installed inside, and one installed outside the building when a proper roof ring ground system is available

2.04 Optional: for communications with technical support, or other members of the installation team, ensure there is at least one phone line available within 3 meters of the DCD-LPR/C.

B. Cables Required

Notes:

1. Throughout this section, the “xx” noted in a cable part number is used in place of the number indicating the length. Contact Symmetricom Inside Sales Department for available lengths and part numbers.
2. For detailed information regarding the cables and ordering instructions, refer to the Engineering Guidelines section of this manual. For cable requirements, refer to the Installation Job Specifications.

2.05 Three cables are required for the operation of the GTR in conjunction with the GTI/C card. The cables required are:

- Fiber optic cable
- Three-conductor power cable
- 4.115 mm (6 AWG) (or larger) copper grounding wire

2.06 Fiber optic cable is used for passing clocking information between the GTR and the GTI/C. The cable must be 200 micron 850 nm wavelength multimode fibers housed in a Riser-rated cable sheath. The maximum fiber loss (including ST type connectors) between the GTR and the DCD-LPR/C Shelf is 7.0 dB. Symmetricom recommends a two-strand Riser-rated cable. (Refer to Table A.)

Note: ST type connectors must be purchased from Symmetricom if not using connectorized cable. A fiber ST terminator connector tool will be required for crimping on the connectors. (Refer to Table A.)

Table A. Separately Ordered Cables

QTY	ITEM	PART NUMBER	MANUFACTURER	COMMENTS
1	Riser-rated connectorized fiber cable	060-45110-xx	Symmetricom	Contact SpecTran Specialty Optics Co. at +1 860 678 0371 A termination kit is required to attach the connectors to the fiber cable
		BP05522-xx	SpecTran	
	Riser-rated unconnectorized fiber cable (optional)	060-45100-xx	Symmetricom	
		AC02405-xx	SpecTran	
1	Fiber Optic Connector Kit (six connectors are included) (optional)	093-42100-20	Symmetricom	
1	Fiber ST Terminator Connector Tool (optional)	TK-230-ST	SpecTran	
1*	Shielded 3-conductor power cable (for single lightning protector installations) for GTR to lightning protector connection	060-45125-xx	Symmetricom	Terminated at one end with a power connector
		9366	Belden	Unterminated at both ends
1	Unshielded 3-conductor power cable for lightning protector to DCD Shelf connection	060-45140-xx	Symmetricom	Unterminated at both ends
		9494	Belden	
*Two cables of this type are required for dual lightning protector installations, for the additional cable between lightning protectors.				

2.07 To power the GTR, and for a single lightning protector installation, Symmetricom recommends a 1.47 mm (16 AWG) shielded three-conductor power cable with an included 1.47 mm (16 AWG) drain wire for the GTR to lightning protector connection. (This cable is available from Symmetricom; contact Symmetricom's Customer Service Department for additional information.)

2.08 Symmetricom recommends an unterminated, unshielded three-conductor power cable for the lightning protector-to-DCD Shelf connection. This must be provided by the user. (An unterminated, unshielded three-conductor power cable is available from Symmetricom; contact Symmetricom's Customer Service Department for additional information.)

2.09 For the dual lightning protector installation, the same cabling materials are required as for the single lightning protector installation, plus an additional shielded cable is required to connect the inside lightning protector to the outside lightning protector.

Notes:

1. Do not ground both protectors together with one common ground wire; the outside and inside protectors must have separate ground points.
2. For outdoor cable runs, the cable should be run in weather-resistant conduit. *Avoid hard corner turns and unnecessary turns.*

2.10 For grounding the lightning protector(s), 4.115 mm (6 AWG) if less than 30.3 meters, 5.189 mm (4 AWG) if greater than 30.3 meters, copper grounding wire is recommended. This is not available from Symmetricom, and must be provided by the user.

2.11 The ground wire should be as short (less than 4.5 meters is recommended) and straight as possible, and grounded to outside building (ring) ground if using nonmetallic conduit for cable runs; if ring ground is not available, the best alternative is to use the shielded power cable and the single lightning protector scheme installed in the building. Other acceptable alternatives are to ground the lightning protector to building steel, or other metallic items known to be well grounded per national or local code (e.g., metal conduits, air conditioner ducts, etc.). If using metallic conduit for cable runs, ground the outside protector to the metal conduit, if possible. Consideration should be given to installing the grounding wires without any bends or turns.

2.12 The inside protector should be grounded to a C.O. ground bar that is bonded to the office principal ground point (OPGP). The ground wire should be as short as possible (less than 4.5 meters is recommended). Other acceptable alternatives are to ground it to building steel, metal conduits, air conditioner ducts, or other metallic items known to be well grounded per national or local code.

C. Tools and Materials

2.13 Ensure that the tools and materials listed in Table B are on hand for installation of the GTR.

Table B. Customer Provided Tools and Materials (for GTR Installation)

ITEM	COMMENT
TOOLS	
One 15.9 mm open-end wrench	For attaching the connector plugs
9.5 mm open-end wrench (or deep-socket nut-driver)	For attaching the GTR to the flange
6.4 mm open-end wrench (or deep-socket nut-driver)	For securing the grounding plate to the lightning protector
Ladder	To reach the lightning protector(s) and GTR
Hand drill with a 1.27 cm drill bit	To drill drain holes in the junction box
Soldering iron and solder	For preparing the GTR power cable
Diagonal pliers	Required if using the connectorized fiber cable purchased from Symmetricom
Cable cutting tools	—
Volt-ohm meter (digital multimeter)	—
If using unterminated fiber cable, a fiber ST terminator connector tool will be needed for crimping on the ST type connectors	Refer to Table A
(Optional) power extension cord	—
(Optional) hand-held GPS receiver	Available at most local marine boat stores
(Optional) two walkie-talkie sets	For cable pulling and testing operations
(Optional) one 17.5 mm open-end wrench	For attaching the power connector plug if an unterminated power cable was ordered
(Optional) one Wilcom FS850 fiber optic power source (or equivalent)	For testing fiber cable termination quality
(Optional) one Wilcom FM850 fiber optic power meter test set (or equivalent)	For testing fiber cable termination quality

Table B. Customer Provided Tools and Materials (for GTR Installation) (Contd)

ITEM	COMMENT
MATERIALS	
<p>Weather-resistant junction box(es), large enough to house the lightning protector with sufficient space to perform necessary connections</p>	<p>One junction box is optional, but recommended, for the inside lightning protector. For dual lightning protector configurations, one junction box is mandatory for the outside lightning protector, and an additional junction box is optional, but recommended, for the inside lightning protector.</p> <p>It is recommended that a Carlon (Lamson and Sessions) 30 cm x 30 cm x 15 cm weather-resistant junction box, p/n E989R, or equivalent, be used.</p> <p>It is recommended that for cable slack, the weather-resistant junction box should be large enough to hold the excess fiber cable and the lightning protector.</p> <p>Note: The GTR power cable must not have any complete loops in it.</p>
<p>(Optional) two each #8 screws and nuts for mounting the lightning protector in the junction box</p>	<p>The screw length is determined locally, depending on the type of junction box provided.</p>
<p>Strain relief devices, as desired, to be installed in the junction box</p>	<p>The mounting flange for the GTR provides built-in strain relief devices; if additional strain relief devices are desired, these may be installed in the junction box.</p>
<p>Expansion joint sleeves</p>	<p>For preventing breaks in the conduit due to expansions and contractions</p>
<p>Two weather-resistant conduit fittings per weather-resistant junction box</p>	<p>For connecting the junction box to the conduit</p>
<p>Weather-resistant conduit, metal or PVC conduit; use minimum 50.8 mm rigid UL Listed #651 PVC (minimum Schedule 40) if PVC is chosen, also for elbows, tees, sleeves, plugs, Ys, etc., for cable runs on the roof.</p>	<p>If metal conduit is used, conduit joints must be bonded and, at minimum, both ends of the conduit run must be connected to building structural ground via the ring ground, metal conduits, air conditioning ducts, etc. It is recommended that an intermediate point along the conduit be also grounded.</p> <p>If a valid ring round or bonding to building structure steel is not available, it is recommended that the single lightning protector installation method be used.</p>
<p>Either 50.8 mm or 101.6 mm PVC or metal conduit may be used as a mast to mount the GTR; the length and type depends on individual installation requirements</p>	<p>It is recommended that rigid UL Listed #651 PVC conduit (minimum Schedule 40) be used if PVC is chosen. The mast should be long enough to position the GTR minimum 1.4 m higher than any reflective metallic object on the roof. If proper grounding on the roof is not available, it is not recommended to use a metallic mast.</p>
<p>Weather-resistant pipe reducer, either metal or PVC—101.6 mm to 50.8 mm</p>	<p>For connecting the mast to the conduit, and/or changing from a 101.6 mm mast to a 50.8 mm mast (or 73.2 mm if using a Prodelin Corp. mast [p/n 0800-101]) If proper grounding on the roof is not available, it is not recommended to use metallic reducers.</p>
<p>One fitting per junction box</p>	<p>For the 4.115 mm (6 AWG) (or larger) ground wire to enter the junction box for connection to the lightning protector</p>

Table B. Customer Provided Tools and Materials (for GTR Installation) (Contd)

ITEM	COMMENT
MATERIALS (Contd)	
Ground bonding clamps, gutter taps, etc.	For connecting 4.115 mm (6 AWG) (or larger) ground wires to protective and ring ground
4.115 mm (6 AWG) (or larger) ground wires. The wires should be long enough to reach from the inside lightning protector to the Central Office (C.O.) ground and, if applicable, from the outside lightning protector to the outside building (ring) ground	For grounding the lightning protector(s). Symmetricom recommends using 4.115 mm (6 AWG) if the cable distance is <30 m, 5.189 mm (4 AWG) if the cable distance is >30 m.
Fiber cable innerduct from the DCD-LPR/C Shelf to the inside lightning protector or junction box	Riser-rated fiber cable should be treated like copper cable; fiber cable innerduct is normally not required for this type of cable. Installation of innerduct is required only if necessitated by company practice.
Pulling wire or cord (if using unconnectorized fiber cable)	Not required if using the terminated fiber cable from Symmetricom; the fiber cable comes equipped with a pulling grip.
2.54 cm black electrical tape	Required if using the terminated fiber cable from Symmetricom
One sheet of fine-grain sandpaper	To provide a bare metal surface for ground connections
Spaghetti insulation for 1.47 mm (16 AWG) wire	Required for single lightning protector installations. Used to insulate shield drain wires on shielded cables
Small roll of vinyl or aluminum fine mesh window screen material and appropriate adhesive (may be found at hardware or home improvement stores)	To screen water drain holes in junction boxes and conduit to keep out living creatures
Fire-stopping material	To block fire from crossing through the cable/conduit hole in the roof and walls
Electrically conductive antioxidant compound (Kopr-Shield or equivalent)	To coat any connection exposed to weather, to prevent oxidation at the connection
ABS to PVC cement	For connecting ABS/PVC to ABS/PVC (e.g., metal to ABS/PVC connections are made with an ABS/PVC connector that is threaded on one end for metallic connection to ABS/PVC; the other end is cemented for ABS/PVC to ABS/PVC connection)
Hardware to mount the GTR Assembly to the roof, tower, parapet, or side of building, such as brackets, clamps, U-bolts, nuts, washers, etc.	Caution: Clamps that form a complete circle around the power cable, or the cable conduit, are not allowed. The ring clamp acts like a choke coil to induced currents which resists current flow, and hampers proper lightning protection.
Weatherproofing material (pipe thread tape, silicon sealer)	—
Ring terminal or spade lug connectors to fit a 1.47 mm (16 AWG) wire, 6.4 mm wide, and fit to a #6 stud	Minimum 15 lugs are needed

D. Unpacking

2.14 Save packing material. All equipment returned *must be packed in the original packing material. Returned equipment not packed in original packing material voids warranty.* Contact your local Symmetricom distributor, or call Symmetricom's Customer Service Department, if additional packaging is needed at +44 1483 510300 (U.K.).

1. Unpack equipment carefully.
2. Inspect equipment for shipping damage, including bent or loose hardware, and broken connectors. Notify Symmetricom and the carrier if equipment was damaged in transit.
3. Verify all items have been received. For a parts list, refer to Table K, at the end of this section.
4. Notify Symmetricom and the carrier if equipment was damaged in transit, and/or any items are missing.

Note: If installing only one GTI/C card, only one antenna is required; if installing two GTI/C cards, two antennas are required.

E. Assembly and Mounting

2.15 To assemble and mount the GTR (refer to the Engineering Guidelines section of this manual for

recommended location and mounting considerations); use company practices to perform the following:

Warning: *Ensure that the lightning protectors are placed away from electrical devices or cabling that may induce arcing.*

Caution: *When routing fiber cable, do not have less than a 50.8 mm bending radius; 25.4 mm for stripped (unsheathed) fiber cable. Less could cause fiber breakage or excessive fiber loss.*

Notes:

- a. Do not install the GTI/C card in the DCD-LPR/C Shelf until instructed to do so.
- b. For single lightning protector installations, this procedure pertains to sites where the lightning protector is located within 15 meters of where the GTR power cable enters the building. The shielded cable must not be run more than 15 meters inside the building without being grounded to a C.O. ground bar that is bonded to the OPGP. If the lightning protector is located at a cable distance greater than 15 meters from the cable entrance, either relocate it to within 15 meters of the entrance, or contact Symmetricom CTAC for an alternate method.

1. Optional: mount a junction box for the inside lightning protector. The inside lightning protector should be mounted as near to the cable entrance point as possible. If using the single lightning protector scheme, it must be installed no more than 15 cable meters from the cable entrance point.
2. If installing dual lightning protectors, mount the weather-resistant junction box for the outside lightning protector according to company Installation Job Specification. It should be mounted as near to the cable entrance point as possible that permits the ground terminal of the lightning protector to be bonded as direct, and short as possible to the ring ground system. If using the single lightning protector scheme, it must be installed no more than 15 cable meters from the cable entrance point.

Warning: *Ensure that the lightning protectors are placed away from electrical devices or cabling that may induce arcing.*

Note: The provided mounting flange for the GTR provides built-in strain relief devices; if additional strain relief devices are desired, install in the junction box. The junction box can also be used for fiber cable slack.

Warning: *Do not attempt to coil excess GTR power cable into the junction box. The power cable must not have complete loops in it. Failure to observe this caution may*

result in increased damage if a lightning strike occurs.

3. If installing additional junction box(es) for cable slack and/or strain relief, mount at this time.
4. Drill a hole, approximately 12.7 mm in diameter, centered in the lowest side of the junction box(es); the hole will be used to drain excess moisture that may accumulate in the box (Figure 1).
5. Glue a piece of fine mesh window screen over the hole on the inside of the junction box, to keep insects, etc., out of the box.

Note: For the following steps, refer to Figures 2 through 5.

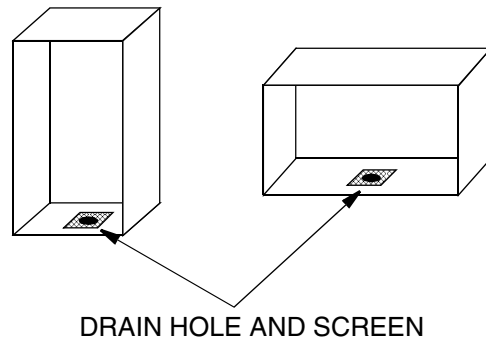
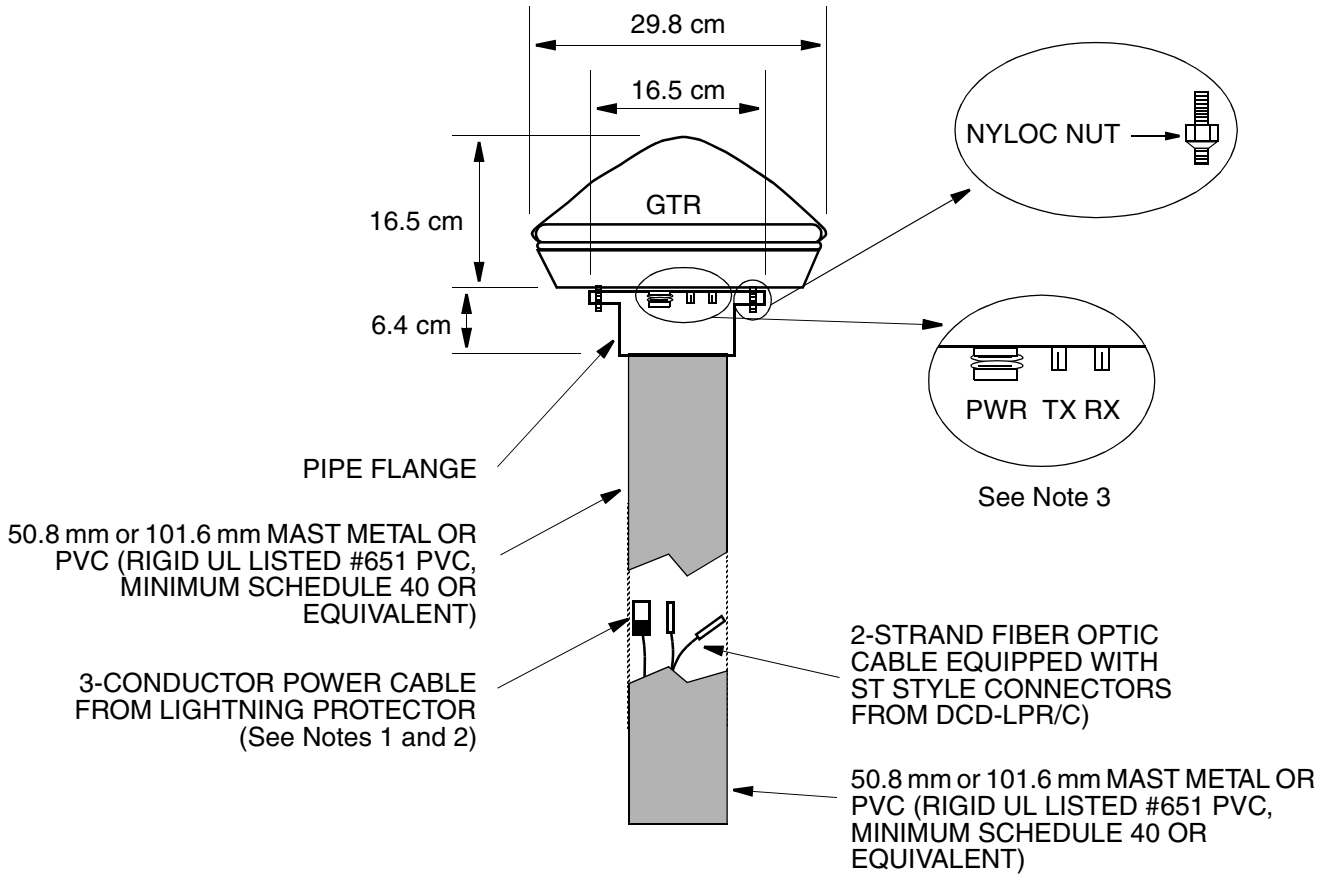


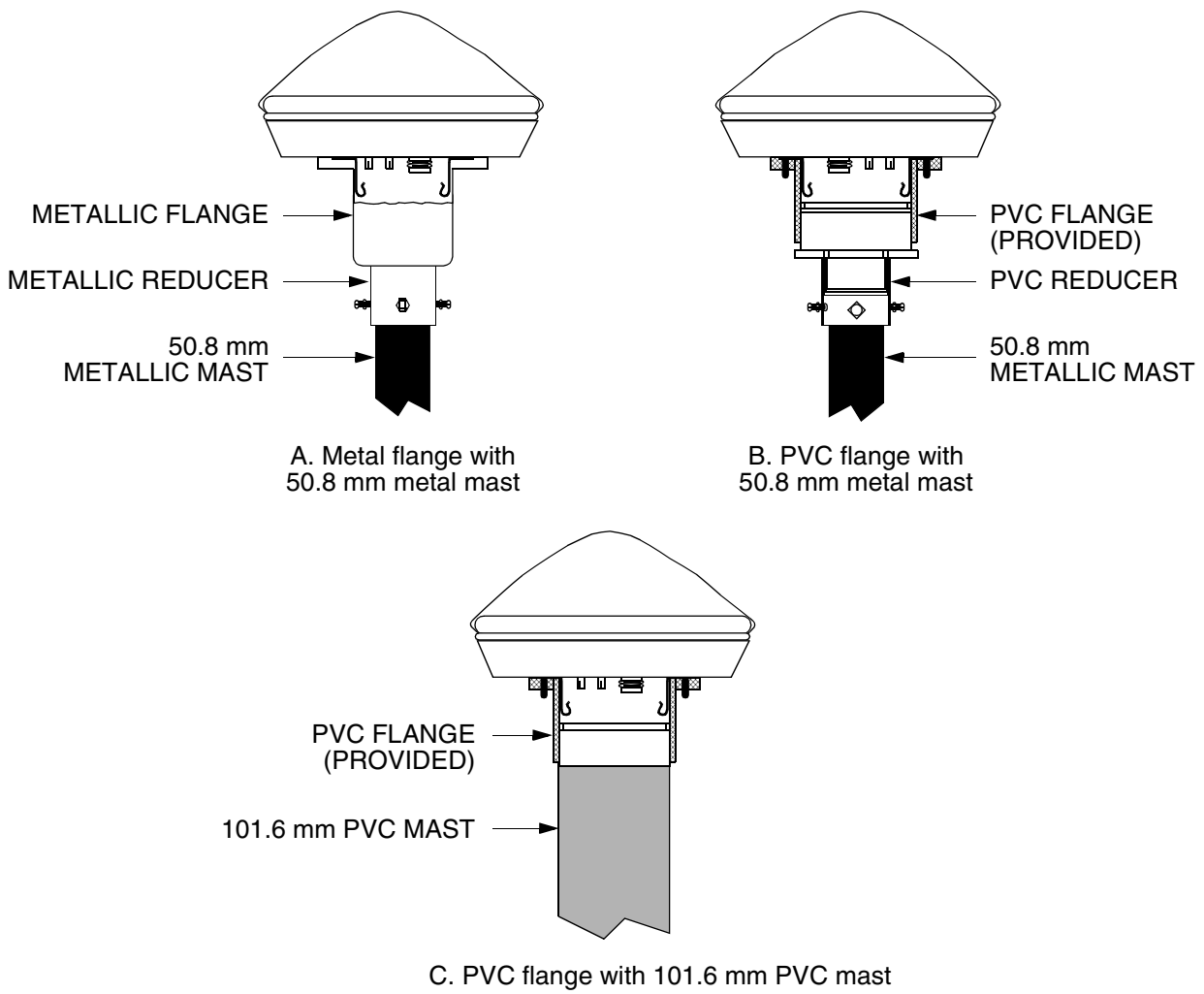
Figure 1. Junction Box Drain



Notes:

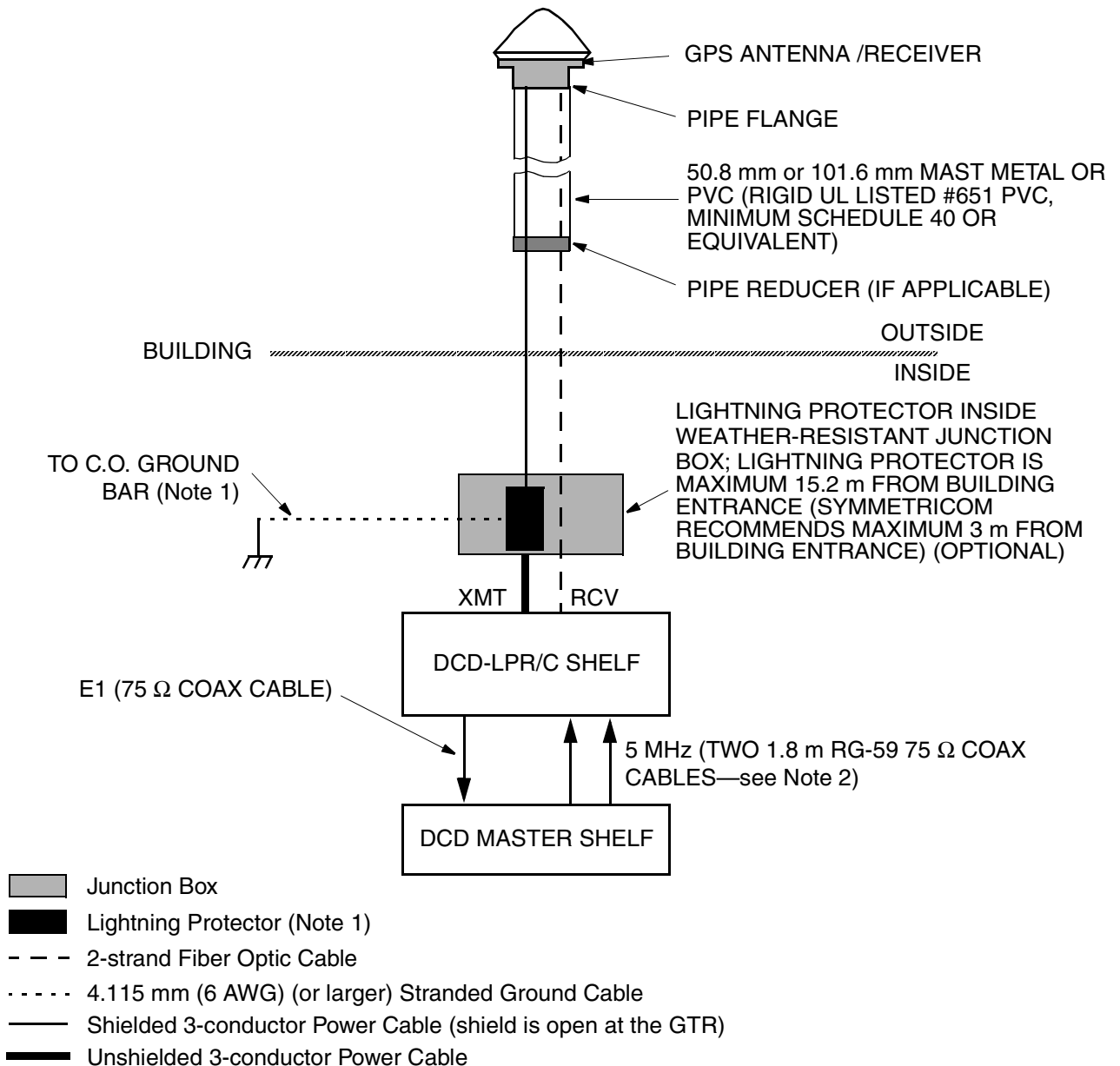
1. Allow enough cable slack to reach the GTR connectors.
2. The shield is open at the GTR.
3. The TX and RX connectors are plastic; use care when connecting to these connectors, as the locking screw may break off if tightened too much.

Figure 2. GTR Mounting



Note: These are examples only. Not all parts are available from Symmetricom.

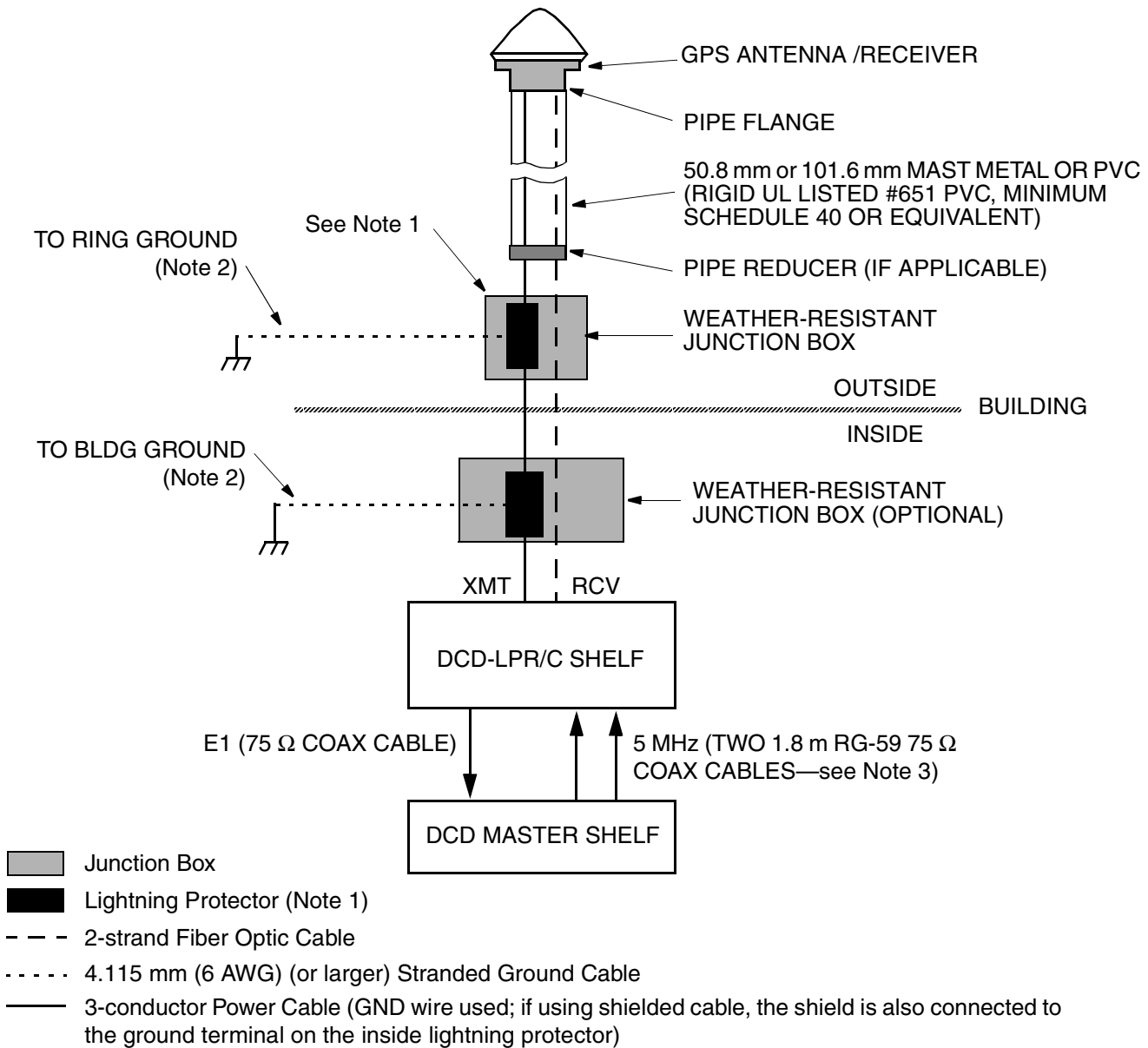
Figure 3. Examples of GTR Mast Configurations



Notes:

1. The lightning protector is connected to a C.O. ground bar bonded to the office principal ground point (OPGP). If such a ground is not available, an acceptable alternative is to run a cable from the lightning protector grounding plate direct, and bond to the OPGP. 4.115 mm (6 AWG) or larger; run as straight and direct as possible.
2. Provided with each DCD-LPR/C Shelf are two 1.8 m coaxial cables to make the 5 MHz input connections from the DCD Shelf to the DCD-LPR/C Shelf. If longer cables are required, cables (not to exceed 15.2 m) must be provided by the user.

Figure 4. DCD-LPR/C with GTR System Parts (for Single Lightning Protector)



Notes:

1. The lightning protector located outside the building must be installed in a weather-resistant junction box. If using PVC mast to PVC conduit, or metal to metal, it should be located as close as possible to the building entry point. If using PVC mast to metal conduit, or metal to PVC, the lightning protector should be located as close as possible to the transition point from PVC to metal.
2. The inside lightning protector is connected to the building ground, and the outside lightning protector is connected to the metal conduit (if used) or outside building (ring) ground. Common ground connection between the inside and outside lightning protectors is not permitted.
3. Provided with each DCD-LPR/C Shelf are two 1.8 m coaxial cables to make the 5 MHz input connections from the DCD Shelf to the DCD-LPR/C Shelf. If longer cables are required, cables (not to exceed 15.2 m) must be provided by the user.

Figure 5. DCD-LPR/C with GTR System Parts (for Dual Lightning Protectors)

6. Install the hardware for mounting the mast on which the GTR is mounted.
7. Using a plumb line or bubble level, position the flange for mounting the GTR on top of the mast. Ensure that the flange is within 5 degrees of level (with the horizon).

Note: When the GTR is attached to the flange, the GTR must be within 5 degrees of perpendicular to the horizon.

8. Cement the flange for GTR mounting to the top of the mast.
9. Mount the GTR assembly on the mounting hardware.
10. Lay out the weather-resistant conduit, sleeves, elbows, pipe reducer (if applicable), etc., from the building entrance to the junction box (if an outside lightning protector is installed), to the mast. Do not cement together at this time.

Note: The conduit route should be as direct as possible. *Avoid hard corner turns and unnecessary turns.*

11. Attach and cement sections to both sides of the weather-resistant junction box (if applicable) and at the building entrance. Seal and waterproof the conduit section where it enters the building.
12. Insert pulling wires or cords in all conduit sections. Ensure the pulling wire or cord is routed through all conduit elbows, tees, sleeves, plugs, Ys, etc., that are not yet cemented to the conduit.
13. If fiber cable innerduct is installed inside the building between the DCD-LPR/C Shelf and the lightning protector or junction box (installed inside the building), attach the fiber cable, three-conductor power cable, and pulling wire or cord (if required) to the inside conduit pulling wire or cord at the DCD-LPR/C end.

Note: Fiber cable innerduct is not required if Riser-rated fiber cable is used; Riser-rated cable may be treated like copper cable. Installation of innerduct is required only if necessitated by company practice.

14. Pull or run the fiber and power cables from the DCD-LPR/C Shelf to the lightning protector or junction box (installed inside the building), if provided.
15. Detach the cables from the pulling wire or cord.
16. At the lightning protector or junction box (installed inside the building), cut the power cable and pulling wire or cord. Allow sufficient slack in the power cable to secure it per company practice, and permit future replacement of lug connectors, if required.
17. Attach the fiber cable, power cable, and pulling wire or cord to the pulling wire or cord in the conduit to the junction box for the lightning protector installed outside the building, if provided.
18. Pull the cables to the outside lightning protector junction box, if provided; if not, proceed to the next step.
19. Detach the cables from the pulling wire or cord.
20. Cut the power cable and pulling wire or cord, allowing sufficient slack for securing, connecting, and future lug connector replacement, if required.
21. Attach fiber and power cables, and pulling wire or cord to the pulling wire or cord in the conduit to the mast.

Warning: *In the next step, install the GTR power cable with approximately 35 cm of extra length beyond the end of the conduit where the GTR will be mounted. After connection to the GTR, this excess cable can be pushed down into the conduit. Do not attempt to coil excess GTR power cable into the junction box. Failure to observe this caution may result in increased damage if a lightning strike occurs.*

22. Pull the cables through the conduit, uncemented conduit elbows, tees, sleeves, plugs, Ys, etc., and through the top of the mast. Allow sufficient slack (approximately 35 cm) for securing, connection to the GTR, and future lug connector or ST type connector replacement. Temporarily secure at the top of the conduit. The fiber cable should be long enough to pull back slack loops at junction box(es).

Caution: When routing fiber cable, do not have a bending radius less than 50.8 mm; 25.4 mm for stripped (unsheathed) fiber cable. Less could cause fiber breakage or excessive fiber loss.

Note: Within the junction box(es) used for cable slack or strain relief, coil the fiber optic cable a few times, and bundle together with nylon ties. An extra coil of cable provides the slack for GTR removal, if necessary.

Warning: Do not attempt to coil excess GTR power cable into the junction box. Failure to observe this caution may result in increased damage if a lightning strike occurs.

- 23. Cement all conduit ends to conduit elbows, tees, sleeves, plugs, Ys, etc., on the rooftop conduit run.

Note: If the GTR will not be installed immediately, it is recommended that the conduit or mast be covered to ensure that moisture or undesirable elements do not get inside the conduit or mast.

- 24. If metal conduit is used, use company practice and ground conduit joints, as shown in Figure 6A.
- 25. If metal conduit is used, use company practice, and at both ends of the conduit run, connect to building structural ground via the OPGP, ring ground, metal conduits, air conditioning ducts, etc. (Figure 6B).
- 26. Install fire-stopping material in all holes opened in the roof and/or walls during this procedure.
- 27. Ensure the GTI/C card is not installed in the DCD-LPR/C Shelf before proceeding.

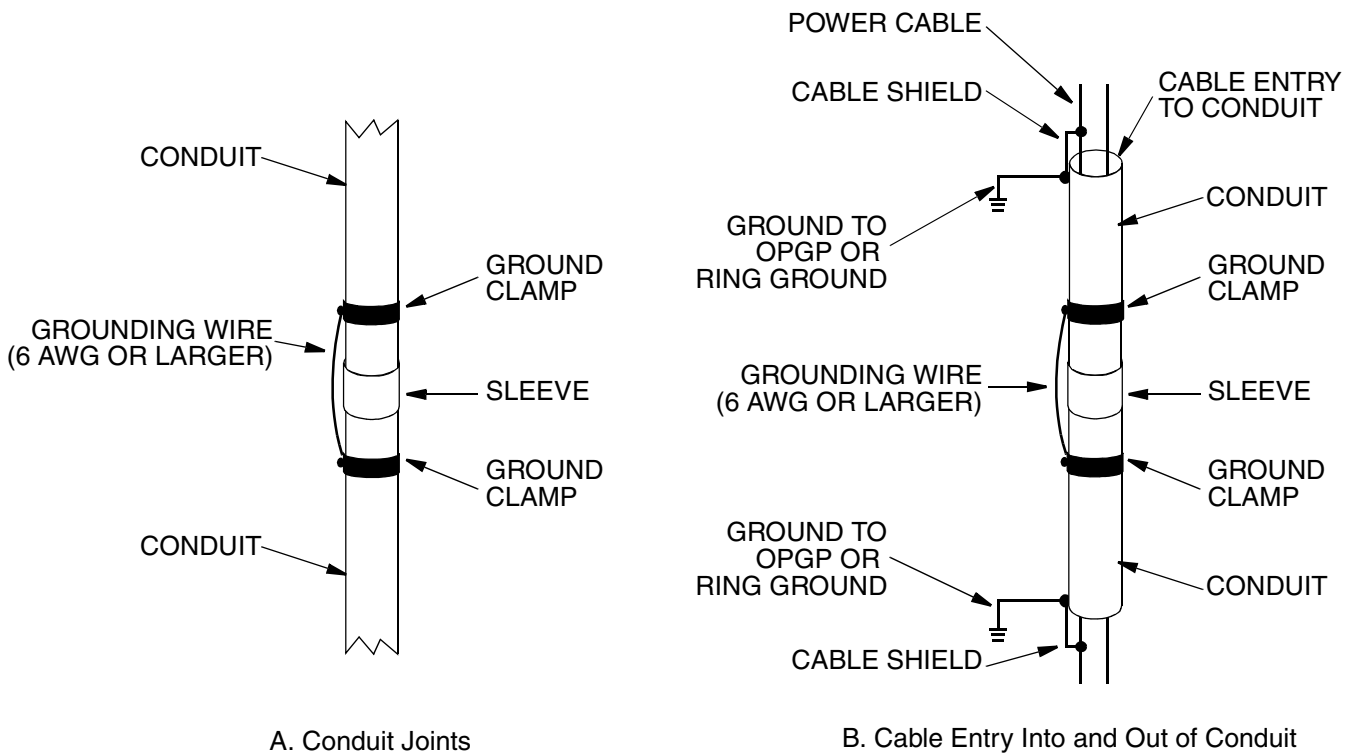


Figure 6. Metallic Conduit Bonding

F. Lightning Protectors

Caution: *If installing more than one antenna, under no circumstances are the two systems to be grounded together. Each system must have its own connection to ground.*

Single Lightning Protector Installations

Note: The single lightning protector scheme is recommended for locations which do not have the inside and outside ground points connected to an OPGP.

2.16 This procedure pertains to initial installations at sites where the lightning protector is located within 15 meters of where the GTR power cable enters the building. If the lightning protector is located at a distance greater than 15 meters from the cable entrance, either relocate it to within 15 meters of the entrance, or if this is an upgrade to an existing site, contact Symmetricom CTAC for assistance.

Note: Symmetricom recommends that the inside lightning protector be located within 3 meters of the cable entry location.

2.17 The screw connections for the lightning protector and lightning protector grounding plate connections are designed to accommodate spade lug connectors. The spade lugs should be the type to accommodate a 1.47 mm to 0.64 mm (16 AWG to 22 AWG) stranded wire, with a #6 stud size, and no more than 6.4 mm wide.

2.18 Inside the building, within 15 meters from the cable entry point, following company installation and grounding procedures, perform the following:

Note: The lightning protector should be mounted such that the GTR end is pointed toward the GTR cable from the antenna, and the LPR/C end is pointed toward the GTR cable from the DCD-LPR/C Shelf.

1. Using Figure 7, install the flat washer onto the GND stud, and mount the lightning protector grounding plate onto the GND stud.

2. Install one of the two nuts onto the GND stud. Tighten the nut with the open-end wrench, to secure the plate to the lightning protector.
3. Install and tighten the second nut, to lock the first nut in place. Use an anti-oxidation agent on all connections.
4. Install the lightning protector in the junction box (if provided), securing it inside, following company installation practices.
5. If using power cables other than ones purchased from Symmetricom, write down the color of each lead connected to the PWR+, PWR-, and CMN (GND) terminals for making connection to the lightning protector and the GTR.

Note: The GTR power cable wire colors (purchased from Symmetricom) are: + is red, - is black, ground is white, and the built-in drain wire is silver. If power cables are purchased from another source, the colors may vary. If this is the case, ensure that wiring continuity is maintained when making power cable connections. See Figure 8 for an illustration of the Symmetricom's GTR power cable.

Caution: *In the next step, care must be taken to ensure that when stripping the sheath and foil shield from the power cable, the built-in drain wire is not inadvertently cut off or damaged.*

6. Strip the sheath and shield from the power cable (from the GTR) — do not cut off the drain wire.

Note: Allow sufficient pigtail length of the PWR+, PWR-, CMN (GND), and drain wire leads, for ease of connection to the lightning protector and ground terminal. Consider future maintenance when determining the pigtail length (no wire or cable should have a complete loop in it).

7. Strip the PWR+, PWR-, and CMN leads, and crimp spade lugs on the ends (Figure 9).
8. Strip the drain wire, and install spaghetti insulation on the drain wire. Crimp a spade lug on the end.

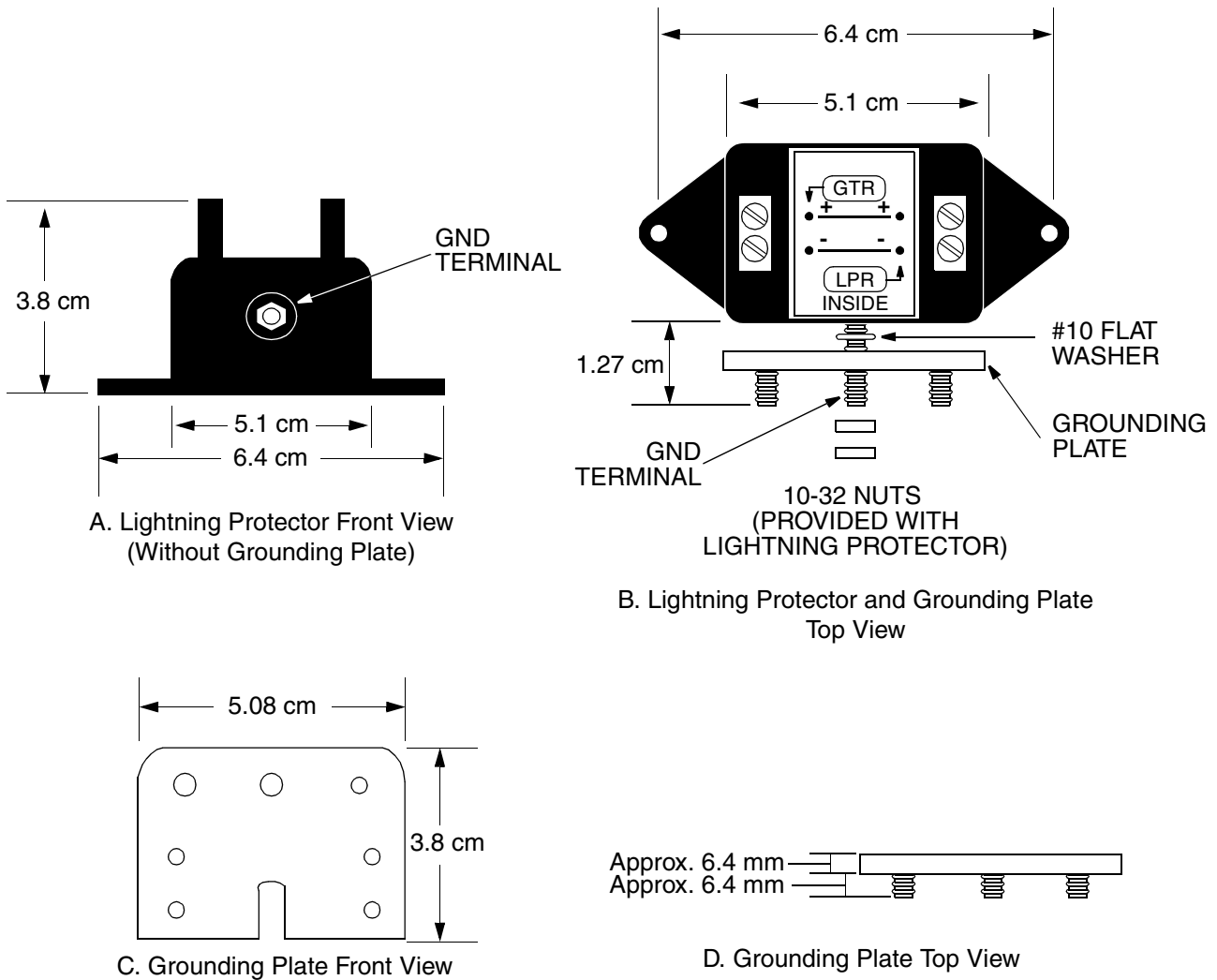


Figure 7. GTR Lightning Protector and Grounding Plate

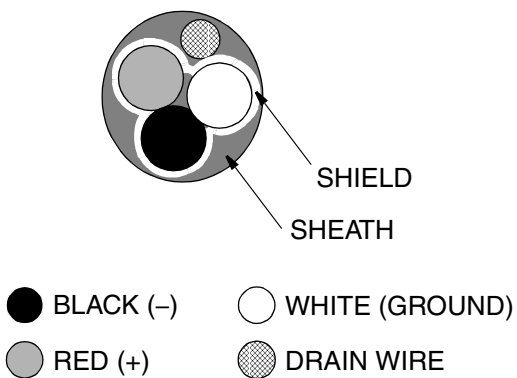


Figure 8. Shielded GTR Power Cable

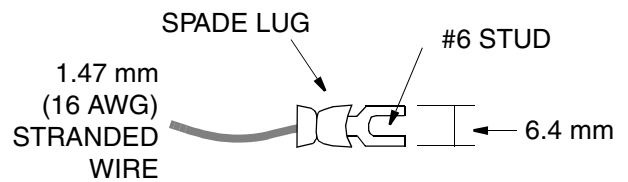
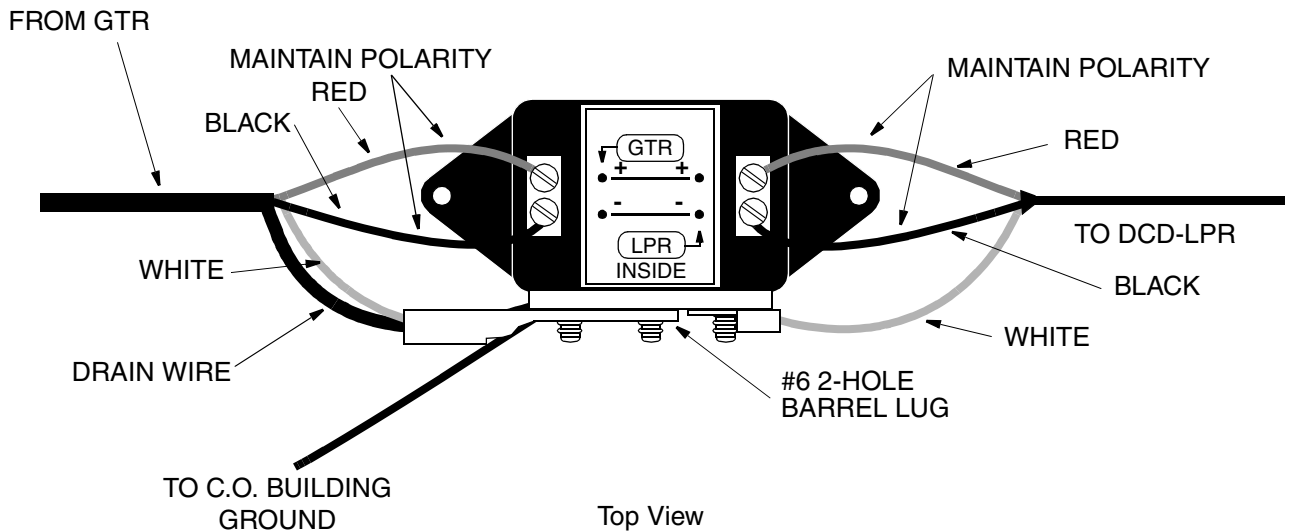


Figure 9. Spade Lug Connector

9. Connect the PWR+ and PWR- leads to the GTR side of the lightning protector, ensuring that the PWR+ lead connects to the “+” terminal, and the PWR- lead connects to the “-” terminal (Figure 10). Use an anti-oxidation agent on all connections.
10. Obtain the drain wire and CMN leads of the power cable from the GTR. Install an external-toothed lockwasher over the two #6 studs (the small studs) on the GTR end of the grounding plate (Figure 11).
11. Install the drain wire and CMN leads spade lugs on each stud, and secure them in place by installing and tightening a self-locking “KEPS” nut on each of the two studs.
12. Ensure that the spade lugs are seated in the grooves around the studs, to prevent lateral movement. Use an anti-oxidation agent on all connections.
13. Obtain the CMN lead of the unshielded power cable from the DCD-LPR/C, and cut off the ring terminal lug on its end. Crimp a spade lug on its end.
14. Install an external-toothed lockwasher over one of the #6 studs (the small studs) on the LPR/C end of the grounding plate (it is recommended to use the stud that is directly across from the CMN lead of the GTR cable).
15. Install the CMN lead spade lug on the stud, and secure it in place, by installing and tightening a self-locking “KEPS” nut on the stud.
16. Ensure that the spade lug is seated in the groove around the stud, to prevent lateral movement. Use an anti-oxidation agent on all connections.
17. Obtain the 4.115 mm (6 AWG) C.O. ground cable, and cut off the ring terminal lug on its end. Crimp a two-hole lug on its end.
18. Install an external-toothed lockwasher on two of the three #10 studs (the two that will cause the least bend in the C.O. ground cable).



Notes:

1. Refer to Figure 11 for the grounding plate connections.
2. The drain wire from the GTR is connected to the grounding plate on the lightning protector; the power cable shields from the GTR and the DCD-LPR/C are cut off, and secured per company practice.
3. CMN leads are connected to the grounding plate.

Figure 10. GTR Lightning Protector Connections (Single Lightning Protector)

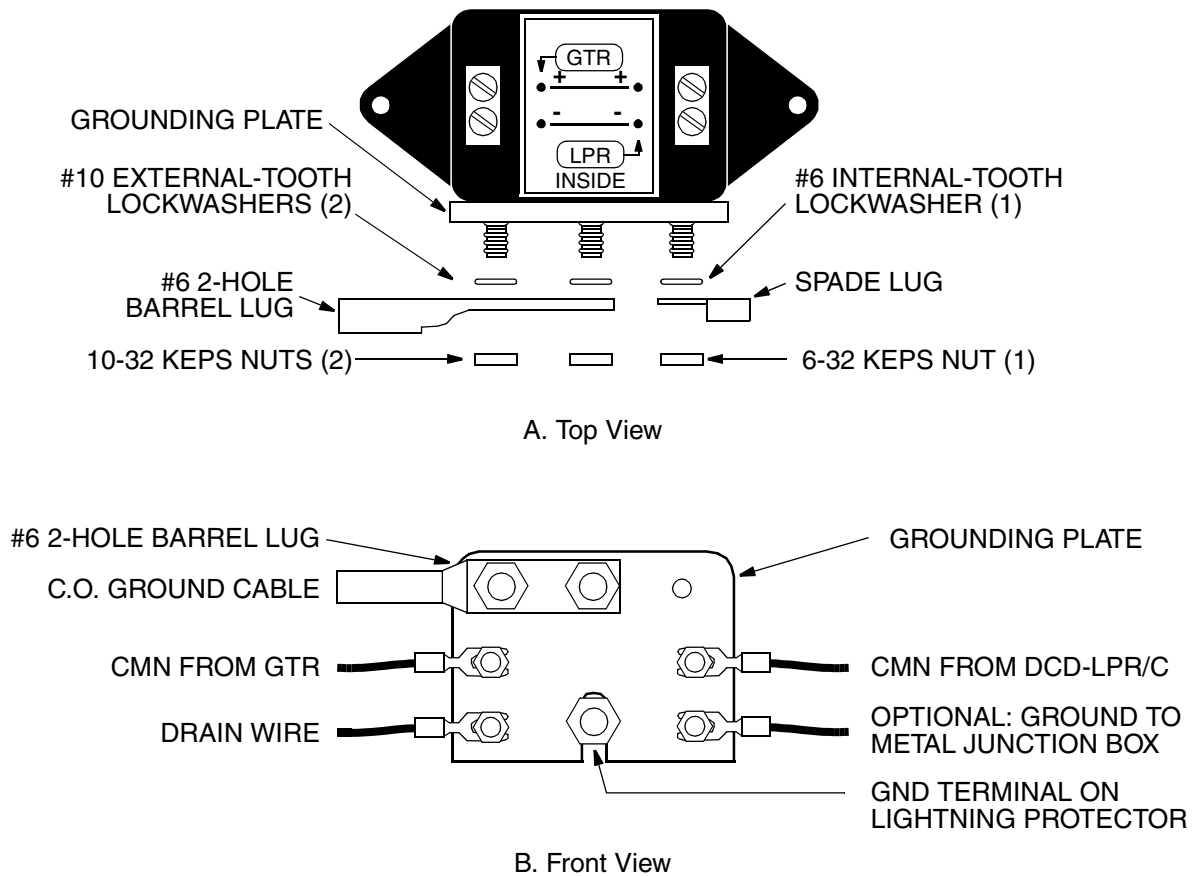


Figure 11. GTR Grounding Plate Connections

19. Install the two-hole lug over the two studs (noted in Step 18), and secure in place by installing and tightening a self-locking “KEPS” nut on the studs. Use an antioxidant on all connections.

Notes:

- a. The C.O. ground cable, in some cases, may be larger than 4.115 mm (6 AWG). The two-hole lug provided in the GPS power cable ground kit is for 4.115 mm (6 AWG) cable. If a different gauge cable is used for the C.O. ground cable, a two-hole lug for that cable size must be provided locally.
- b. Ensure that the grounding wire is run as short and straight as possible. Do not run grounding wire through cable ducts. If

grounding wires to the protector connect to any other type of grounding wire, i.e., to ring or building ground, the connection must be bonded (following company installation practices), to prevent arcing. Also, ensure that no unnecessary loops (no coiling) or hard turns on any ground wire occur.

- c. The other end of the C.O. ground cable must be connected to a C.O. ground bar that is bonded to the OPGP. If such a ground is not available, an acceptable alternative is to bond the end of the C.O. ground cable from the lightning protector to the nearest commercial AC green wire ground. The OPGP C.O. ground is the recommended ground, even if it is further away than the AC ground.

20. Using Figure 7, secure the lug connectors to the “LPR +” and “-” side of the lightning protector, following the color code saved previously (if not using Symmetricom cable), or if using Symmetricom cable: + is red, - is black, and ground is white.

Caution: *DC polarity must be maintained. If not, the DCD-LPR/C / GTR will not function.*

21. If the junction box is metal, ground the box to the spare #6 stud on the grounding plate.
22. Check all connections for tightness, to prevent arcing and intermittent operation.
23. Secure and seal cover on the junction box.
24. Spray all exposed connectors with an electrically conductive antioxidant compound (e.g., Kopr-Shield).

Dual Lightning Protector Installations

Caution: *If installing more than one antenna, under no circumstances are the two systems to be grounded together with one common wire. Each system must have separate ground points.*

Caution: *Do not ground both protectors together with one common wire; the outside and inside protectors must have separate ground points.*

Note: The dual lightning protector scheme can be used in locations that have the inside and outside ground points connected to an OPGP.

2.19 In dual lightning protector installations, the GTR is provided with two lightning protectors, one specifically designated for use outside the building, and the other for inside the building. Ensure that the outside protector is only installed outside the building, and the inside protector is only installed inside the building.

2.20 Install the lightning protectors, following company installation and grounding procedures, Installation Job Specification, and the following procedures.

Warning: *Ensure that the lightning protectors are placed away from electrical devices or cabling that may induce arcing.*

Inside Installation

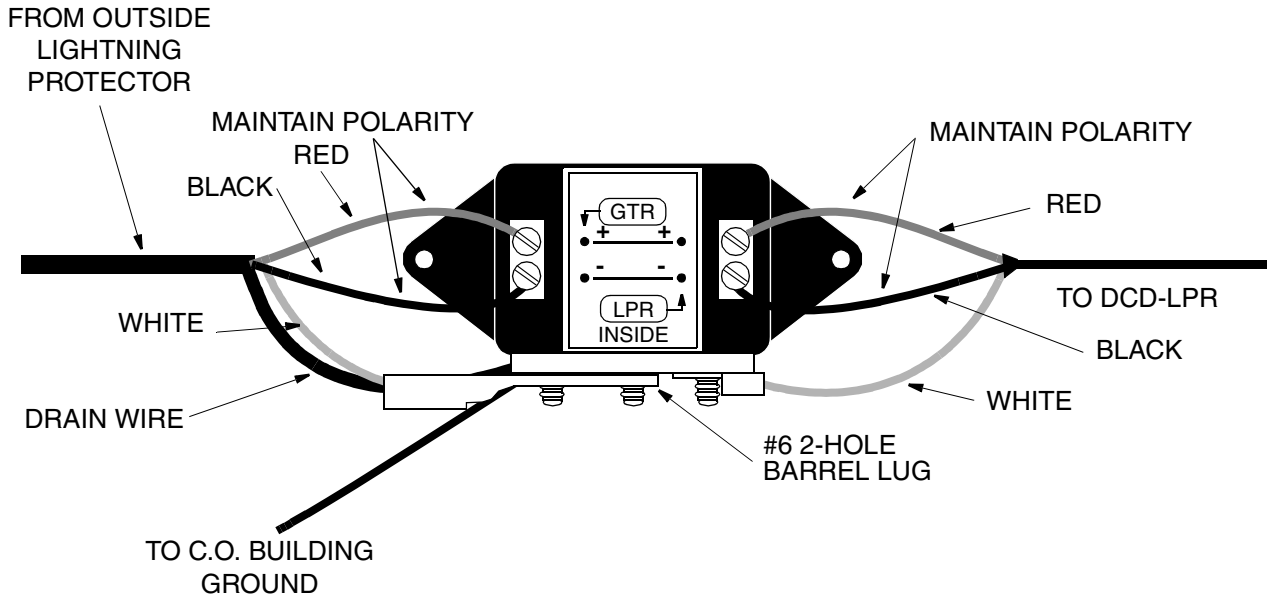
2.21 The screw connection for the lightning protectors are designed to accommodate spade lug connectors. The spade lugs should be the type to accommodate a 1.47 mm (16 AWG) stranded wire, with a #6 stud size, and no more than 6.4 mm wide.

2.22 Inside the building, as close as possible to the cable entry point, following company installation and grounding procedures, perform the following:

1. Using Figure 7, install the flat washer onto the GND stud, and mount the inside lightning protector grounding plate onto the GND stud.
2. Install one of the two nuts onto the GND stud. Tighten the nut with the open-end wrench, to secure the plate to the lightning protector.
3. Install and tighten the second nut, to lock the first nut in place. Use an anti-oxidation agent on all connections.
4. Install the inside lightning protector in the junction box (if provided), securing it inside, following company installation practices.
5. Strip the sheath from the three-conductor power cable from the DCD-LPR/C Shelf.
6. Strip the PWR+, PWR-, and CMN leads, and crimp lug connectors on each lead (Figure 9).
7. If using power cables other than ones purchased from Symmetricom, write down the color of each lead connected to the PWR+, PWR-, and CMN (GND) leads for making connection to the inside and outside lightning protectors and the GTR.

Note: The GTR power cable wire colors (purchased from Symmetricom) are: + is red, - is black, and ground is white. If power cables are purchased from another source, the colors may vary. If this is the case, ensure that wiring continuity is maintained when making power cable connections.

8. Connect the PWR+ and PWR- leads to the LPR side of the lightning protector, ensuring that the PWR+ lead connects to the “+” terminal, and the PWR- lead connects to the “-” terminal (Figure 12). Use an anti-oxidation agent on all connections.
9. Install an external-toothed lockwasher over one of the #6 studs (the small studs) on the LPR end of the grounding plate (it is recommended to use the stud that is directly across from the CMN lead of the GTR cable). (See Figure 13.)
10. Install the CMN lead spade lug on the stud, and secure it in place, by installing and tightening a self-locking “KEPS” nut on the stud.
11. Ensure that the spade lug is seated in the groove around the stud, to prevent lateral movement. Use an anti-oxidation agent on all connections.



Notes:

1. Refer to Figure 13 for the grounding plate connections.
2. The drain wire from the GTR is connected to the grounding plate on the lightning protector; the power cable shields from the GTR and the DCD-LPR/C are cut off and secured per company practice.
3. CMN leads are connected to the grounding plate.

**Figure 12. GTR Lightning Protector Connections
(Dual Lightning Protector - Inside Installation)**

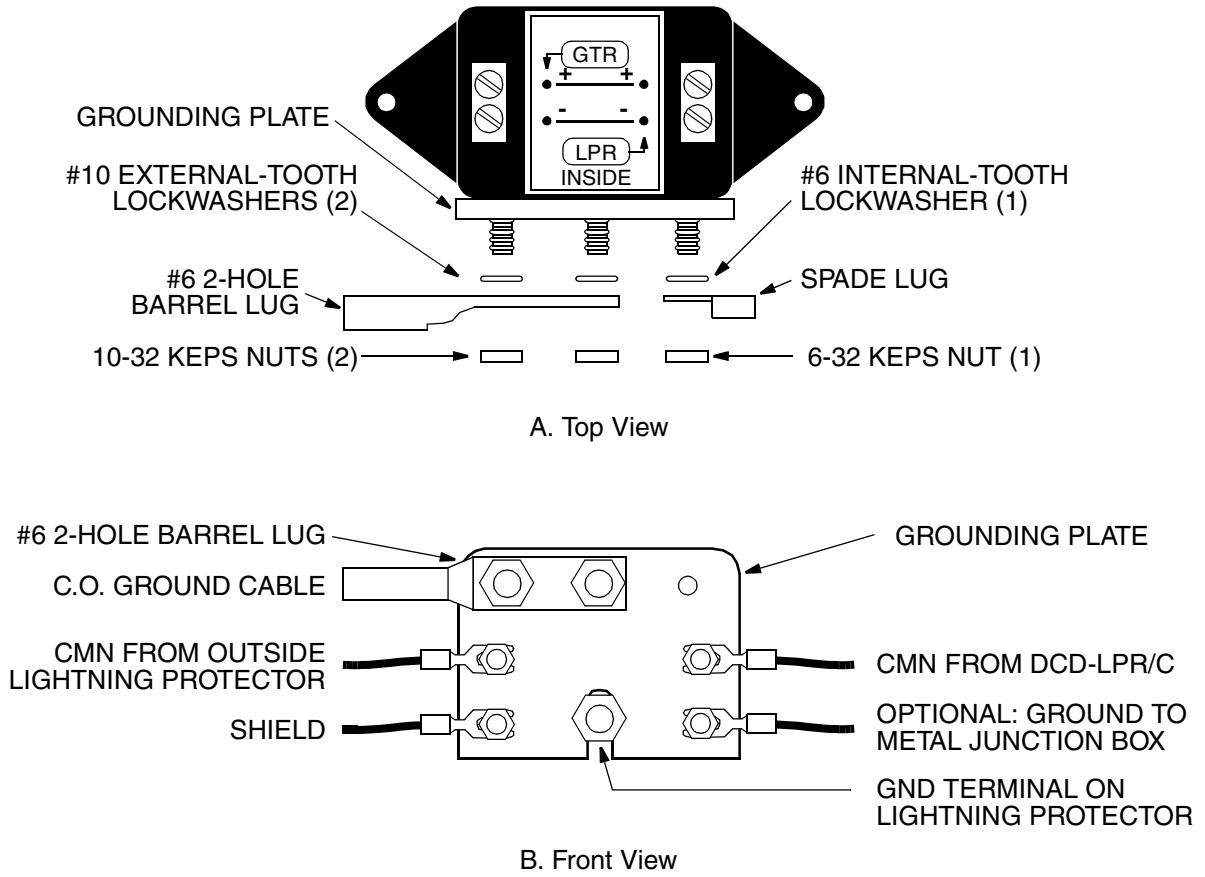


Figure 13. GTR Grounding Plate Connections (Dual Lightning Protector - Inside Installation)

12. Strip the sheath and shield from the power cable (which will come from the outside lightning protector) — do not cut off the drain wire.

Note: Allow sufficient pigtail length of the PWR+, PWR–, CMN (GND), and drain wire leads, for ease of connection to the lightning protector and ground terminal. Consider future maintenance when determining the pigtail length (no wire or cable should have a complete loop in it).

13. Strip the PWR+, PWR–, and CMN leads, and crimp spade lugs on the ends (Figure 9).
14. Strip the drain wire, and install spaghetti insulation on the drain wire. Crimp a spade lug on the end.
15. Following the color code saved previously (if not using Symmetricom cable), strip the ends of the colored wires for PWR+ and PWR– from the outside lightning protector, and crimp lug connectors on each lead. The ground colored wire should not be connected, but dressed and secured as a future spare wire, should it be needed to replace a broken PWR+ and PWR– wire.
16. Connect the PWR+ and PWR– leads to the GTR side of the lightning protector, ensuring that the PWR+ lead connects to the “+” terminal, and the PWR– lead connects to the “–” terminal (Figure 12). Use an anti-oxidation agent on all connections.

Caution: Do not ground both protectors together with one common wire; the outside and inside protectors must have separate ground points.

Caution: DC polarity must be maintained. If not, the DCD-LPR/C / GTR will not function.

17. Obtain the drain wire and CMN leads of the power cable from the inside lightning protector. Install an external-toothed lockwasher over the two #6 studs (the small studs) on the GTR end of the grounding plate (Figure 13).
18. Install the drain wire and CMN leads spade lugs on each stud, and secure them in place, by installing and tightening a self-locking “KEPS” nut on each of the two studs.

19. Ensure that the spade lugs are seated in the grooves around the studs, to prevent lateral movement. Use an anti-oxidation agent on all connections.
20. Refer to Figure 7, and connect a 4.115 mm (6 AWG) (or larger) wire from the GND terminal on the side of the inside lightning protector to the building ground (primary protection ground) in the building.

Note: Ensure that the grounding wire is run as short (less than 4.5 meters is recommended) and straight as possible. Do not run grounding wire through cable ducts. If grounding wires to the protector connect to any other type of grounding wire, i.e., to ring or building ground, it is necessary that the connection be bonded (following company installation practices), to prevent arcing. Also, ensure that no unnecessary loops (no coiling) or hard turns on any ground wire occur.

21. Check all connections for tightness, to prevent arcing and intermittent operation.
22. Secure and seal the cover on the junction box.
23. Spray all exposed connectors with an electrically conductive antioxidant compound.

Outside Installation

2.23 Mount the outside lightning protector in a weather-resistant junction box (i.e., a Carlon [Lamson and Sessions] 30 cm x 30 cm x 15 cm weather-resistant junction box, p/n E989R, or equivalent).

Note: The weather-resistant junction box must be large enough to house the lightning protector and grounding plate, with enough space to allow for performing the various connections to the lightning protector. If large enough, the junction box housing the lightning protector can also be used to hold excess fiber optic cable.

Warning: Do not attempt to coil excess GTR power cable into the junction box. Failure to observe this caution may result in increased damage if a lightning strike occurs.

1. Using Figure 7, install the flat washer onto the GND stud, and mount the outside lightning protector grounding plate onto the GND stud.
2. Install one of the two nuts onto the GND stud. Tighten the nut with the open-end wrench, to secure the plate to the lightning protector.
3. Install and tighten the second nut, to lock the first nut in place. Use an anti-oxidation agent on all connections.
4. Insert the outside lightning protector into the weather-resistant junction box, securing it inside, following company installation practices.
7. Strip the ends of the three-conductor power cable from the GTR, and crimp lug connectors on each lead.
8. Using Figure 7, secure the lug connectors to the “GTR + and –” side of the outside lightning protector and GND terminals, following the color code saved previously (if not using Symmetricom cable), or if using Symmetricom cable: + is red, – is black, and ground is white.
9. Make the appropriate grounding connections, using Figure 14 for reference, and the following guidelines:

Note: The GTR is provided with two lightning protectors, one specifically designated for use outside the building, and the other for inside the building. Ensure that the outside protector is only installed outside the building, and the inside protector is only installed inside the building.

5. Follow the color code saved previously (if not using Symmetricom cable), or use Symmetricom cable colors, to strip the ends of the wires for the PWR+, PWR–, and CMN leads from the inside lightning protector; crimp lug connectors on each lead.
6. Using Figure 7, connect the PWR+ and PWR– leads to the “LPR +” and “–” side of the outside lightning protector, following the color code saved previously (if not using Symmetricom cable), or use the Symmetricom cable colors.
- a. The ground connection to the lightning protector should be made, following company installation procedures, and connected to a metal conduit, or ring ground, with a 4.115 mm (6 AWG) (or larger) wire. A hole should be drilled through the outside of the box, to accommodate a locally obtained screw, nut, and set of lock washers.
- b. When attaching a ground wire to building ground, drill a hole in the weather-resistant junction box, and secure the ground lug (following company installation practices).
- c. If grounding wires cross any other type of principal grounding wire, it may be necessary to bond the two wires together (at the intersection), to prevent arcing (following company installation practices). Also, ensure that there are no unnecessary loops or hard turns on any ground wire (this will minimize inductance).
10. Check all connections for tightness, to prevent arcing and intermittent operation.
11. Secure and seal the cover on the weather-resistant junction box.

Caution: *Do not ground both protectors together with one common wire; the outside and inside protectors must have separate ground points.*

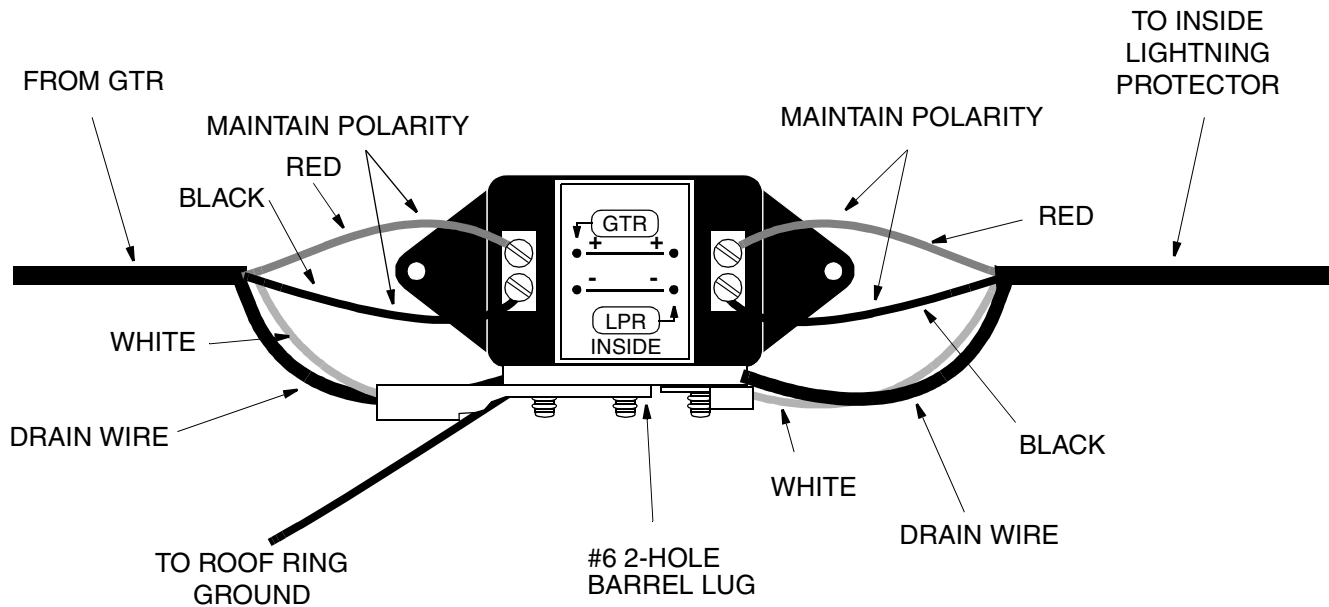


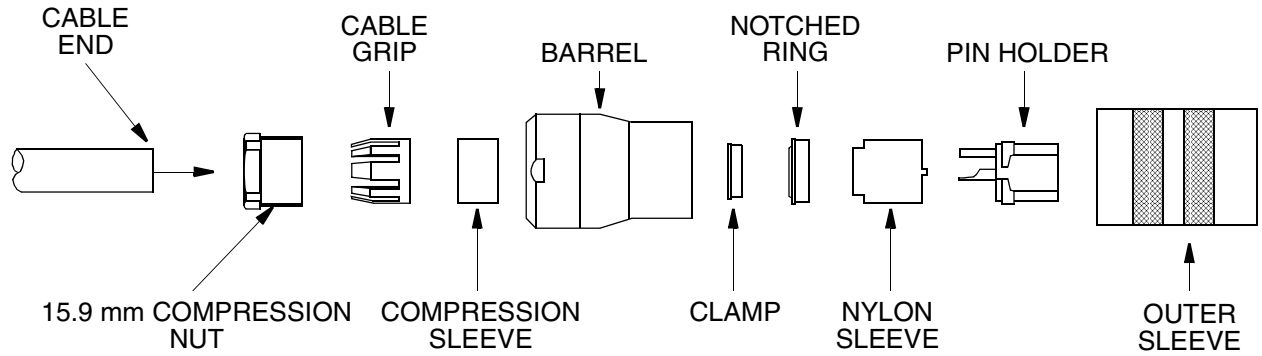
Figure 14. GTR Lightning Protector Connections
(Dual Lightning Protector - Outside Installation)

Installing Power Cable to GTR

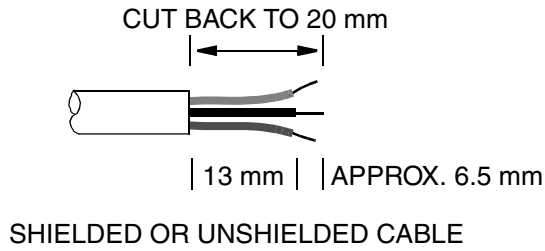
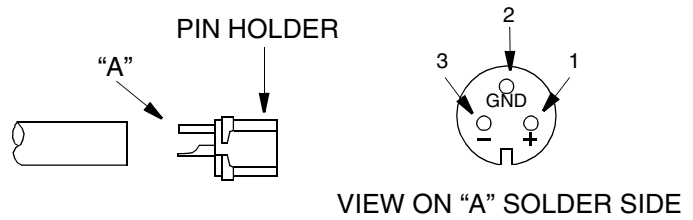
1. If the GTR power cable was purchased from Symmetricom, skip to Step 2. If the cable was purchased from another source, the power connector must be attached. To attach the power

connector to the cable end, use Figure 15 as reference, and perform the following:

Note: A 15.9 mm open-end wrench is required for attaching the connector to the cable.



A. Order of Connector Parts on Cable

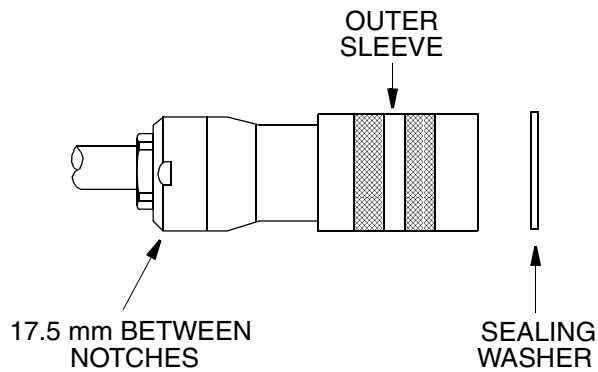


VIEW ON "A" SOLDER SIDE

PIN NO.	WIRE COLOR	FUNCTION
2	White	GND or Common
1	Red	(+)
3	Black	(-)

C. Pin Holder and Cable Function

B. Cable Preparation



D. Outer Sleeve Components

Figure 15. GTR Power Cable Connector Assembly
 (For reference - use only if not purchasing pre-connectorized cable from Symmetricom)

- a. Slide the compression nut, cable grip, compression sleeve, barrel, clamp, notched ring, and nylon sleeve onto the power cable, in the order shown in Figure 15A.
- b. Prepare the cable end, as shown in Figure 15B, removing all plastic covering and thread. If using shielded cable, trim the shield even with the plastic covering.
- c. Remove the insulation from the three conductors for a length of approximately 6.35 mm, and tin the exposed copper wire.
- d. Solder the wires into the pin holder, as shown in Figure 15C, and use the color code saved previously (if not using Symmetricom cable), or if using Symmetricom cable: + is red, - is black, and ground is white.

Note: Power polarity must be maintained, or the GTR will not operate correctly. If wiring polarity is incorrect, "GTR PWR FAULT" appears on the GTI/C LCD display.

- e. Slide and lock the nylon sleeve into the pin holder, using the tabs.
- f. Align the grooves in the pin holder, nylon sleeve, and ring. These must be aligned, to enable correct placement in the outer sleeve.

Note: In the next step, if using shielded cable, the shield will be covered by the barrel.

- g. Slide the barrel up and over the ring and clamp, ensuring the clamp is seated firmly. Ensure that alignment of the grooves in the pin holder, nylon sleeve, and ring is maintained.
- h. Locate the pin holder into the outer sleeve, and align the grooves (in the pin holder, nylon sleeve, and ring) to the ridge in the sleeve. Screw the barrel assembly into the sleeve, ensuring a tight fit.

Note: When tightening, it is important that the barrel assembly rotate around the pin holder and cable; the pin holder and cable do not rotate.

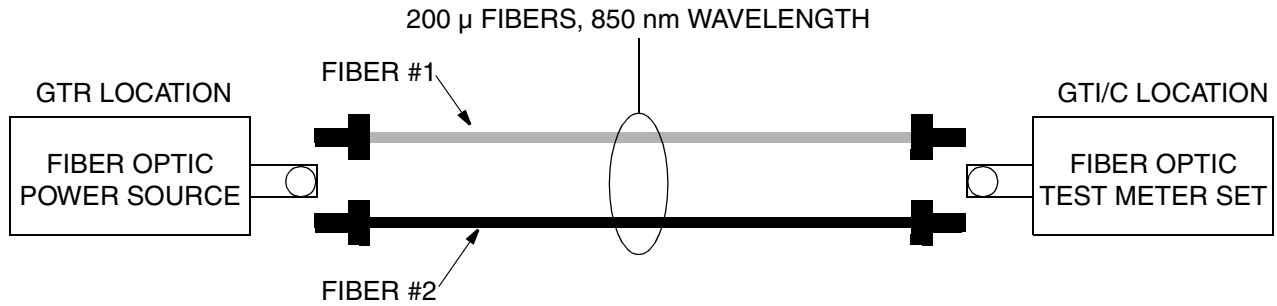
- i. Slide the compression sleeve, cable grip, and compression nut into the barrel, and tighten.

Note: The barrel assembly is notched to accept a 17.5 mm open-end wrench. The compression nut accepts a 15.9 mm open-end wrench.

- j. Insert the sealing washer into the front of the connector, over the pin holder, to complete assembly.
2. At the GTR, obtain the power cable, and lightly apply the lubricant (provided in the GTR hardware kit) to the threads of the power cable connector, enabling an easier connection to the GTR. The lubricant also serves as a corrosion preventative.
3. Attach the power cable connector to the PWR connector on the GTR.
4. At the GTR, obtain the fiber optic cable. If ST type connectors are not already attached to the ends of the fiber cable, use the fiber ST terminator connector tool, and follow the instructions provided with the tool, to attach a connector to each fiber end.

Note: If the fiber connectors are terminated in the field, the quality of the termination must be determined. The fiber optic cable contains two 200 micron diameter fibers; the GTR to DCD-LPR/C communication system operates in the 850 nm spectrum. The total fiber loss cannot exceed 7 dB (including connectors). To determine the quality of the connector terminations, use a Wilcom FS850 fiber optic power source (or equivalent) and a Wilcom FM850 fiber optic meter test set (or equivalent), and perform the following steps:

- a. Measure each of the fibers end to end, using a known output level source at one end, and the test set at the other end; record the readings.
- b. Subtract the known source output level from the #1 and/or #2 fiber measurements, to determine the fiber loss (see Figure 16 for examples); the fiber loss should not exceed 7 dB.
- c. If the loss in Step b exceeds 7 dB, the ST connector should be inspected and replaced (if necessary). After the connector is replaced, retest the fiber, repeating Steps a and b.



Typical losses for 200 μ cable lengths:

- 30.3 m 2.0 dB
- 151.7 m . . . 2.7 dB
- 304.8 m . . . 3.6 dB
- 457.2 m . . . 4.5 dB
- 609.6 m . . . 5.4 dB

Typical examples for 151.7 m of 200 μ cable (the losses have been calculated in the following examples):

Step a.	Output level	-17.0 dB (source)	
	Fiber #1	-19.7 dB (receive)	
	Fiber #2	-20.1 dB (receive)	
Step b.	Fiber #1	-19.7 dB (receive)	
	Output level	-17.0 dB (source)	
	Fiber Loss	-2.7 dB	Fiber #1 Acceptable
Step c.	Fiber #2	-20.1 dB (receive)	
	Output level	-17.0 dB (source)	
	Fiber Loss	-3.1 dB	Fiber #2 Acceptable

Figure 16. Fiber Termination Test

5. If the fiber cable was purchased from Symmetri-com with the connectors and pulling mechanism already attached, follow the steps below, to position the pulling grip for strain relief:
 - a. Using diagonal pliers, carefully remove the shrink tubing covering the grip and connectors (Figure 17A), and discard.
 - b. Remove the black electrical tape, and discard.
 - c. Slide the grip down until the “eye” is even with the end of the fiber cable outer jacket (Figure 17B). To loosen the grip, squeeze the mesh part of the grip together to move, and when in place, release the grip.
 - d. Using black electrical tape, secure the grip in place; tape the bottom of the grip to the cable (Figure 17B).
 - e. Securely place the eye into one of the hooks in the flange (Figure 17C).
6. Connect one fiber to the TX connector on the GTR. Connect the other to the RX connector on the GTR.

Note: The TX and RX connectors are made of plastic; use care when connecting to these connectors, because the locking screw may break off if over-tightened.
7. Write down the color of the fiber connected to the TX connector on the GTR. The same color fiber connected to the TX connector will be connected to the appropriate RCV connector on the DCD-LPR/C backplane. The other color fiber will be connected from the RX connector on the GTR to the appropriate XMT connector on the DCD-LPR/C backplane.

Note: Fiber polarity must be maintained, or the GTR will not operate correctly. If wiring polarity is incorrect, the “GTR COMM” message appears on the GTI/C LCD display, and the “DS1” (or DS2) lamp on the backplane will not be lit.

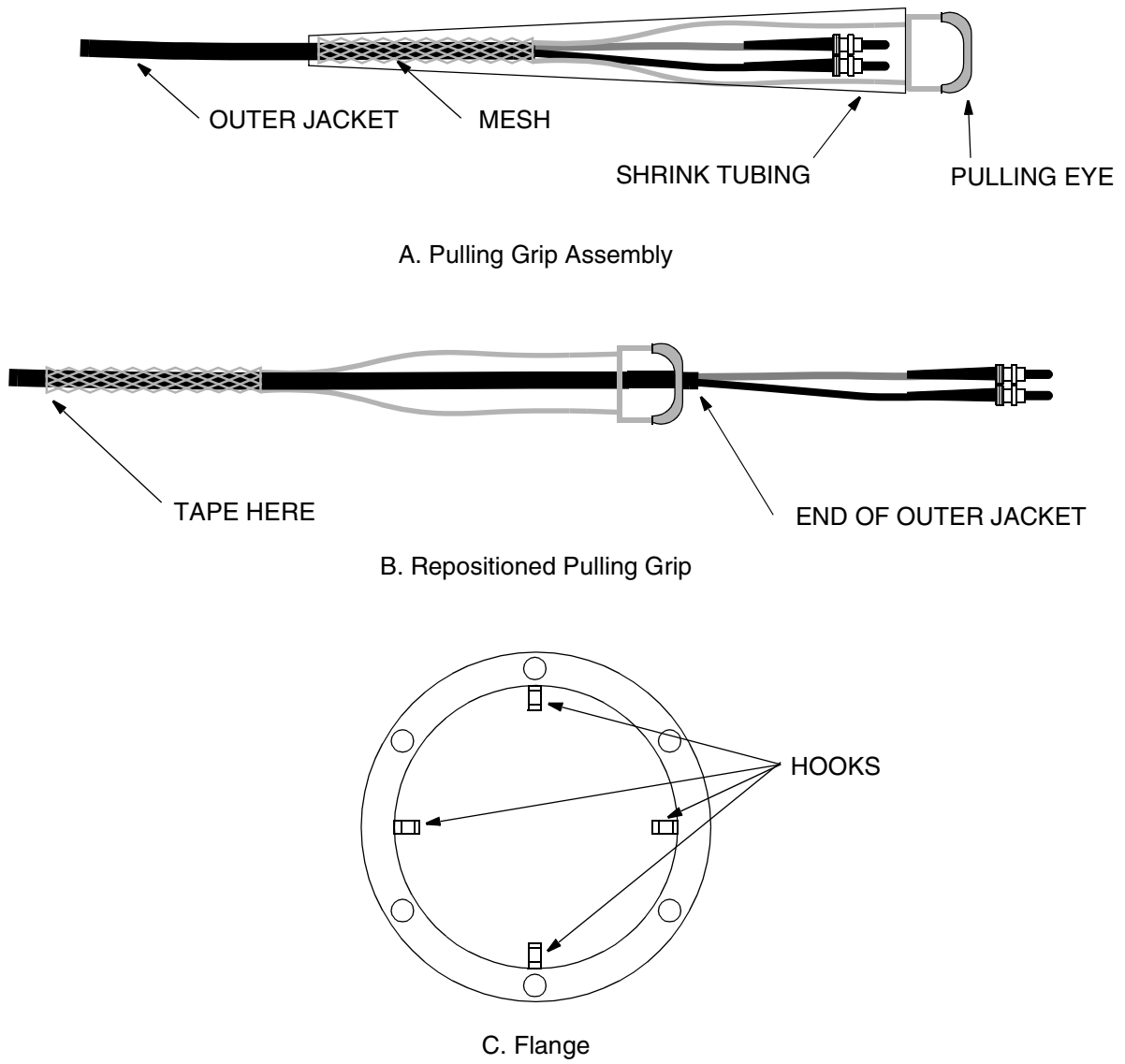


Figure 17. Pulling Grip and Flange (for Strain Relief)

8. Remove the four 10-24 Nyloc nuts from the threaded studs of the GTR, then align the threaded studs on the GTR with the holes on the mounting flange on the mast, and insert.

Note: Ensure that the cables are not caught between the flange and the GTR.

9. At this point, using a plumb line or bubble level, manipulate the GTR into position. Ensure that the GTR is within 5 degrees of level (with the horizon). If within 5 degrees, proceed to the next step. If not, use company practice to manipulate the GTR to within 5 degrees of level.
10. Once level, ensure that the cables are not caught between the flange and the GTR, and secure the GTR in place, using the four 10-24 Nyloc nuts removed in Step 8.
11. After the GTR installation is completed, weatherproof ALL openings of the weather-resistant junction boxes, side plate openings, weather-resistant conduit, etc. Use an appropriate waterproofing material, e.g., silicone glue and sealer.
12. Spray all exposed connectors with an electrical-ly conductive anti-oxidation compound.

3. DCD-LPR/C INSTALLATION

A. Pre-installation Considerations

3.01 Prior to installation, verify the quality of ground within the building; consult with the office grounding specialist as to the quality of ground and grounding protection methods.

3.02 The following is optional: for communications with technical support, or other members of the installation team, ensure there is at least one phone line available within 3 meters of the DCD-LPR/C.

B. Cables Required

3.03 The cables required for installing the DCD-LPR/C Shelf and connecting to the DCD Shelf are:

- 0.643 mm (22 AWG), tinned, solid copper, shielded twisted pair cable
- 1.47 mm (16 AWG) stranded wire
- 4.115 mm (6 AWG) (or larger) copper grounding wire

- Two RG-59 75 ohm coax cables with appropriate connectors
- DB25-to-DB25 shielded standard RS-232 ribbon cable (factory provided)

3.04 To make the E1 connection from the DCD-LPR/C to the DCD Shelf, a cable with an SMB connector at the LPR/C end is required. Depending on the type of input connector at the DCD Shelf, a certain cable should be used (refer to Table C). This cable must be provided by the user.

3.05 To make the power connections to the DCD-LPR/C Shelf, 1.47 mm (16 AWG) stranded wire is needed. This cable must be provided by the user.

3.06 For grounding the relay rack containing the DCD-LPR/C Shelf, 4.115 mm (6 AWG) (or larger) copper grounding wire is recommended. This cable must be provided by the user.

3.07 To make the oscillator connections from the DCD-ST2, or any 500 series, shelf to the DCD-LPR/C Shelf, two RG-59 75 ohm coax cables with BNC connectors are required. Two 1.8 meter RG-59 75 ohm coax cables with BNC connectors are provided with the DCD-LPR/C Shelf. If longer cables are required (not to exceed 15 meters), these must be provided by the user. (Not used for stand-alone configurations.)

3.08 If connecting to a DCD-419 Shelf (Rev. D or later), two 75 ohm coax cables, with BNC-to-SMB connectors are required (refer to Table C). This cable must be provided by the user.

Notes:

1. The DCD-LPR/C can only be used with Rev. D or later revisions of the DCD-419.
2. The revision letter of the DCD Shelf is located on the right rear outside sheet metal shelf, with the part number and serial number. This information may be stamped directly on the sheet metal or on a large white label.

3.09 Alarm and status information to the DCD Shelf through the MIS/C card is carried via the factory-provided DB25-to-DB25 shielded cable; a 1.5 meter length of this cable is provided in the timing kit.

Note: Alarm and status information to the DCD Shelf requires that an MIS/C card be installed in the master shelf.

3.10 To make the Time-of-Day (TOD) adapter to RS-422-to-RS-232 converter connection(s), one (or two) 0.511 mm (24 AWG), three twisted-pair shielded cable with a DB9 (male) connector on one end and a DB9 (female) connector on the other end is required. This cable must be provided by the user, and must not exceed 15 meters (50 feet) if using the 1 pps signal; if not using the 1 pps signal, the cable must not exceed 305 meters (1,000 feet).

3.11 To make the RS-422-to-RS-232 converter to Cisco Systems router connection(s), an RS-232 data

communications cable with a 25-pin male connector on one end and a 25-pin female connector on the other end is required; not to exceed 15 meters (50 feet). For NTP Type 4 TOD applications, an RS-232 or RS-422 cable can be used.

C. Tools and Materials

3.12 Ensure that the user-provided tools and materials listed in Table C are on hand for installation of the DCD-LPR/C.

Table C. Customer Provided Tools and Materials (for DCD-LPR/C Shelf Installation)

ITEM	COMMENT
TOOLS	
Soldering iron and solder	—
Cable cutting tools	—
Volt-ohm meter	—
Multimeter	—
Wire-wrap tool	—
Small and medium screwdrivers	—
One 15.9 mm open-end wrench	For attaching connector plugs
MATERIALS	
75 Ω cable with an SMB connector on one end for the DCD-LPR/C Shelf, and an appropriate connector on other end for the DCD Shelf	For the DCD Shelf BNC input connector: p/n 060-00029-02 (0.6 m), 060-00029-01 (1.2 m), or 060-00029-06 (1.8 m) For the DCD Shelf SMB input connector: p/n 060-00040-01 (1.2 m) For the DCD Shelf Siemens 1.6/5.6 connector: p/n 060-00045-01 (1.2 m)
1.47 mm (16 AWG) stranded wire	For power connections to the DCD-LPR/C Shelf
4.115 mm (6 AWG) (or larger) copper grounding wire	For grounding the relay rack containing the DCD-LPR/C Shelf
Two RG-59 75 Ω coax cables with appropriate connectors	Two 1.8 m RG-59 75 Ω coax cables with BNC connectors are provided with the DCD-LPR/C Shelf to make the oscillator connections from the DCD-ST2, or any 500 series, shelf to the DCD-LPR/C Shelf. If longer cables are required, these are not to exceed 15 m. (Not used for stand-alone configurations.) If connecting to a DCD-419 Shelf (Rev. D or later), two RG-59 75 Ω coax cables with BNC-to-SMB connectors are required, and may be provided by the user, or ordered from Symmetri-com, p/n 060-00029-06 (1.8 m)

Table C. Customer Provided Tools and Materials (for DCD-LPR/C Shelf Installation) (Contd)

ITEM	COMMENT
One or two 0.511 mm (24 AWG), 3 twisted-pair shielded cable (Belden 9680 or equivalent) with appropriate connectors	For TOD adapter connection(s) The cable length should not exceed 15 m (ft) if using the 1 pps signal, 305 m (1000 ft) if not If an RS-422-to-RS-232 converter is used, DB9 male and DB9 female connectors are required; if a converter is not used, DB9 female connector(s) are not required.
25-pin to 25-pin D (male to female) connectors RS-232 data communications cable	For RS-422-to-RS-232 converter to router connection(s) Not required if a converter is not used
Additional fuses (Bussman-type 3 A, 5 mm x 20 mm cartridge fuse or equivalent)	For power distribution panel fuse replacement
Spade lug connectors to fit a 1.47 mm (16 AWG) wire, 63 mm wide, and fit to a #6 stud	—
Stand-alone power supply, p/n 990-40031-01 or equivalent (optional)	For an external power source

D. Unpacking

3.13 Save packing material. All equipment returned *must be packed in the original packing material. Returned equipment not packed in original packing material voids warranty.* Contact your local Symmetricom distributor, or call Symmetricom’s Customer Service Department if additional packaging is needed at +44 1483 510300 (U.K.).

1. Unpack equipment carefully.
2. Inspect equipment for shipping damage, including bent or loose hardware, and broken connectors. Inspect the pins on the backplane to ensure that none are bent or broken. Notify Symmetricom and the carrier if equipment was damaged in transit.
3. Verify all items have been received. For a parts list, refer to Table K, at the end of this section.
4. Notify Symmetricom if any items are missing.

E. Assembly and Mounting

Rack Mounting

3.14 The DCD-LPR/C can be mounted in 48 cm (19 in) or 58 cm (23 in) racks, as well as ETSI 53 cm (21 in) racks, depending on the position of the mounting ears. For mounting the DCD-LPR/C Shelf into a rack, refer to Figure 18, and use the following instructions. The mounting ears can be positioned for flush mount or offset 12.7 cm for either rack.

1. Position the mounting ears for mounting the receiver in a rack (Figure 18), and attach the mounting extensions as shown. Repeat for the other side of the shelf.
2. Install the DCD-LPR/C Shelf above a DCD Shelf. If the shelf must be mounted directly above equipment other than Symmetricom’s equipment, leave approximately 19 mm, beneath the DCD-LPR/C Shelf for ventilation.

Note: If the DCD-LPR/C Shelf is not collocated with the DCD Shelf housing the clocks, the oscillator cable length is maximum 15.2 meters.

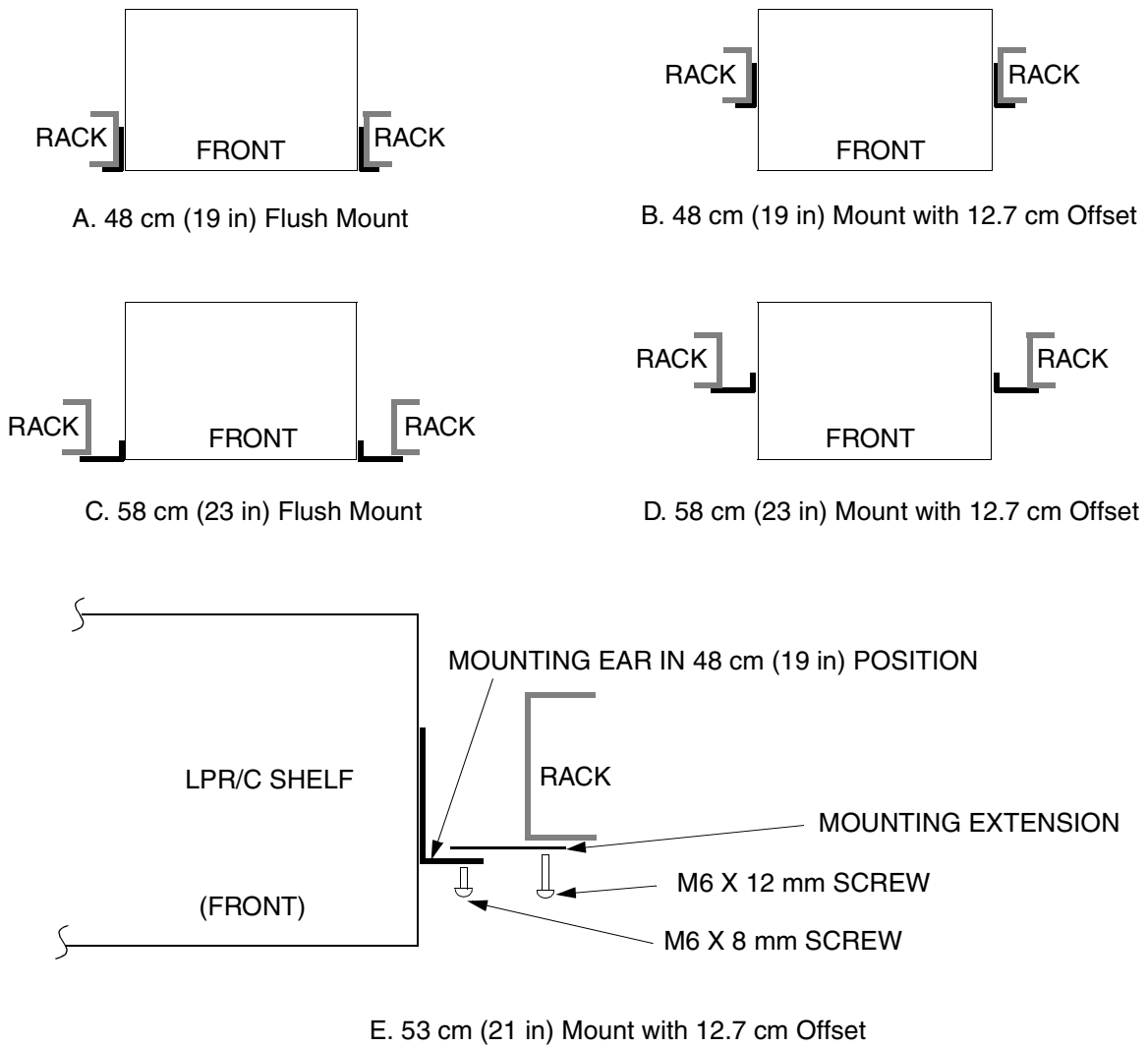


Figure 18. DCD-LPR/C Shelf Mounting Ears (Top View)

TOD Adapter

Notes:

- a. Prior to beginning the following procedures, ensure that the appropriate router has been installed, and power applied, per manufacturer's instructions.
- b. For NTP Type 4 TOD applications, an RS-232 or RS-422 cable can be used; if an RS-422 cable is used, an RS-422-to-RS-232 converter is not required.

3.15 If configuring the DCD-LPR/C for TOD applications, and an RS-422-to-RS-232 converter is used, once the DCD-LPR/C Shelf is mounted in the rack, install the converter as follows:

1. Obtain the RS-422-to-RS-232 converter (Figure 19), and position where desired (the distance between the adapter and the converter is not to exceed 15 meters, if using the 1 pps signal; if not using the 1 pps signal, the distance is not to exceed 305 meters).
2. Use the provided 12-24 screws and flat stainless-steel washers, and the slot and/or cutout in the

converter's mounting ear (Figure 19B), to secure the converter to the desired surface.

3. Obtain the 0.511 mm (24 AWG), three twisted-pair shielded cable(s) (user-provided, Belden 9680 or equivalent). Using company practice and Figure 20, attach a DB9 (male) connector on the DCD-LPR/C Shelf end of the cable, and a DB9 (female) connector on the converter end of each cable; Table D contains the pin assignments for the DB9 connector. This is a straight cable (no null).
4. Connect the connectorized cable(s) from TOD A (J21) and/or TOD B (J22) (TOD A is associated with GTI A, and TOD B is associated with GTI B, on the DCD-LPR Shelf) on the adapter to the appropriate DB9 converter connectors (Figure 19). Refer to Table E for DB9 cable pin assignments on the converter.
5. Obtain the 25-pin standard data cable (should not exceed 15 meters), and plug one end into the 25-pin connector on the converter, and the other end into the 25-pin AUX port on the router. (Refer to Table F for the DB25 cable pin assignments on the converter; for the router pin assignments, refer to the documentation supplied with the router.)

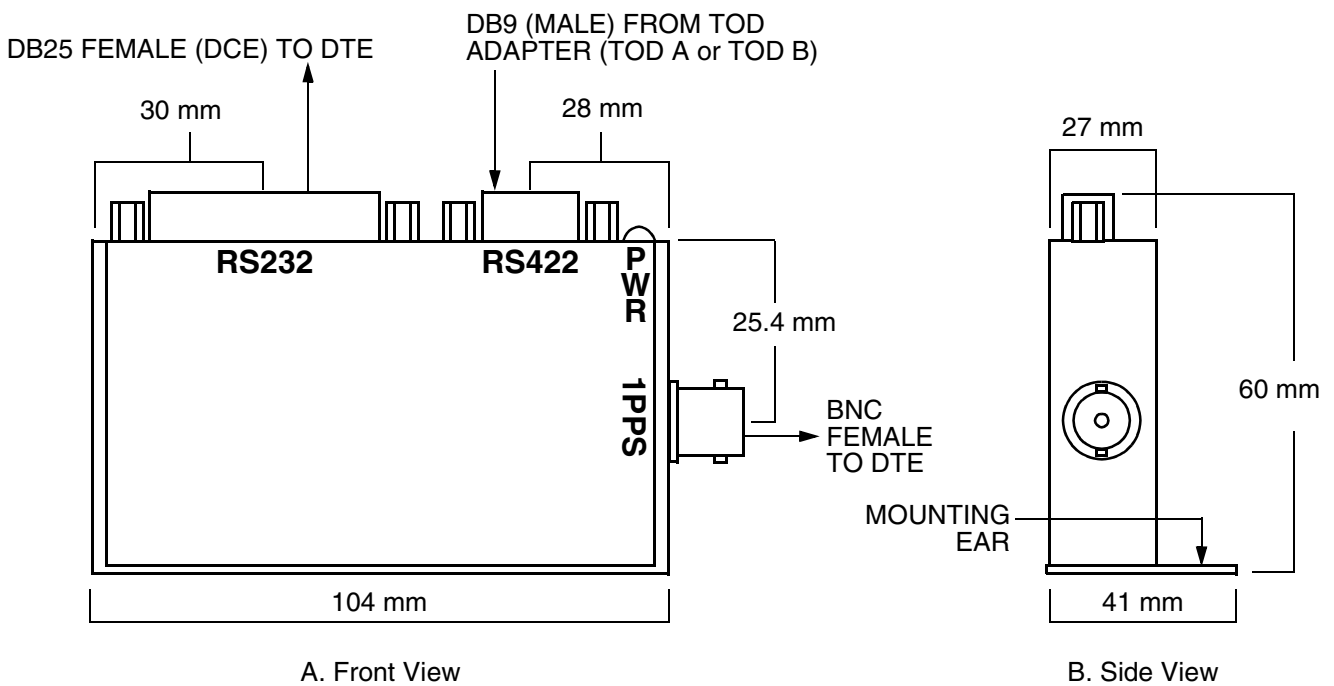
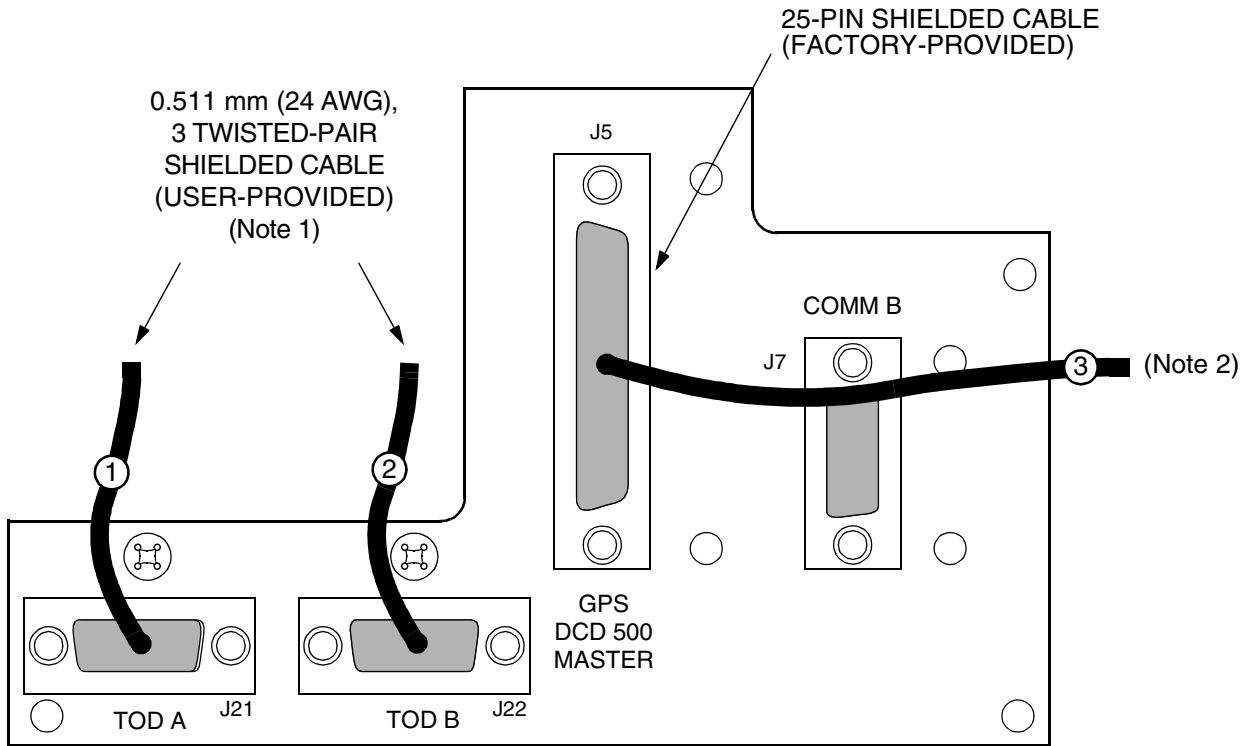


Figure 19. RS-422-to-RS-232 Converter and Connections



- ① Connect to the RS-422 connector on the DTE; if an RS-232 connector is on the DTE, connect to the DB9 connector on the converter designated for GTI A.
- ② Connect to the RS-422 connector on the DTE; if an RS-232 connector is on the DTE, connect to the DB9 connector on the converter designated for GTI B.
- ③ To the LPRS connector on the DCD Shelf backplane.

Notes:

- 1. See Table C for connector type; see Table D for pin assignments.
- 2. For use with the MIS/C card.

Figure 20. Adapter Positioning and Connections

**Table D. Adapter DB9 Connector (J21 and J22)
Pin Assignments**

PIN	FUNCTION
1	No connection
2	Data + Output (RS-422) (see Note)
3	Data – Output (RS-422) (see Note)
4	No connection
5	Ground (see Note)
6 and 7	No connection
8	1 pps Output (RS-232) (see Note)
9	+9 V for RS-232 levels, Maximum 100 mA (see Note)
Note: Connect pins to 3 twisted-pairs: Pins 2 and 3 to one twisted pair, 5 and 8 to second pair; 9 to both wires of third pair.	

**Table E. Converter DB9 Connector
Pin Assignments**

PIN	FUNCTION
1	No connection
2	Data + Input (RS-422)
3	Data – Input (RS-422)
4	No connection
5	Ground
6 and 7	No connection
8	1 pps Input (RS-232)
9	+12 V to +9 V Input

**Table F. Converter DB25 Connector
Pin Assignments**

PIN	FUNCTION
1 and 2	No connection
3	Data Output (RS-232)
4	No connection
5	1 pps (RS-232)
6	No connection
7	Ground
8 through 25	No connection

F. GTR to DCD-LPR/C Connections

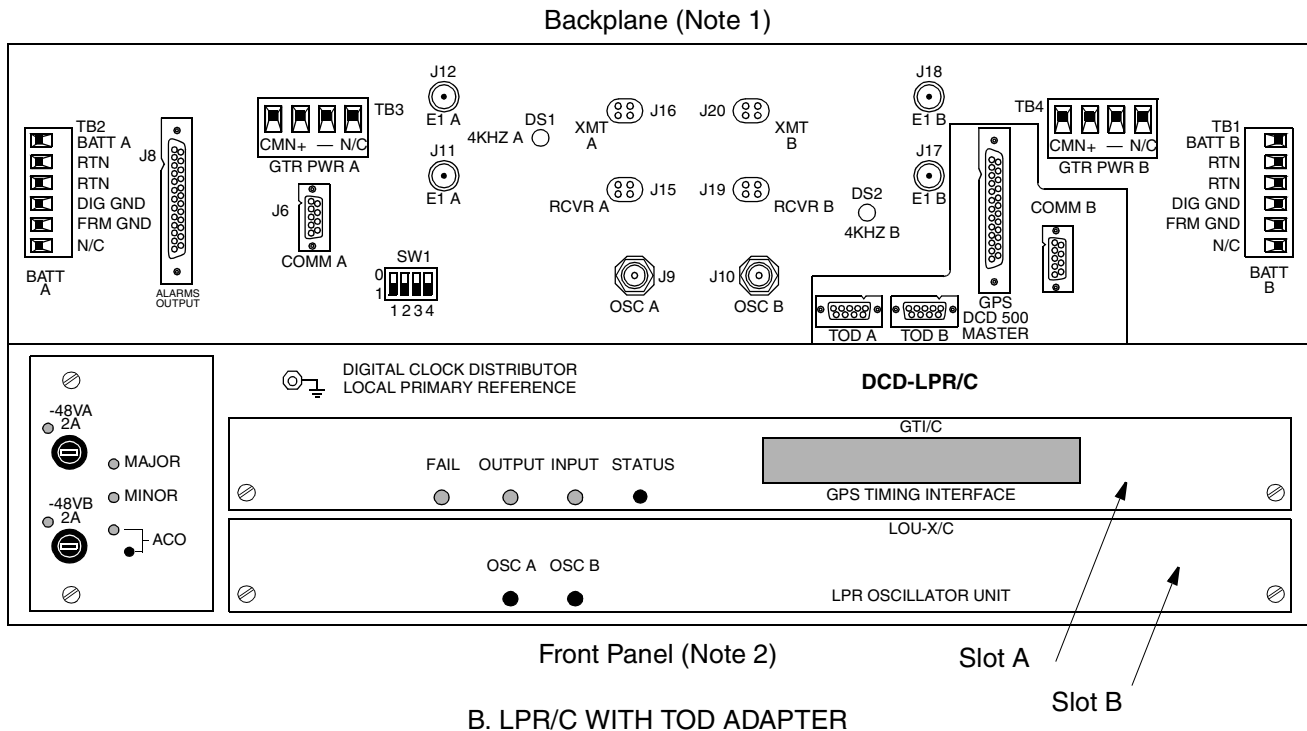
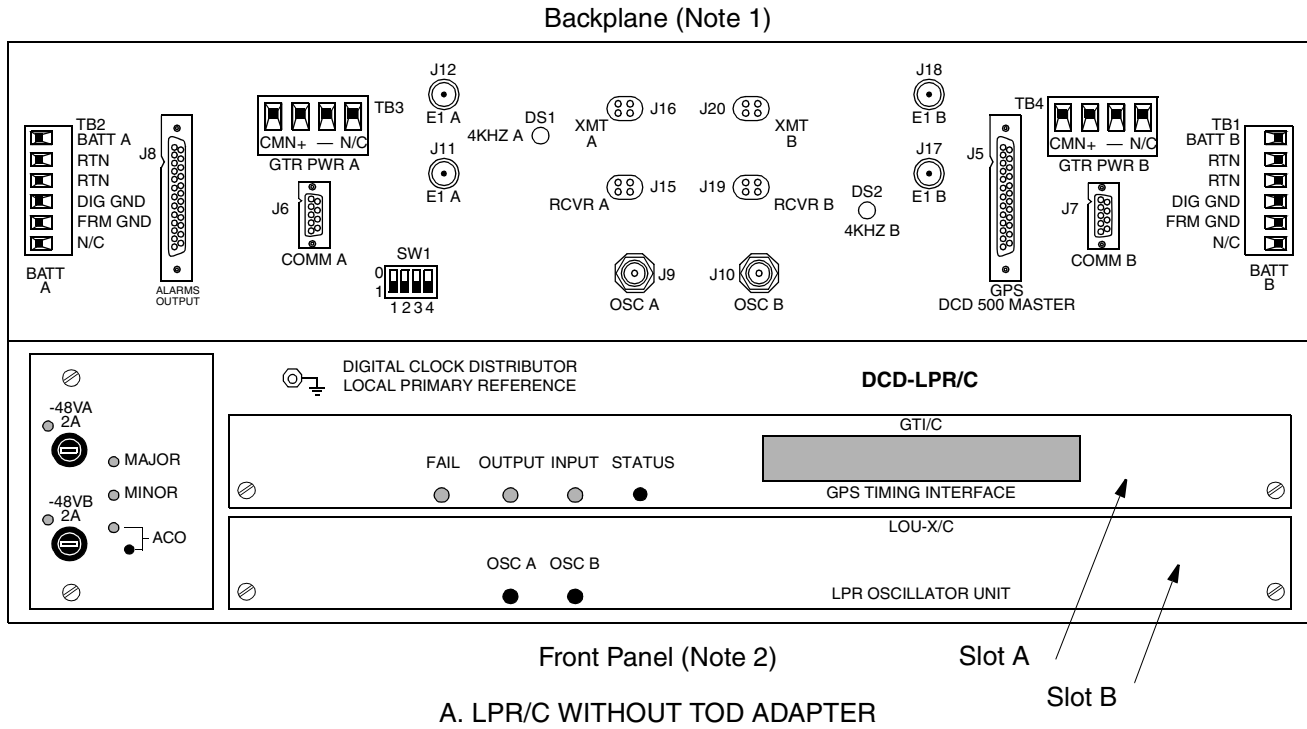
3.16 All connections to the DCD-LPR/C are made at the backplane. Typically, the backplane is covered with a panel; cable routings are through openings on either side of the backplane.

3.17 Before beginning connections, remove the backplane cover, and route the power and fiber cables through the openings on either side of the backplane.

Power Connections

3.18 There are three GTR power connections: one from the GTR to an outside lightning protector, another from the outside lightning protector to the inside lightning protector, and a third from the inside lightning protector to the DCD-LPR/C Shelf. Figure 21 shows the LPR/C Shelf, and Table G lists the shelf connectors. Figure 22 through Figure 24 show connection diagrams. Follow company installation practices to cable the GTR to the DCD-LPR/C Shelf.

Note: The top slot on the DCD-LPR/C Shelf is the “A” slot; “B” is the bottom slot (Figure 21).



Notes:

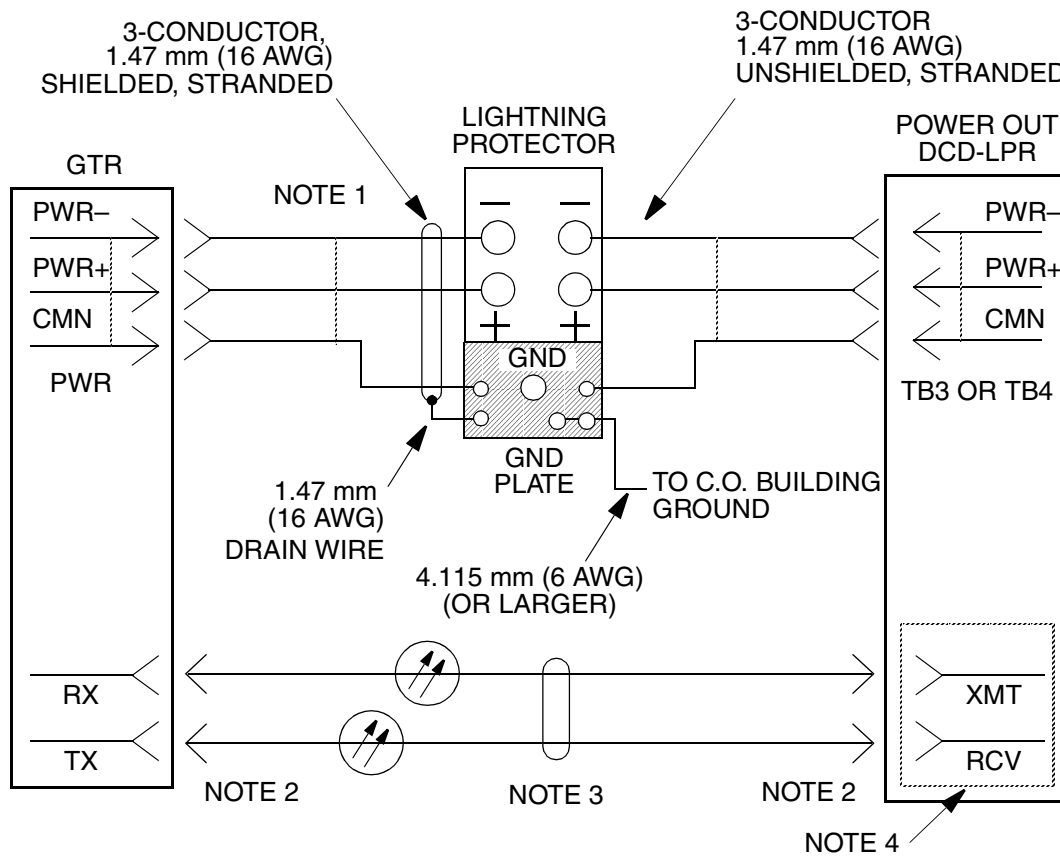
1. Typically, the backplane is covered with a panel; cable routings are through openings on either side of the backplane.
2. The slot(s) which the LOU/C or GTI/C go into are independent; any card can go into either slot.

Figure 21. DCD-LPR/C Shelf

Table G. DCD-LPR/C Backplane

DESIGNATION	LABEL	TYPE	USE
TB1	BATT B	Snap screw-down	Power and ground terminal block for B power source
TB2	BATT A	Snap screw-down	Power and ground terminal block for A power source
TB3	GTR PWR A	Snap screw-down	Power connections to GTR A
TB4	GTR PWR B	Snap screw-down	Power connections to GTR B
J5	GPS DCD 500 MASTER	DB25 connector	Alarm and status connections to DCD Shelf
J6	COMM A	DB9 connector	Diagnostic connector
J7	COMM B	DB9 connector	Diagnostic connector
J8	ALARMS OUTPUT	DB25 connector	Alarm and status connections to office alarm system
J9	OSC A	BNC connector	Oscillator A connections from DCD Shelf to DCD-LPR/C Shelf
J10	OSC B	BNC connector	Oscillator B connections from DCD Shelf to DCD-LPR/C Shelf
J11	E1 A	SMB connector	E1 output connection from DCD-LPR/C to DCD Shelf
J12	E1 A	SMB connector	E1 output connection from DCD-LPR/C to DCD Shelf
J15	RCVR A	Fiber optic connectors	Receive fiber optic connections from GTR A to DCD-LPR/C Shelf
J16	XMT A	Fiber optic connectors	Transmit fiber optic connections from GTR A to DCD-LPR/C Shelf
J17	E1 B	SMB connector	E1 output connection from DCD-LPR/C to DCD Shelf
J18	E1 B	SMB connector	E1 output connection from DCD-LPR/C to DCD Shelf
J19	RCVR B	Fiber optic connectors	Receive fiber optic connections from GTR B to DCD-LPR/C Shelf
J20	XMT B	Fiber optic connectors	Transmit fiber optic connections from GTR B to DCD-LPR/C Shelf
—	DS1 4KHZ A	Lamp	Indicates presence of 4 kHz signal from GTR A
—	DS1 4KHZ B	Lamp	Indicates presence of 4 kHz signal from GTR B
—	SW1	Switch	Factory setting; switches set to OFF (down) position. Set switches SW1-1 and SW1-2 to down, and SW1-3 and SW1-4 to up for MIS/C communications.

Caution: DC polarity must be maintained. If not, the DCD-LPR/C will not function.

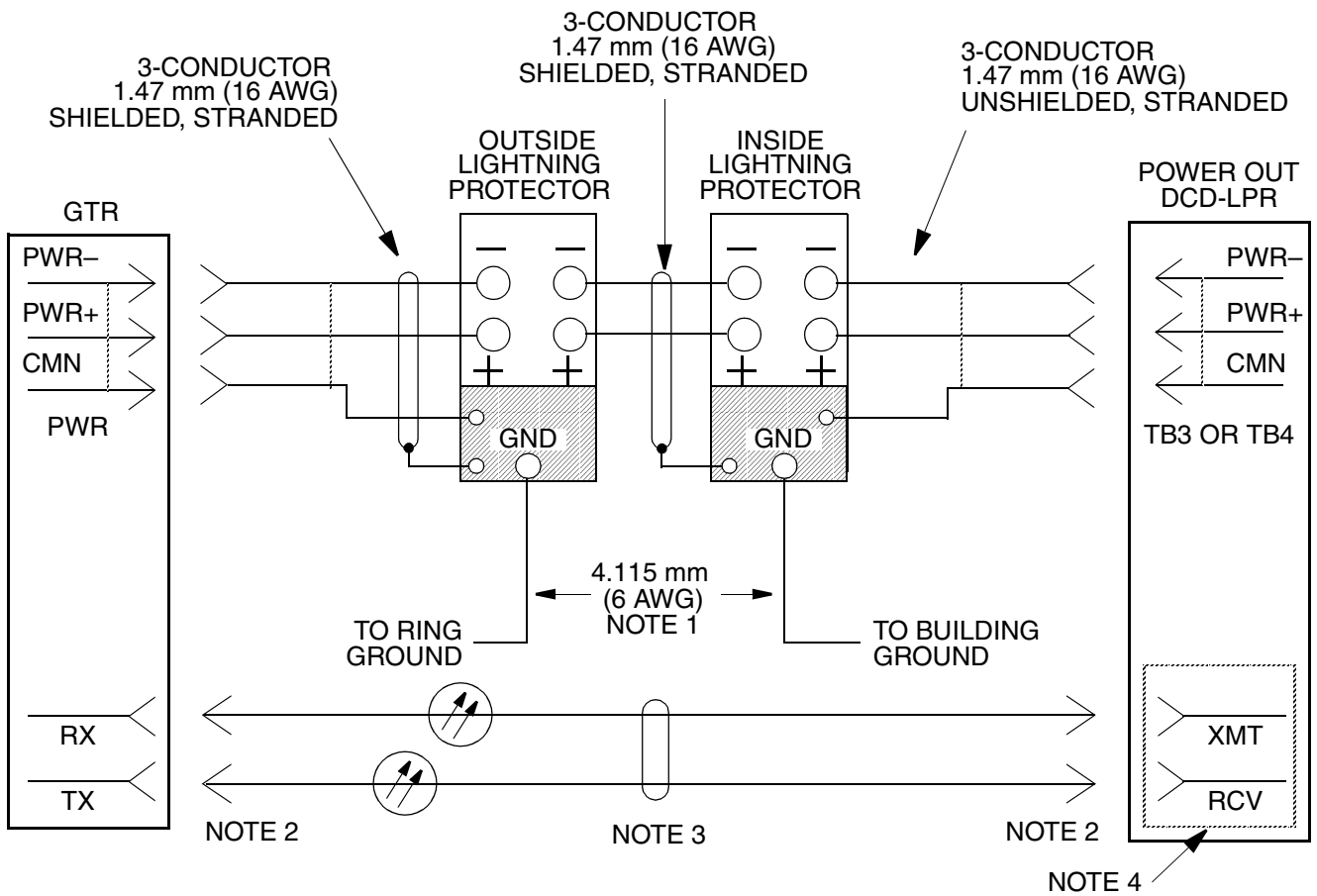


Notes:

1. The cable shield is open at the GTR. The drain wire is connected to the grounding plate of the lightning protector.
2. Fiber optic compound cleave ST style connector.
3. Riser-rated fiber optic 200 μ multimode cables.
4. Fiber optic compound cleave ST style connectors on the DCD-LPR/C backplane.

Figure 22. GTR to DCD-LPR/C Connections (Single Lightning Protector)

Caution: DC polarity must be maintained. If not, the DCD-LPR/C will not function.



Notes:

1. Do not ground both protectors together with one common wire; the outside and inside protectors must have separate ground points.
2. Fiber optic compound cleave ST style connector.
3. Riser-rated fiber optic 200 μ multimode cables.
4. Fiber optic compound cleave ST style connectors on the DCD-LPR/C backplane.

Figure 23. GTR to DCD-LPR/C Connections (Dual Lightning Protectors)

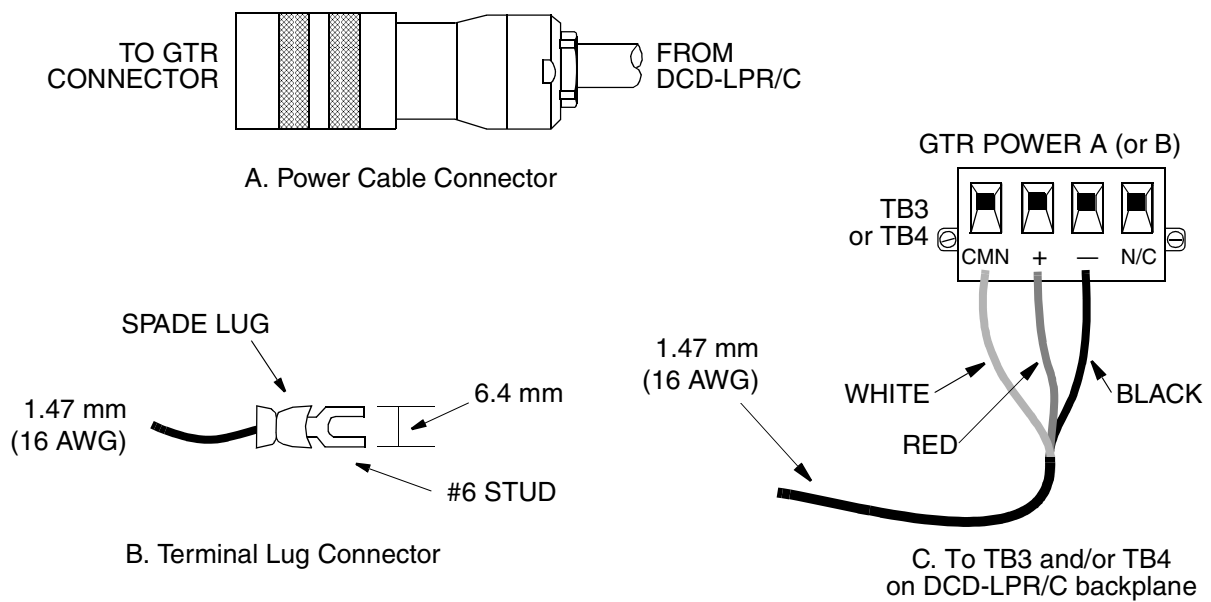


Figure 24. GTR to DCD-LPR/C Power Cable Connectors

Fiber Optic Cable Connections

3.19 There are four fiber optic cable connections (XMT A and B, and RCV A and B) to the DCD-LPR/C backplane (Figure 21). Connect to A if the GTI/C is installed in Slot A (of the DCD-LPR/C), or to B if the GTI/C is installed in Slot B. To make the fiber cable connections, perform the following:

Note: Fiber polarity must be maintained, or the GTR will not operate correctly. If wiring polarity is incorrect, “GTR COMM” appears on the GTI/C LCD display, and the “DS1” (or DS2) lamp on the DCD-LPR/C backplane will not be lit.

1. Connect the same color fiber optic cable that is connected to the TX connector on the GTR to the appropriate RCV (A or B) connector on the DCD-LPR/C backplane (J15 or J19).
2. Connect the other color fiber optic cable to the appropriate XMT (A or B) connector on the DCD-LPR/C backplane (J16 or J20).
3. If a GTI/C card will be installed in Slot B, repeat Steps 1 and 2, but connect to RCV B and XMT B.

G. DCD-LPR/C to DCD Shelf Connections

Timing Output Connections

3.20 If the DCD-LPR/C is a stand-alone configuration, skip this section and proceed to Part H, Alarm and Status. Connect the E1 or DS1 timing output cables from the DCD-LPR/C to the DCD Shelf, using Table H as reference.

Note: The DCD-521/C connection requires SMB-to-SMB connectors.

Table H. GTI/C Timing Output Connections

DCD SHELF	FROM LPR/C CONNECTOR	TO DCD SHELF CONNECTOR
DCD-521/C	J11, J12 J17, J18	See Note
<p>Note: Actual connection is a function of the DCD-521/C input module and user configuration. For information regarding the timing input connections for the DCD-521/C, refer to the DCD-521/C Manual.</p>		

LNC/C Thermal Insulators

3.21 In DCD systems equipped with LNC/C cards, a thermal insulator must be installed on the LNC/C card's oscillator to keep the oscillator temperature constant.

3.22 If the thermal insulator is not installed on the LNC/C card's oscillator, a Thermal Insulator Kit is available from Symmetricom (refer to Table K). Follow the instructions provided in the kit to install the insulator.

DCD Clock Connectors

Caution: *If installing an LOU/C card, do not make a connection between the clock connectors on the DCD Shelf and the DCD-LPR/C Shelf OSC A and B connectors.*

3.23 Use the two 75 ohm coax cables (two 1.8 meter lengths of cable are provided with the DCD-LPR/C Shelf) to make the connections to the DCD Shelf. If longer cables are required, these must not exceed 15.2 meters, and are to be user-supplied. Route the cables through the openings on either side of the backplane.

3.24 To connect the 5 MHz inputs, refer to Table I, and connect from the DCD Shelf to the OSC A and OSC B connectors on the DCD-LPR/C backplane.

Table I. DCD Clock to DCD-LPR/C Connections

DCD-521/C SHELF		DCD-LPR/C SHELF	
CONNECTOR	LABEL	CONNECTOR	LABEL
J12	OSC A	J9	OSC A
J13	OSC B	J10	OSC B
Caution: Do not make these connections if an LOU/C card is installed.			

10 MHz Inputs

3.25 If configured to accept 10 MHz inputs (via jumpers on the GTI/C card), connect the OSC A and OSC B connectors on the DCD-LPR/C Shelf backplane to an external source. Refer to the Test and Acceptance section of this manual for instructions on restrapping the GTI/C card for 10 MHz input.

Note: If connecting to an external source, the external source must be a 5 MHz or 10 MHz sine wave, 1.25 volts ac to 1.50 volts ac.

3.26 These connections are made using two 75 ohm BNC-to-BNC coax cables (two 1.8 meter lengths of cable are provided with the DCD-LPR/C Shelf). If longer cables are required, these must not exceed 15.2 meters, and are to be user-supplied.

H. Alarm and Status

3.27 Refer to Table J for a list of the pinouts for the DB25 connector labeled ALARM OUTPUTS (J8) (Figure 21). Connect this cable from the DCD-LPR/C Shelf to the office alarm reporting system, using company practices; route the cable out through the opening on either side of the backplane.

3.28 Alarm contacts may be connected as NC (Normally Closed), NO (Normally Open), with a reference of C. Both NO audible and visual relay contacts close upon the occurrence of the corresponding alarm. Only the audible contacts are deactivated (opened) when the Alarm Cut Off (ACO) pushbutton on the Fuse and Alarm panel is pressed.

Table J. 25-pin J8 ALARMS OUTPUT Pin Assignments

PIN	SIGNAL
1	MAJ VIS NC
2	MAJ VIS NO
3	MAJ AUD NC
4	MIN VIS NC
5	MIN VIS NO
6	MIN AUD NC
7	MIN AUD C
8	STATUS NC
9	STATUS NO
10	STATUS C
14	MAJ VIS C
15	MAJ AUD NC
16	MAJ AUD C
17	MIN VIS C
18	MIN AUD NO
Note: Pins not listed are not connected.	

3.29 Both NC audible and visual relay contacts open upon the occurrence of the corresponding alarm. Only the audible contacts are deactivated (closed) when the Alarm Cut Off (ACO) pushbutton on the front panel of the Fuse and Alarm panel is pressed.

GPS DCD 500 Master

3.30 Alarm and status information to the DCD Shelf is carried via a DB25-to-DB25 shielded cable; a 1.2 meter length of this cable is provided in the MIS Modification kit. Connect this cable from the GPS DCD 500 Master (J5) connector (on the DCD-LPR/C) to the LPRS connector on the DCD Shelf; route the cable out through the openings on either side of the DCD-LPR/C backplane.

Note: Alarm and status information to the DCD Shelf requires an MIS/C card be installed in the master shelf.

I. Ground and Power Connections

3.31 Power and frame grounding connections are made at both the TB1 and TB2 FRM GND terminals on the DCD-LPR/C backplane; GTR power connections are made at TB3 and TB4.

3.32 Use 1.47 mm (16 AWG) stranded wire (green insulation) for grounding connections; these wires must be supplied by the user.

3.33 Two 1.47 mm (16 AWG) stranded wires are used for power connections, one with red insulation (-48V) and the other with black insulation (RTN); these wires are not provided, and must be supplied by the user. The -48 volt dc A and -48 volt dc B input voltage supplies can be either filtered or unfiltered.

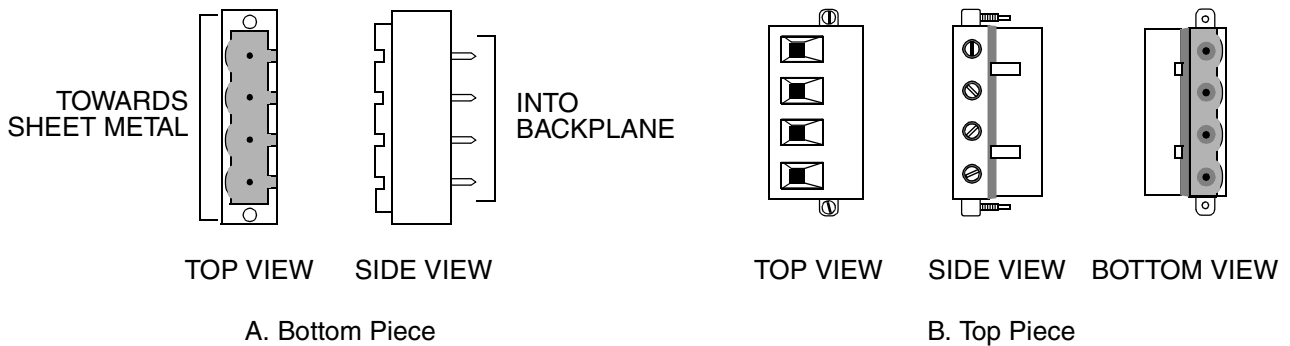
Note: A and B power inputs must come from two separate sources (leads). The power sources should be specified in the company Installation Job Specification. These may be from a battery distribution fuse board (BDFB), a miscellaneous fuse bay, or a miscellaneous fuse panel in the same rack as the DCD-LPR/C. The DCD-LPR/C Shelf is fused for 2 amps. Fusing at the fuse bay should be 150 percent of the shelf rating, or the nearest larger size (minimum 3 amps).

3.34 TB1 through TB4 may require the user to attach a two-piece snap screw-down connector to the terminal block, four-position connectors on TB3 and TB4, six-position on TB1 and TB2.

3.35 A bottom piece (Figure 25A) is placed on the terminal block with the rounded part of the piece facing the sheet metal. The top piece is inserted into the bottom, and the power and ground wires are then connected to the top piece of the connector (Figure 25B).

3.36 In most cases, the snap screw-down connectors are already installed on the appropriate terminal block. If the snap screw-down connectors are not installed, perform the following:

Note: When placing the bottom piece of the snap screw-down connector, ensure that the rounded portion of the connector faces the sheet metal. If not, the connector cannot be wired.



**Figure 25. Example of a Snap Screw-Down Four-Position Connector
(Six-position connectors also available)**

1. Place the bottom piece of the six-position snap screw-down connector on both TB1 and TB2, ensuring that the rounded portion of the connector faces the sheet metal.
2. Secure each connector in place with the two set screws.
3. Place the top piece of the six-position snap screw-down connector onto the bottom piece on both TB1 and TB2, ensuring that the rounded portion faces the sheet metal.
4. Secure each connector in place with the two set screws.
5. Place the bottom piece of the four-position snap screw-down connector on both TB3 and TB4, ensuring that the rounded portion of the connector faces the sheet metal.
6. Secure each connector in place with the two set screws.
7. Place the top piece of the four-position snap screw-down connector onto the bottom piece, on both TB3 and TB4, ensuring that the rounded portion faces the sheet metal.
8. Secure each connector in place, with the two set screws.

3.37 To wire power and ground, perform the following:

1. Remove the shelf fuses from the front panel.
2. Remove the battery source fuses from the rack fuse bay.
3. Run the power wires from the power source(s) to the DCD-LPR/C Shelf; route the wires through the openings on either side of the backplane.
4. Strip approximately 13 mm from one end of a length of 1.47 mm (16 AWG) stranded wire (green insulation). The wire should be long enough to reach from the shelf backplane to the rack frame ground.
5. Connect the wire to the FRM GND wire receptacle on the TB2 connector.
6. Connect the A power source wire with red insulation to the -48V A wire receptacle on the TB2 connector.
7. Connect the A power source wire with black insulation to the RTN wire receptacle on the TB2 connector.
8. Repeat Steps 3 through 7, but for the B power source, and connect to the TB1 connector.

9. Verify with a volt-ohmmeter that there are no foreign battery, grounds, or shorts at the power source end of the wires.
10. Connect the leads to the power source terminals, with the appropriate type of connectors or lugs, as specified in the company Installation Job Specification.

Note: If power sources are direct from the BDFB, a separate, detailed Method of Procedure to cut leads into the BDFB should be developed and cut during non-busy hours.

11. Proceed with completing the ground and power connections.

Ground Connections

Notes:

1. Ensure the ground source is low noise, using company practices.
2. Route the power and ground wires out through the openings on either side of the backplane.

3.38 Refer to Figure 26 for an illustration of the DCD-LPR/C power and ground connections. Perform the following, to correctly ground the DCD-LPR/C.

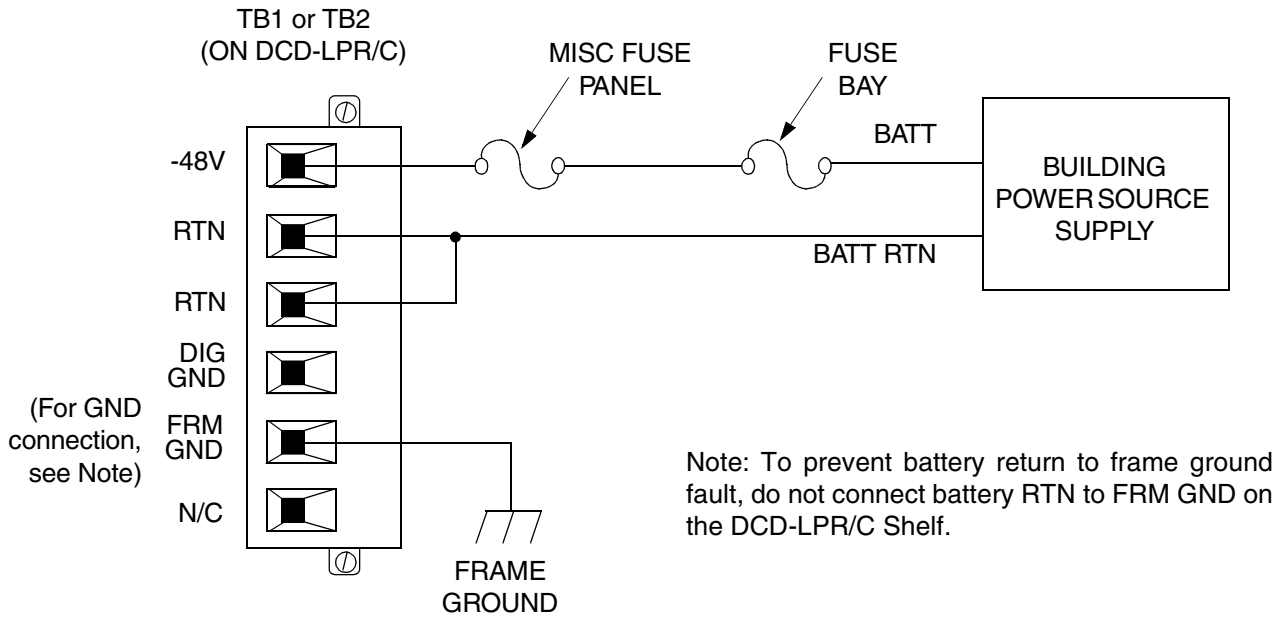


Figure 26. DCD-LPR/C Ground and Power Connections

1. Connect TB1 FRM GND terminal on the shelf backplane to rack frame ground. To do this, perform one of the following:

Note: Use a 25 watt soldering iron, to ensure the #6 rod (frame ground connection) is heated sufficiently, to prevent a cold solder connection.

- a. The connection should be soldered to the #6 frame ground rod run vertically on each side of the rack, if provided. Two methods are acceptable:
 - Crimp a #16 spade lug to the 1.47 mm (16 AWG) wire, bend the lug around the #6 rod, and solder.

- Strip enough insulation from the 1.47 mm (16 AWG) wire to permit three complete turns around the #6 rod and solder.

- b. If the #6 ground rods are not provided, crimp a #16 spade lug to the 1.47 mm (16 AWG) wire, and screw the lug to a screw hole on the rack. Remove the paint, and sand the area around the screw hole, to ensure proper conductivity.

2. Repeat Step 1, but perform on the TB2 FRM GND terminal, to connect to rack frame ground.

Note: Do not connect DIG GND to FRM GND on TB1 or TB2.

GTR Power Connections

3.39 GTR power connections are made on TB3 (GTR POWER A) and TB4 (GTR POWER B) (Figure 21).

3.40 Ensure that the power load sources (A and B) are fully diverse, and cable runs are as diverse as possible. Do not install any type of redundant lead lying parallel and adjacent in the same cable rack. Leads A and B must be run down separate sides of each shelf. If the site only has one power source, run both A and B feeds from that single source. Route the wires out through the openings on either side of the backplane.

3.41 To complete the power connections to the GTR, perform the following:

1. Strip approximately 13 mm off the ends of the three-conductor power cable at the DCD-LPR/C Shelf.

Note: For the next step, if using power cables purchased from Symmetricom, the cable wire colors are as follows: + is red, – is black, and ground is white. If using power cables purchased from another source, ensure that wiring continuity is maintained when making power cable connections. Also, the cable should be 1.29 mm (16 AWG) for distances maximum 303 meters; for distances minimum 303 meters, consult the factory.

2. Secure the wires to the designated wire receptacles (on the snap screw-down connector) for the PWR+, PWR–, and CMN terminals on the GTR POWER terminal block (TB3 or TB4 on the DCD-LPR/C backplane).
3. Connect to TB3 if the GTI/C card is to be installed in Slot A of the DCD-LPR/C, or to TB4 if the GTI/C card is to be installed in Slot B.

Note: If using an external power source (a linear power supply is preferred), follow the manufacturers' instructions, and connect the power cable connectors. Ensure that the power source meets the following specifications:

- 1.16 amps in-rush maximum current
- Nominal 200 mA at 32 volts

Notes:

- a. Symmetricom recommends the Stand-alone Power Supply (refer to Table C) for use as an external power source.
 - b. Save the removed GTI/C card power supply daughter board, in case the GTI/C card has to be returned for servicing.
 - c. Reinstall battery source fuses in the rack fuse bay.
4. Using a multimeter, verify that the input voltage level across –48V and RTN terminals of TB1 and TB2 is between –42 volts dc and –56 volts dc.
 5. Reinstall the shelf fuses in the front panel.

J. Switch SW1

3.42 The SW1 switch set (on the DCD-LPR/C backplane) is shipped from the factory in the “OFF” (down position). This allows use of the COMM A and COMM B ports for communication. If using the MIS/C card in the DCD Shelf, the switch setting must be changed to enable communications with the MIS/C card via the GPS DCD 500 MASTER (J5) connection. Set the switches per the following:

- SW1-1 and SW1-2 set to the down or OFF position
- SW1-3 and SW1-4 set to the up or ON position

Note: Setting SW1 for MIS/C communications disables the COMMA and COMMB ports on the DCD-LPR/C Shelf.

4. TEST AND ACCEPTANCE

4.01 At this point, refer to the Test and Acceptance section of this manual for instructions on installing the GTI/C and/or LOU/C cards, and performing a systems test and acceptance.

Table K. Parts List

ITEM	PART NUMBER
KITS	
Note: See Table L for kit details.	
E1 DCD-LPR/C Timing Kit	990-44140-12
GPS Timing Antenna/Receiver	090-42110-01
GTI/C -12 Card	090-44140-12
GTR Hardware Kit	093-42100-11
E1 DCD-LPR/C Timing Kit	990-44140-14
GPS Timing Antenna/Receiver	090-42110-01
GTI/C -12 Card	090-44140-14
GTR Hardware Kit	093-42100-11
E1 DCD-LPR/C Timing Kit	990-44140-16
GPS Timing Antenna/Receiver	090-42110-01
GTI/C -12 Card	090-44140-16
GTR Hardware Kit	093-42100-11
E1 DCD-LPR/C Timing Kit	990-44140-18
GPS Timing Antenna/Receiver	090-42110-01
GTI/C -12 Card	090-44140-18
GTR Hardware Kit	093-42100-11
DCD-LPR/C Shelf Kit	990-44100-12
LPR/C Shelf	090-44100-12
DCD-LPR/C Manual	997-44100-13
DCD-LPR/C Shelf Hardware Kit	093-44100-12
Time-of-Day Kit (optional)	990-44181-01
RS-422-to-RS-232 Converter	090-42182-01
ADDITIONAL PARTS	
LOU/C Card (optional)	090-44145-01
LOU/C Card (optional)	090-44145-02
Thermal Insulator Kit (optional)	093-40019-01

Table L. Kit Details

QTY	ITEM	PART NUMBER
1	GTR Hardware Kit	093-42100-11
1	10 cm plastic pipe fitting flange	032-00006-02
1	Outdoor Lightning Protector Kit	093-42100-41
1	Lightning protector grounding plate	070-00300-01
1	Copper terminal	121-00055-01
8	22/16 spring-spade stud lug	121-00083-01
4	6-32 stainless-steel nuts	125-00121-06
2	10-32 stainless-steel hex nuts	125-00121-11
4	#6 stainless-steel washer	125-00522-06
2	#10 stainless-steel washer	125-00523-10
1	Outside Lightning Protector	143-00011-01
1	Indoor Lightning Protector Kit	093-42100-42
1	Lightning protector grounding plate	070-00300-01
1	Copper terminal	121-00055-01
8	22/16 spring-spade stud lug	121-00083-01
4	6-32 stainless-steel nuts	125-00121-06
2	10-32 stainless-steel hex nuts	125-00121-11
4	#6 stainless-steel washer	125-00522-06
2	#10 stainless-steel washer	125-00523-10
1	Inside Lightning Protector	143-00006-01
1	Lubricant	116-00025-01
1	DCD-LPR/C Shelf Hardware Kit	093-44100-12
1	3 m 25-pin D-Type cable	060-44210-04
8	M6 x 1 mm screws	125-00704-54
2	2 A, 250 V, 5 mm x 20 mm, fast blow fuses	143-00004-19
2	1.8 m coaxial cables (RG-59, 75 Ω)	160-00201-06
1	RS-422-to-RS-232 Converter	090-42182-01
1	RS-422-to-RS-232 Converter module	190-00078-01
2	M6 x 14 mm screws	125-00704-54
2	12-24 x 1/2 screws	125-22441-08