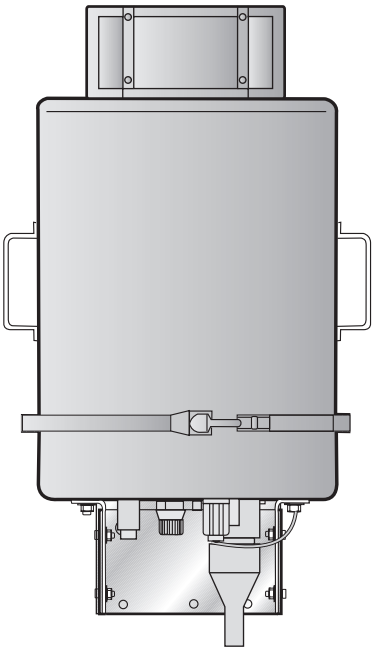
# HiGain Remote Therm-O-Nator Enclosure



**HRE-458 List 1, List 1B, and List 2**
**Product Catalog: 150-458-100-05**
CLEIs: T1RHNBV4 and T1RHNBW4

## Revision History of This Manual

| Revision | Release Date | Revisions Made |
|---|---|---|
| 01 | April 30, 1998 | Initial Release. |
| 02 | October 9, 1998 | Revision to Figure 10, minor corrections. |
| 03 | June 22, 1999 | Added Figure 10 and updated Figures 3, 4, 7, 8, and 9. |
| 04 | February 23, 2000 | Replaced plastic valves with all-metal valves. |
| 05 | August 9, 2002 | ADC Rebranding |

# USING THIS MANUAL

Two types of messages, identified by icons, appear in the text.

**Notes contain information about special circumstances.**

**Cautions indicate the possibility of equipment damage or the possibility of personal injury.**

# INSPECTING SHIPMENT

Upon receipt of the equipment:

- Unpack each container and inspect the contents for signs of damage. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company and to ADC. Order replacement equipment, if necessary.
- Check the packing list to ensure complete and accurate shipment of each listed item. If the shipment is short or irregular, contact ADC as described in the Warranty located inside the back cover. If you must store the equipment for a prolonged period, store the equipment in its original container.

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# OVERVIEW

This document describes the HiGain® Remote Therm-O-Nator HRE-458 gel-filled (List 1, List 1B) and air-filled (List 2) enclosures and provides installation instructions for these enclosures.

## FEATURES

The following features are included on the HRE-458 HiGain Remote Therm-O-Nator enclosure:

- Ten doubler card slots that support:
  - HDU-437 and HDU-407 (DDS Mechanics), HDU-439 (Dual 239 T1 Mechanics), and HDU-409 (Single T1 Mechanics) Full T1 doublers
  - HDU-217 (DDS Mechanics) and HDU-219 (Dual 239 T1 Mechanics) Fractional T1 doublers
  - HDU-239 T1 repeaters
- 30-foot (9.144 m), gel-filled or air-filled, 52-pair cable stub
- Flat surface, rack, or pole mount
- Primary surge protection
- Seamless, stainless steel cover with Therm-O-Nator heat exchange unit
- Single stub access
- Tilt forward mounting
- Unique card guides that automatically adapt to accommodate any of the three mechanics form factors currently supported

## APPLICATIONS

The primary application of the HRE-458 is to house HiGain doubler units in a High-bit-rate Digital Subscriber Line (HDSL) T1 transmission system. The remote enclosure is designed to protect HiGain doubler units from potentially harmful conditions found in outdoor environments. The enclosure comes in either a single gel core stub (List 1, List 1B) or air core stub (List 2) unit.

The HRE-458 gel core List 1, List 1B unit is intended for aboveground, pole-mounting applications that do not require pressurization through the cable stub. However, if you prefer to pressurize the unit, it can be locally pressurized by an optional exterior air cutoff valve (see Figure 2 on page 4). The HRE-458 air core List 2 unit is intended for underground installations. It can be pressurized from the main feeder cable through its air core stub. The pressurization prevents the enclosure from flooding when mounted in underground manholes. Both units are similar in that they have primary gas tube surge protection on all cable pairs.

The HRE-458 can be used to house the following doubler and repeater units. All of these doublers and repeaters share the same generic slot pin assignments as shown in Table 2 on page 15.

- HDU-439, HDU-437, HDU-409, or HDU-407 Full T1 (1.544 Mbps) unit
- HDU-219 or HDU-217 Fractional T1 (772 Mbps) unit
- ISDN repeater
- DDS repeater
- 239 T1 repeater

# FUNCTIONAL DESCRIPTION

The following section discusses the function of each component on the HRE-458. The enclosure consists of an aluminum card cage with a holding capacity for up to ten doubler units, a stainless steel composite baseplate, and a stainless steel cover that maintains weathertight integrity and provides efficient heat exchange to expel the heat generated within the units.

## Gel-filled Stub Unit

The gel-filled cable stub on the List 1, List 1B unit (Figure 1) is equivalent to an ALP FTS-PIC filled core telephone cable (refer to Table 5 on page 27 for a complete description of the cable stub). The unit is intended for aboveground applications. Standard color codes are used for pair identification with color compounds chosen for electrical balance and permanency. An inner core jacket protects the core and provides improved mechanical and electrical characteristics. The outer jacket consists of material that provides protective covering from sunlight, atmospheric temperatures, ground chemicals, and stresses expected in standard installations.

**The cable complies with the requirements of the American National Standards Institute (ANSI) and the Insulated Cable Engineers Association (ICEA) S-84-608-1994 and REA PE-89, respectively.**

The gel-filled List 1, List 1B unit is similar to the air-filled List 2 unit except that a breather vent valve on the List 1, List 1B replaces the internal pressure cutoff valve on List 2. The breather vent valve allows the circulation of outside air through the List 1, List 1B enclosure when it is not pressurized. The enclosure must breathe to prevent the buildup of excessive moisture and other damaging contaminants from occurring within the enclosure.

An optional pressure relief valve is included in the shipping kit for the List 1, List 1B unit. The kit comes in a small plastic bag that is attached to the brown/white spare pair shrink tab. Use the pressure relief valve in place of the breather vent valve to locally pressurize the List 1, List 1B unit. See page 24 for conversion details.

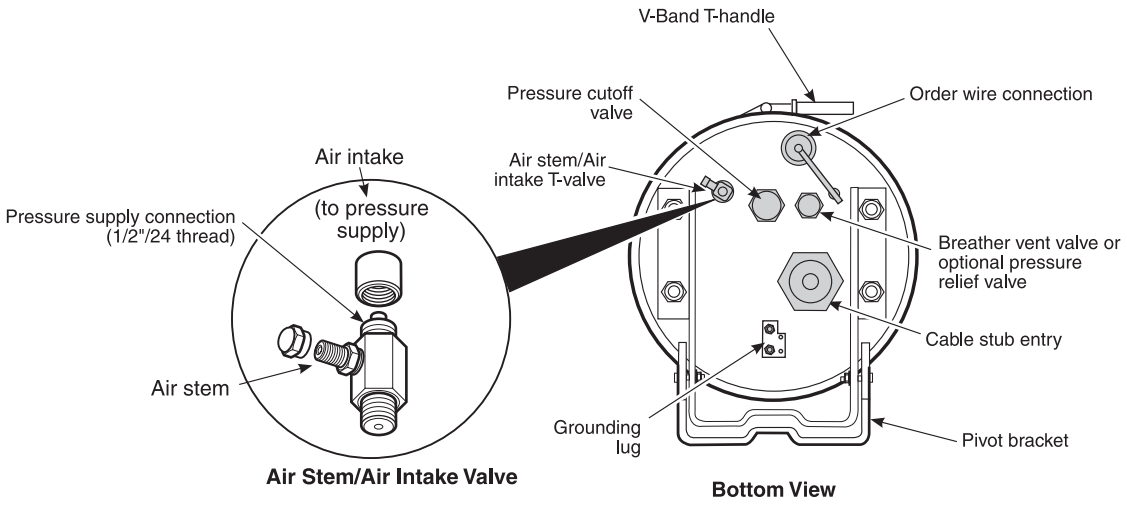



***Figure 1.*** *HRE-458 Gel-filled Remote Enclosure*

## Air-filled Stub Unit

The air-filled cable stub on the List 2 unit (Figure 2 on page 4) is equivalent to an ALP FTS-PIC air core telephone cable (refer to Table 5 on page 27 for a complete description of the cable stub). The air-filled unit is intended for buried, aerial, and duct applications. Standard color codes are used for pair identification with color compounds chosen for electrical balance and permanency. An inner jacket protects the core and provides improved mechanical and electrical characteristics. The outer jacket provides protective covering that can withstand exposure to sunlight, atmospheric temperatures, ground chemicals, and stresses expected in standard installations.

**The cable complies with the requirements of ANSI/ICEA S-85-625-1996 and REA PE-22.**

### Air-filled Stub Pressurization

The unit has an internal pressure cutoff valve, air intake stem, and pressure relief valve. The air cutoff valve is used to shut off the inlet air supply that is pumped from the main feeder cable through the 30-foot (9.144m) stub into the HRE-458 enclosure.

- To shut OFF the inlet air supply, turn the air cutoff valve clockwise one full turn.
- To turn ON the inlet air supply, turn the air cutoff valve counterclockwise one full turn.

# PRESSURIZED APPLICATIONS

For pressurized applications on the HRE-458 List 2, the Schrader air stem valve is used. A pressure gauge is attached to the valve for the purpose of measuring the internal pressure of the enclosure. This valve is also used to relieve the internal pressure prior to opening and removing the dome cover. This can be done by depressing the center pin on the valve (see Figure 2 on page 4 and Figure 3 on page 5 for air stem valve and pin locations).

**Depressurizing must be performed every time the cover is removed from either enclosure. Failure to do so may cause personal injury or damage to the equipment.**

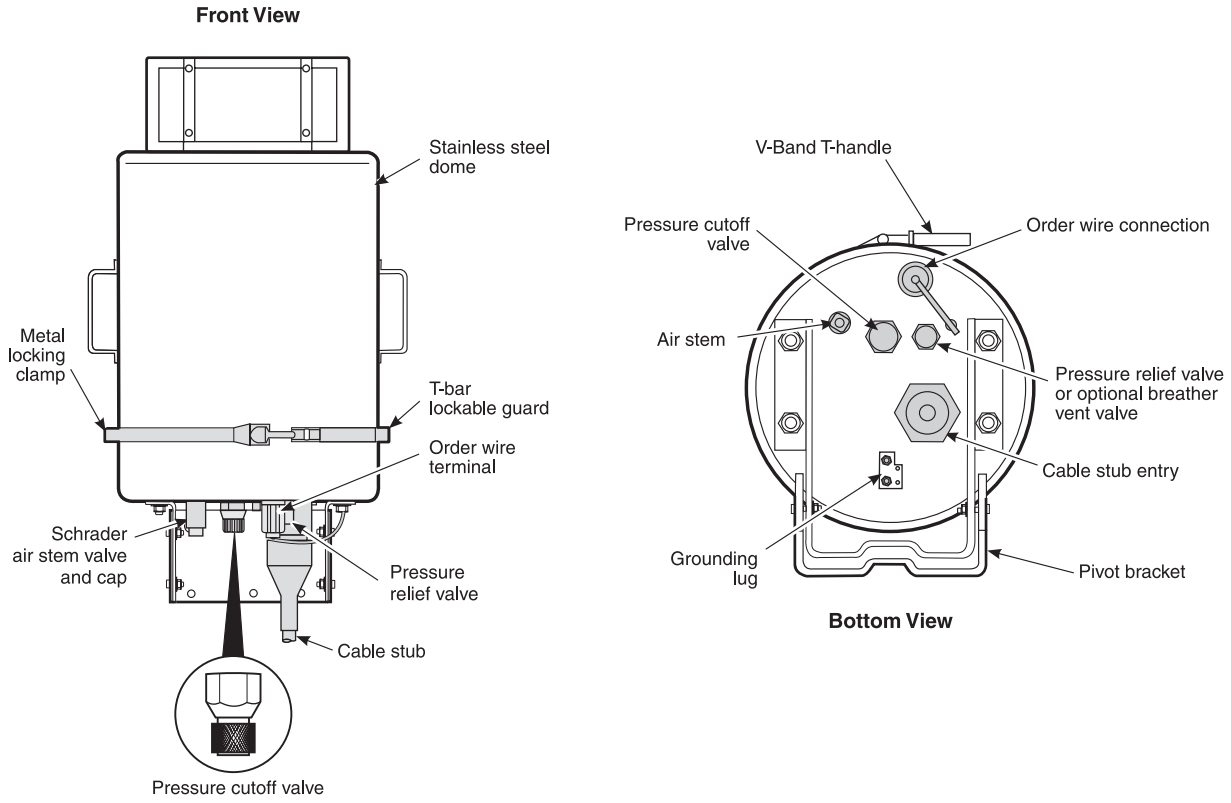
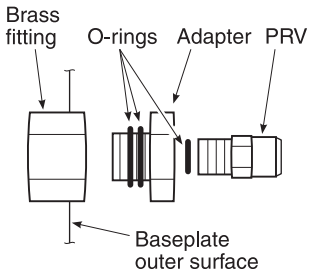


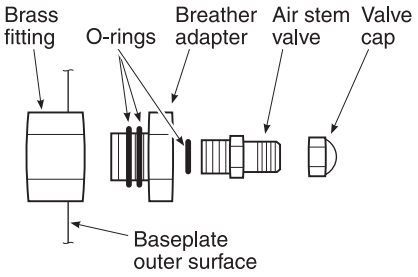

***Figure 2.*** *HRE-458 Air-filled Remote Enclosure*

An optional breather vent valve is enclosed in the List 2 shipping kit. This assembly is used to replace the pressure relief valve if the List 2 is not locally pressurized. The assembly allows the enclosure to breathe and keeps the internal atmosphere free of harmful contaminants. The five metal valves are shown in Figure 3 on page 5.

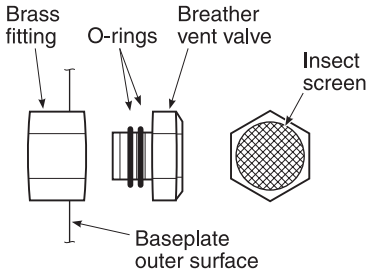
**Two O-rings are required between the brass fitting and adapter of the pressure relief valve, the brass fitting and breather vent valve, the brass fitting and breather adapter of the air stem valve, and the body housing and limiting nut of the pressure cutoff valve. Without the presence of both O-rings in each case, a proper seal cannot be achieved.**



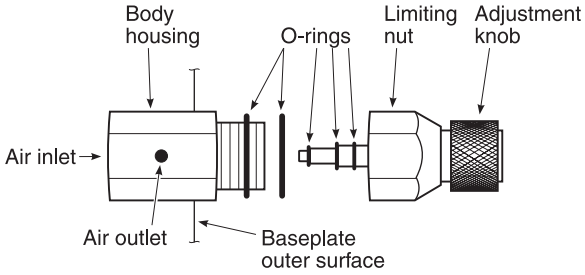

**A. Pressure Relief Valve (PRV)**



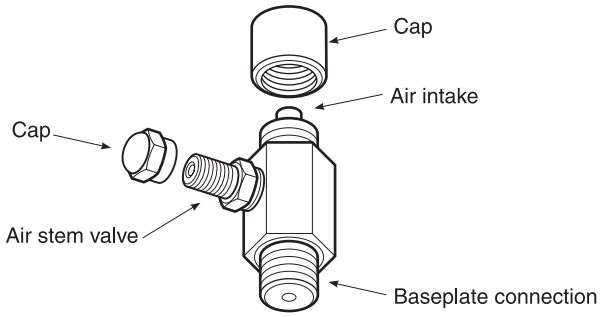

**C. Air Stem Valve (ASV)**




**B. Breather Vent Valve (BVV)**




**D. Pressure Cutoff Valve (PCV)**




**E. Air Stem/Air Intake T-valve**

***Figure 3.*** *Metal Valves*

# INSTALLATION

This section describes the setup and installation of the HRE-458.

## UNPACKING AND INSPECTING YOUR SHIPMENT

When you receive the equipment, inspect it for signs of damage. If damage has occurred, immediately report the extent of damage to the transportation company and to ADC (see "Appendix C - Product Support" on page 38 for more information).

Your shipment should consist of:

- One HRE-458
- HiGain Remote Therm-O-Nator Enclosure HRE-458 List 1, List 1B, and List 2 User Manual

Before installing the HRE-458, unpack and inspect it for missing components and physical damage that may have occurred during shipping. To unpack the enclosure:

**1** Remove the HRE-458 from its shipping carton.

**2** Perform an inventory to verify that all equipment listed on the packing list is present.

**3** Inspect the enclosure for shipping damage.

**4** Check the card cage for any sign of breakage.

**5** Check the O-ring for any sign of damage.

**6** Find and loosen the retaining screws at the rear base of the card cage.

**7** Tilt the card cage on its hinge.

**8** Lower the card cage to its level position and tighten the screws to lock it in position. ADC recommends always keeping the card cage in a level, locked position.

**9** Report any damage to the carrier immediately.

**If you must store the equipment for a prolonged period of time, store it in the container shipped with your equipment.**

# MOUNTING

The HRE-458 may be mounted on a pole, pedestal, flat surface, or in a rack. The mounting details for the various methods are as follows:

***Table 1.*** *Mounting Details*



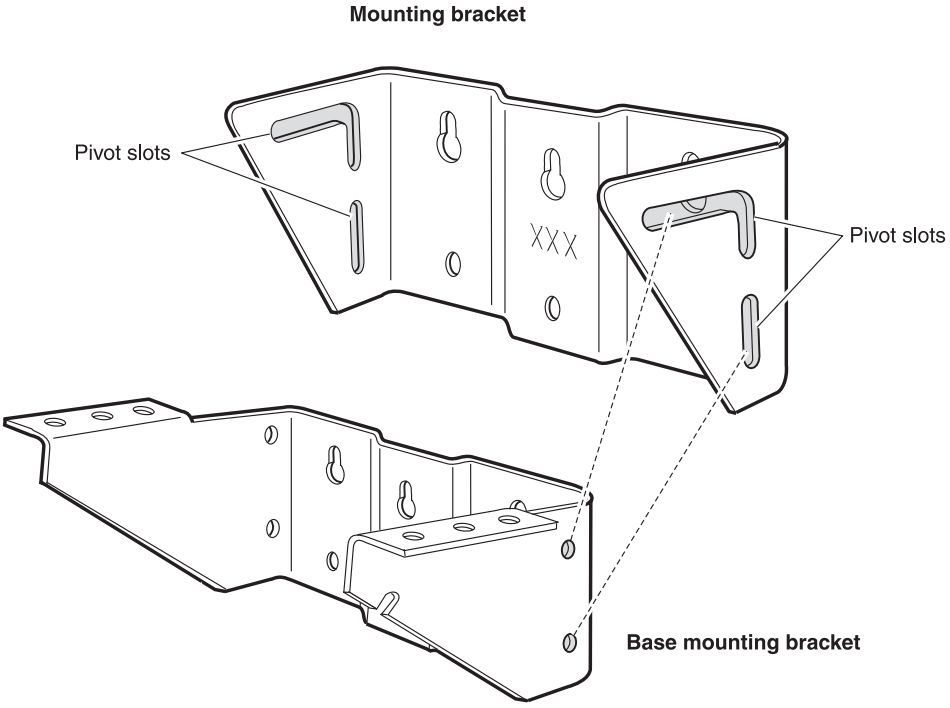



***Figure 4.*** *HRE-458 Pivot-Mounting Bracket*

## Small Pole or Pedestal Mounting

Use the procedure below to mount the enclosure on a pole or pedestal where the pole is less than seven (7) inches (17.78 cm) in diameter. Have the following equipment ready before you begin this procedure:

- Two $^{3}/_{8}$-inch (0.952 cm) lug bolts, 4 inches (10.16 cm) long (minimum)
- Two $^{3}/_{8}$-inch (0.952 cm) washers
- One wrench
- One pencil
- One drill with a $^{1}/_{4}$-inch (0.635 cm) bit

**Because of the weight and size of the enclosure, you may want to remove the dome before mounting the enclosure. The enclosure must be mounted vertically. A shady location is also preferred to minimize thermal stress. Refer to Table 4 on page 26 for thermal load capacity information.**

**While mounting the enclosure, hold the enclosure securely to prevent personal injury or damage to the enclosure.**

**1** Select a convenient mounting location on the pole or pedestal.

**2** Remove the enclosure base mounting bracket from the pivot mounting bracket by removing the four bolts that connect each sideplate (see Figure 4 on page 7).

**3** Position the pivot mounting bracket against the pole or pedestal (stub down) and mark the locations of the center mounting lug bolt holes. Use the two middle mounting holes for this application.

**4** Place the pivot mounting bracket aside.

**5** Drill two $^{1}/_{4}$-inch (0.635 cm) diameter holes 3-inches (7.62 cm) deep at the locations marked in Step 3.

**6** Start a lug bolt in the top center mounting hole and screw the bolt into the pole or pedestal approximately two-thirds of an inch of its length.

**7** Insert a lug bolt into the center bottom hole of the pivot mounting bracket and screw the bolt into the mounting hole.

**8** Secure the mounting bracket to the pole or pedestal by tightening the lug bolts.

**9** Reattach the enclosure to the pivot mounting bracket through the base mounting bracket and torque the mounting bracket bolts between 30 and 40 inch-pounds.

**10** If the cable stub connects to an underground cable, dress the cable down the pole or pedestal to the splice case. If the cable stub connects to an aerial cable, form a drip loop in the cable and dress it up the pole or pedestal to the splice case.

## Large Pole or Pedestal Mounting

Use the procedure below to mount the enclosure on a pole with a diameter greater than seven(7) inches (17.78 cm). Have the following equipment ready before you begin this procedure:

- Four $^{3}/_{8}$-inch (0.952 cm) lug bolts, 4 inches (10.16 cm) long (minimum)
- Four $^{3}/_{8}$-inch (0.952 cm) washers
- One wrench

- One pencil
- One drill with a $^1/_4$-inch (0.635 cm) bit

**While mounting the enclosure, hold the enclosure securely to prevent personal injury or damage to the enclosure.**

1. Select a convenient mounting location on the pole.
2. Remove the enclosure base mounting bracket from the pivot mounting bracket by removing the four bolts that connect each sideplate (see Figure 4 on page 7).
3. Position the pivot mounting bracket against the pole (stub down) and mark the locations of the outer mounting lug holes. Use the four corner mounting holes for this application.
4. Place the pivot mounting bracket aside.
5. Drill four holes $^1/_4$- inch (0.635 cm) in diameter by 3-inches (7.62 cm) deep at the locations marked in Step 3.
6. Start a lug bolt in each of the two top matched bolt mounting slots and screw them into the pole approximately two-thirds of an inch of the bolt length.
7. Insert the lug bolts into the two holes on the outside bottom of the pivot mounting bracket. Begin tightening the bolts.
8. Secure the pivot bracket to the pole by tightening all lug bolts.
9. Reattach the enclosure to the pivot mounting brackets through the base mounting with the four sideplate bolts. Torque the mounting bracket bolts between 30 and 40 inch-pounds.
10. If the cable stub connects to an underground cable, dress the cable down the pole to the splice case. If the cable stub connects to an aerial cable, form a drip loop in the cable and dress it up the pole to the splice case.

## Flat Surface Mounting

Use the procedure below to mount the enclosure on a flat surface or in a manhole. Leave enough room above the enclosure for removing the cover. Allow at least 3 inches (7.62 cm) of clearance above the dome if the 31° tilt feature is used. Allow at least 10 inches (25.4 cm) of clearance if the tilt feature is not used. Have the following equipment ready before you begin this procedure:

- Four $^3/_8$-inch (0.952 cm), 16 NC anchor bolts, 2-$^1/_2$ inches (6.35 cm) long for wall mounting
- Four $^3/_8$-inch (0.952 cm) washers
- One wrench
- One pencil
- One drill with a $^1/_4$-inch (0.635 cm) bit

**While mounting the enclosure, hold the enclosure securely to prevent personal injury or damage to the enclosure.**

1. Select a convenient mounting location on a wall.
2. Remove the enclosure base mounting bracket from the pivot mounting bracket by removing the four bolts that connect each sideplate (see Figure 4 on page 7).

3 Position the pivot mounting bracket against the wall and mark the location of the four outside mounting holes. Place the mounting bracket aside.

4 Drill four holes $^{1}/_{4}$-inch (0.635 cm) in diameter by 2-$^{1}/_{2}$ inches (6.35 cm) deep at the locations marked in Step 3.

5 Start an anchor bolt in each of the two, top-matched, bolt-mounting slots and screw into the wall approximately $^{2}/_{3}$-inch of the bolt length.

6 Insert the anchor bolts into the two bottom holes located on the outside of the pivot mounting bracket and begin tightening the bolts into the two bottom holes of the pivot mounting bracket.

7 Secure the pivot mounting bracket to the wall by tightening all anchor bolts.

8 Reattach the pivot mounting bracket to the enclosure base mounting brackets with the four sideplate bolts and torque the mounting bracket bolts between 30 and 40 inch-pounds.

9 If the cable stub connects to an underground cable, dress the cable down the wall to the splice case. If the cable stub connects to an aerial cable, form a drip loop in the cable and dress it up the wall to the splice case.

## Rack Mounting

Use the procedure below when mounting the enclosure in a rack. Have the following equipment ready before you begin this procedure:

- Four $^{3}/_{8}$-inch thru-bolts for rack mounting
- Four $^{3}/_{8}$-inch nonmetallic washers. Nonmetallic washers are required to avoid a ground loop that may result if both the rack and the enclosure are grounded. ADC does not recommend using the rack ground for the enclosure ground since the integrity of the rack ground is not 100 percent reliable.
- One wrench

**Because of the weight and size of the enclosure, you may want to remove the dome before mounting the enclosure. The enclosure must be mounted vertically. A shady location is also preferred to minimize thermal stress. Refer to Table 4 on page 26 for thermal load capacity information.**

**While mounting the enclosure, hold the enclosure securely to prevent personal injury or damage to the enclosure.**

1 Select a convenient location on the cable rack.

2 Position the enclosure so the outside slots and holes in the mounting bracket align with the mounting holes in the cable rack.

3 Slide the thru-bolts with nonmetallic washers through the outside slots and holes of the mounting bracket. Begin tightening the bolts into the mounting holes.

4 Secure the enclosure to the rack by tightening the thru-bolts.

**The desiccant bags shipped with the units must be activated prior to closing the lid. Do this by removing the bags from their plastic container and placing them inside the enclosure.**

# GROUNDING

The HRE-458 requires a resistance of 25 Ω or less to ground as measured with a megger-type Ohmmeter.

Have the following equipment ready before you begin the procedure:

- One bullet bond
- One ground rod for pole mounted enclosures (may require more than one rod)
- One megger-type Ohmmeter
- 6 American Wire Gauge (AWG) cable

The 8 MIL aluminum shield around the cable stub is connected to the enclosure's ground by attaching it to the card cage mounting bracket with a braided shield ground wire as shown in Figure 9 on page 22. The purpose of the ground wire is to connect the stub aluminum shield to the enclosure ground lug when the stub's shield is not bonded to the shield of the main feeder cable. The wire may need to be temporarily removed from the enclosure ground lug when troubleshooting ground faults. This is accomplished by removing the screw that secures the braided ground strap to the mounting bracket on the card cage.

**The ground wire should be reconnected to the card cage bracket after completing the ground fault test. This insures that the stub's shield is properly grounded which is required to reduce the effects of shield corrosion and lightning damage.**

**The screen divider on the stub is an insulated floating divider separating the pairs. DO NOT GROUND THIS SCREEN DIVIDER. Doing so could result in degraded performance.**

## Grounding a Pole Mounted Enclosure

Use the following procedure to ground a pole or pedestal-mounted enclosure (see Figure 5).

**1** Bond the main cable shield through the splice case using bullet bond.

**2** Drive the ground rod into the ground near the enclosure location.

**Make sure you ground the HRE-458 before splicing the cable stub into the main cable. This grounding method (or an accepted local grounding method) must be in effect at all times to safeguard personnel.**

**If the HRE-458 is improperly grounded, the Lightning Protection Unit (LPU) surge arrestors will not work and the enclosure will be unprotected.**

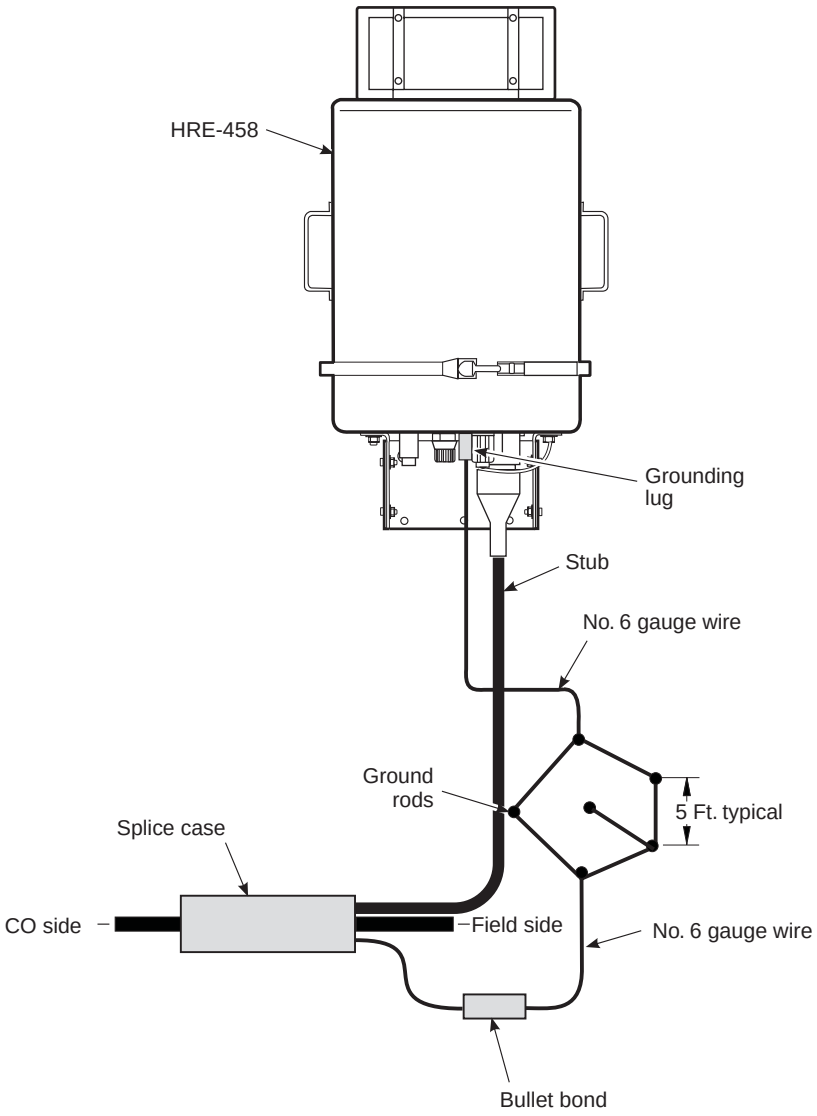



***Figure 5.*** *Grounding for Pole-Mounted Unit*

**3** Use a megger-type Ohmmeter to measure the resistance between enclosure ground and the ground rod. The resistance must be 25 Ω or less.

**4** If the resistance requirement is met, proceed to Step 5. If the resistance requirement is not met, follow local practice to lower the resistance to ground to comply with the requirement before proceeding to Step 5.

**5** Use 6 AWG cable to connect the grounding lug on the enclosure to the ground rod. Torque the grounding lug between 18 and 22 inch-pounds.

**6** Use 6 AWG cable to connect the main cable shield to the ground rod.

**ADC does not recommend connecting the main cable shield to the enclosure stub cable shield because the stub shield is internally grounded to the enclosure ground lug. Connecting the two shields creates a ground loop which could induce noise into the signal pairs. However, if you choose to connect the main cable shield to the stub's shield, and service affecting noise is caused by the ensuing ground loops, disconnect the braid that connects the stub's shield to the enclosure's ground plane.**

7 If commercial power ground exists, bond telephone ground to power ground as a safety measure.

8 Use a megger-type Ohmmeter to measure the main cable shield resistance to ground rods. The resistance must be 5 Ω or less.

9 If the Ohm requirement in Step 8 is not met, ground the main cable shield every 2,000 feet.

## Grounding a Flat Surface Mounted Enclosure

To ground a flat, surface mounted enclosure (see Figure 6 on page 14):

1 Bond the main cable shield through the splice case using bullet bond.

2 Use a megger-type Ohmmeter to measure the resistance between enclosure ground and the ground connection point in the manhole. The resistance must be 25 Ω or less.

**Make sure you ground the HRE-458 before splicing the cable stub into the main cable. This grounding method (or an accepted local grounding method) must be in effect at all times to safeguard personnel.**

**If the HRE-458 is improperly grounded, the LPU surge arrestors will not work, and the enclosure will be unprotected.**

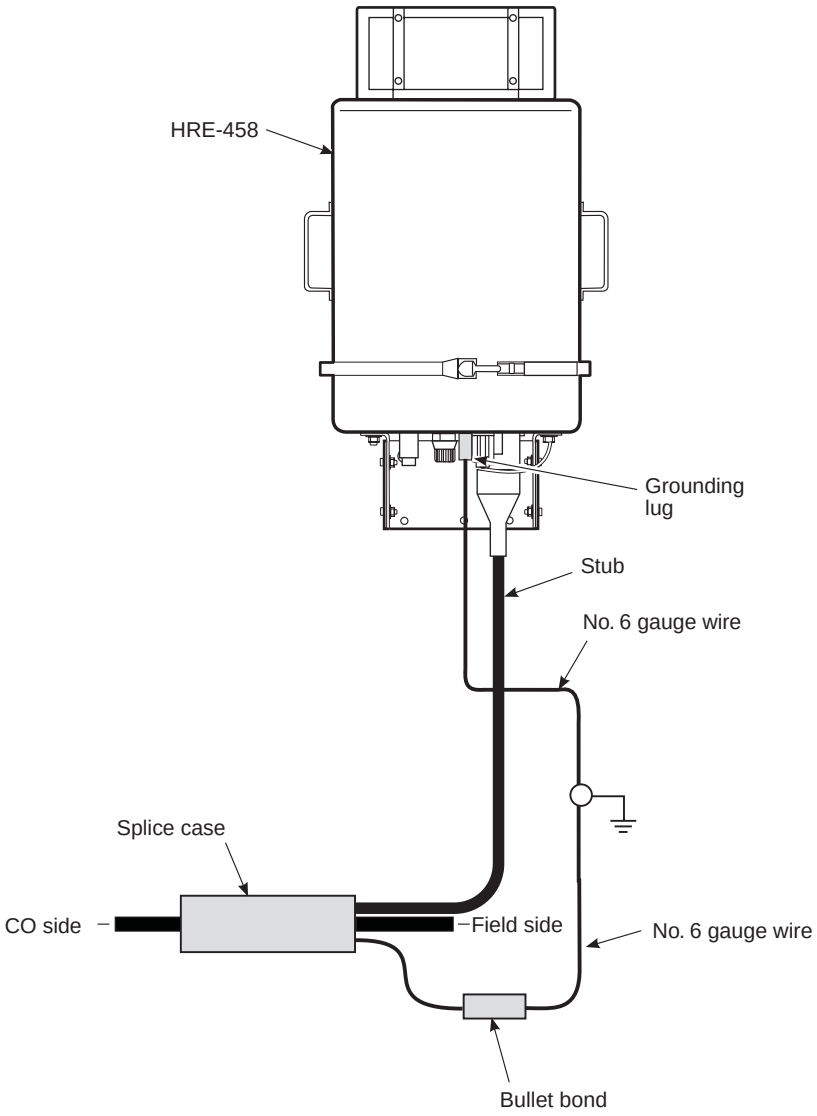



***Figure 6.*** *Grounding for Flat Surface-Mounted Unit*

If the Ohm requirement in Step 2 is met, proceed to Step 3. Otherwise, follow local practices to lower the resistance to ground to comply with the requirement in Step 2 before proceeding to Step 3.

**3** Use 6 AWG cable to connect the ground lug on the HRE-458 to the ground connection in the manhole. Torque the grounding lug between 18 and 22 inch-pounds.

**4** Use a 6 AWG cable to connect the main cable shield to the ground connection in the manhole.

**5** Use a megger-type Ohmmeter to measure the main cable shield resistance to manhole ground. The resistance must be 5 Ω or less.

**6** If the Ohm requirement in Step 5 is not met, ground the main cable shield every 2,000 feet.

## SLOT CHASSIS GROUND CONNECTIONS

Each of the ten slots in the enclosure has both pins 1 and 10 connected to chassis ground. This allows them to support DDS, Dual 239 T1, or Single T1 mechanics plugs which using either pins 1 or 10 for their chassis ground connection.

## DOUBLER AND REPEATER INSTALLATION

To install the units:

**1** Slide the unit into the slot enclosure guides for the desired slot, then push the unit into the enclosure until it is seated in the slot connector.

**2** Push the unit into the card-edge connector until it is entirely within the enclosure guides. The unit should snap into place indicating that it is properly seated.

**3** Reposition the retention bar over the units and tighten the wingnuts on both sides of the bar.

Table 2 lists the slot pin assignments for the doubler and repeater units supported by the HRE-458.

***Table 2.*** *Slot Pin Assignments*

| Signal | Side | Direction | Connector Pin |
|---|---|---|---|
| Tip | 1 | In | 6 |
| Ring | 1 | In | 5 |
| Tip | 2 | In | 12 |
| Ring | 2 | In | 11 |
| Tip | 1 | Out | 4 |
| Ring | 1 | Out | 3 |
| Tip | 2 | Out | 9 |
| Ring | 2 | Out | 8 |
| Ground | -- | -- | 1, 10 |

# DETACHING THE DOME FROM THE BASEPLATE

To detach the dome from the enclosure baseplate (Figure 7):

**1** Release the internal pressure.

**2** Unclamp the dome from the baseplate.

**3** Lift the dome up and away from the baseplate.

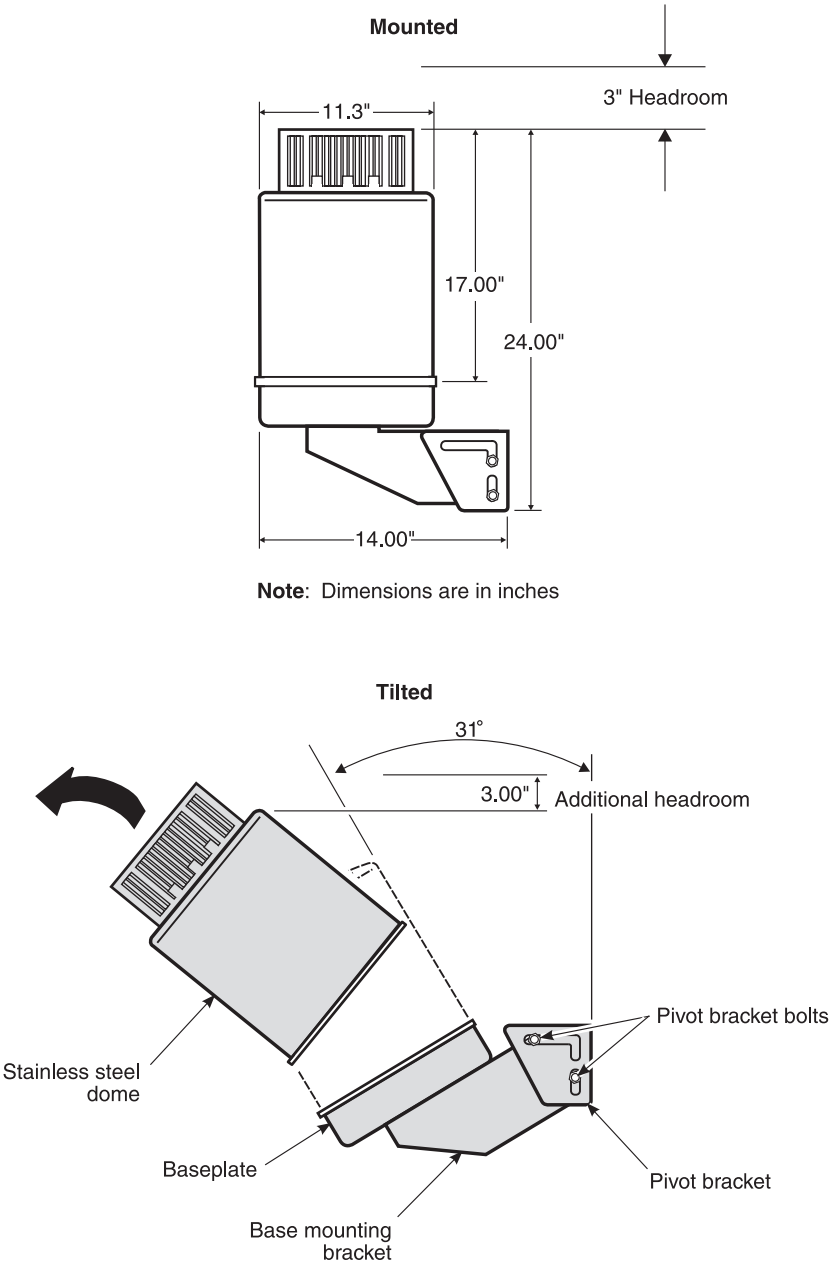



***Figure 7.*** *HRE-458 Enclosure*

# OPENING THE HRE-458 ENCLOSURE

**When handling any enclosures, always assume they are pressurized. Failure to relieve the pressure before removing the cover could result in serious personal injury.**

To open the HRE-458, perform the following steps:

1. To open a gel-filled List 1, List 1B enclosure which **is not** being pressurized, go to Step 7. To open a gel-filled List 1, List 1B enclosure which **is** being pressurized, go to Step 3.
2. To open an air-filled List 2 enclosure, go to Step 5. Steps 3 and 4 relate to the pressurized List 1, List 1B enclosure.
3. Turn off the external pressure supply, if possible. Locate the pressure cutoff valve as shown in Figure 1 on page 2. If the external pressure supply is off, verify that the pressure cutoff valve is in the open position (rotated counterclockwise) which is the normal position when operating a gel-filled enclosure in a pressurized application. If you are **able** to turn the external pressure supply off, go to Step 6. If you are **unable** to turn the external pressure supply off, close the pressure cutoff valve by rotating clockwise one (1) full turn, blocking the pressure from the external source. Go to step 4.
4. Unlock the enclosure. Gently push the dome cover back and forth while loosening the cover clamp until the seal is broken and the pressure is released. The seal should break well before the cover clamp is loosened enough to allow the cover to separate from the enclosure. Go to step 9.
5. Locate the pressure cutoff valve as shown in Figure 1 on page 2. Close the pressure cutoff valve by rotating clockwise one (1) full turn, blocking the pressure from the main cable.
6. Depress the center pin of the air stem to release the remaining pressure within the enclosure.
7. Unlock the enclosure.
8. Loosen cover clamp and twist the stainless steel dome slightly to break seal.
9. Remove the cover clamp.
10. Remove the stainless steel dome from the enclosure.

**Exercise care when removing and handling the stainless steel dome. A damaged stainless steel dome may not seal properly when replaced.**

# CLOSING THE HRE-458 ENCLOSURE

1. Inspect the enclosure cover for dirt, moisture, or mechanical damage especially around the flange which mates with the baseplate and O-ring. Remove any accumulation of dirt or moisture from the cover. Replace any damaged components.
2. Inspect the baseplate for dirt, moisture, or mechanical damage especially around the baseplate flange. Remove any accumulation of dirt or moisture from baseplate.
3. Remove the desiccant pack from the plastic storage bag and place it in the enclosure.
4. Fasten the slot retainer bracket in place.
5. Slide the stainless steel dome over the card cage and position it on the O-ring and baseplate.
6. Lubricate the threads of the cover clamp T-bolt with antiseize compound.

**7** Position the cover clamp around the base of the cover and the baseplate flange. Handtighten the T-bolt securely, then torque the T-bolt between 10 and 15 inch-pounds.

**a** If you are pressurizing the enclosure from a portable pressure bottle, continue from Step 8.

**b** If you are pressurizing the enclosure from the main cable, continue from Step 10.

**c** If the enclosure is mounted aboveground and you are not pressurizing the enclosure, continue from Step 12.

**8** For the List 2 air core stub, block the cable stub in the splice case by placing an air dam in the stub according to local practice to prevent pressure leakage back into the main cable. For pressurized List 1, List 1B and List 2 units, make sure that the air cutoff valve is off (fully clockwise).

**9** Use a portable pressure bottle and standard tire air chuck at the external Schrader air stem valve to pressurize the enclosure to a maximum of 12 PSI (there is no minimum requirement as long as a slight positive pressure is applied). Replace the air stem cap. Continue from Step 11.

**10** For List 2 units, open the air inlet tube by turning the air valve one full turn counterclockwise. Allow the enclosure to pressurize from the main cable through the enclosure's stub.

**11** Check the O-ring and enclosure for leaks by painting the enclosure with a pressure-testing solution, such as soap and water. If you detect a leak, tighten the T-bolt and tap lightly around the cover clamp. Repeat as necessary until the cover is sealed.

**12** Secure the HRE-458 with a padlock. (This step is not required for manhole-mounted enclosures; however, a locking assembly is provided if needed.)

**The desiccant bags shipped with the units must be activated prior to closing the lid. Do this by removing the bags from their plastic container and placing them inside the enclosure.**

## PIVOTING THE ENCLOSURE

To pivot the enclosure out from its vertical position:

**1** Loosen the four bolts that connect the pivot bracket to the enclosure baseplate.

**2** Lift the housing up slightly and pull it out until the top bolts rest against the end of the two pivot bracket slots.

# APPENDIX A - SPECIFICATIONS

**Environment**

| | |
|---|---|
| Operating Temperature | -40 °F to +150 °F (-40 °C to +65 °C) |
| Operating Humidity | 5 to 95% (non-condensing) |
| Altitude | 14,000 ft. (4,300 m) |
| Mounting | Dual or Single 239 T1 or DDS/ISDN Repeater Mechanics |

**Dimensions**

| | |
|---|---|
| Height | 24 in. (61 cm) |
| Diameter | 11.3 in. (28.9 cm) |
| Depth | 14 in. (35.7 cm) |
| Volume | 0.75 $ft^3$ (.021 $m^3$) |

**Weight:** :

| | |
|---|---|
| HRE-458 List 1 (gel-filled) | 53 lb. (24 kg)[(a)] |
| HRE-458 List 1B (gel-filled) | 53 lb. (24 kg)[(b)] |
| HRE-458 List 2 (air-filled) | 50.6 lb. (23 kg) [(b)] |

**Stub Diameters**

| | |
|---|---|
| Gel-filled | 1 in. (25.4 mm) maximum |
| Air-filled | 0.8 in (20 mm) maximum |

(a) Shipping weight, including stubs and packaging.

(b) Shipping weight, including stubs and packaging.

# APPENDIX B - TECHNICAL REFERENCE

Appendix B contains additional technical information about the HRE-458 List 1, List 1B, and List 2.

## CLEI CODE AND P1 LABELS

Figure 8 shows the location of the bar code and P1 labels on the HRE-458 List 1, List 1B, and List 2 units. Table 3 gives a brief description of what the labels represent.

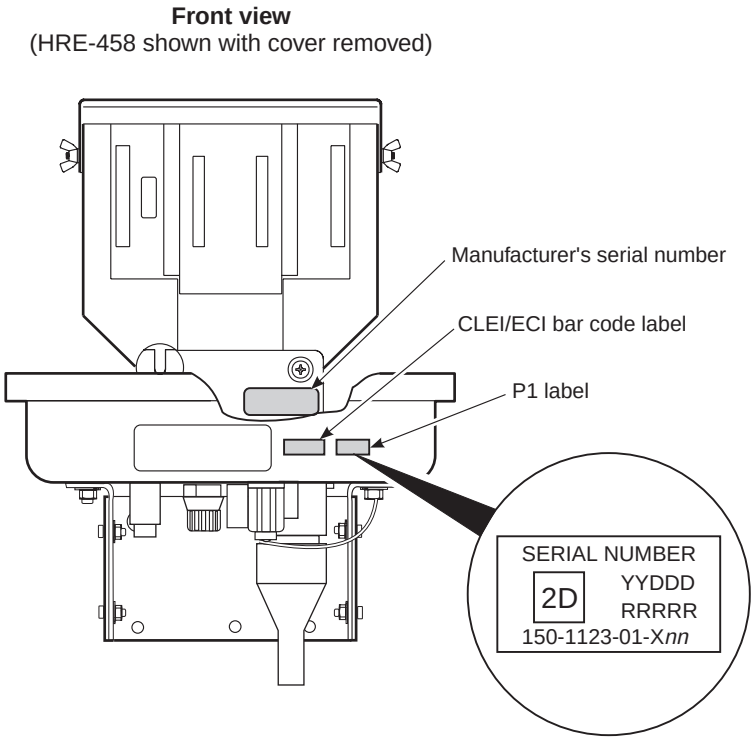



***Figure 8.*** *HRE-458 Bar Code and P1 Label Locations*

***Table 3.*** *Bar Code and P1 Label Information*

| Name | Description |
|---|---|
| CLEI/ECI Bar Code Label | Contains human-readable Common Language Equipment Identifier (CLEI) code number and Equipment Catalog Item (ECI) bar code number. |
| P1 Label Date Code | YY = Last two digits of shipment year.<br>DDD = Julian day. |
| P1 CFG | X*nn* = Configuration. |

# HRE-458 ENCLOSURE INFORMATION

Both the List 1, List 1B, and List 2 units have access to an order wire pair shown in Figure 1 on page 2 (List 1, List 1B) and Figure 2 on page 4 (List 2). The enclosure mounting plate (see Figure 7 on page 16) allows the unit to be tilted 31° from its vertical position. This reduces the headroom, required in manhole installations, from 10 inches to 3 inches and the amount of valuable air space, required for such underground applications.

## Stainless-steel Therm-O-Nator Dome

A stainless steel dome cover fits over the card cage and protects the enclosure from heat and other harmful environmental effects. The dome seals the inner assembly, when clamped to the baseplate, providing a seamless, corrosion-resistant, easily-removed protective cover. The stainless steel cover V-retainer, which is equipped with a T-bolt, is used to tighten the dome firmly against the O-ring on the baseplate. The purpose of the O-ring is to create a pressure-tight seal between the dome and the baseplate. There is also a locking cover over the T-handle which prevents unauthorized access to the enclosure. This cover accepts a padlock with a maximum shackle diameter of 0.3-inch (0.76 cm). The V-retainer T-bolt should be torqued between 10 and 15 inch-pounds for proper sealing.

A special heat exchange assembly is attached to the top lid of the dome. The assembly allows internal heat produced by the units to quickly expel into the outside atmosphere before overheating occurs. This heat reduction also allows the enclosure doubler capacity to increase.

## Card Cage

The card cage inside the enclosure (shown in Figure 9 on page 22) has ten mounting positions to hold up to ten doubler units. The cage also has a retainer bar which serves two purposes:

- The circuit ID of each slot can be written on the label attached to each retainer bar.
- The retainer bar prevents the doubler units from disconnecting when the enclosure is subjected to severe vibrations.

You can access the doubler units by loosening the side wingnuts and rotating the retainer bar. The enclosure has a mechanism that enables the card cage to tilt up approximately 45° to allow for easy access to the rear of the card cage in case LPU board service is needed. Two knobbed retainer screws at the base of the card cage (one on each side) lock the card cage in its normal level position and prevent it from tilting during severe vibrations. The cable stub’s shield is grounded to the card cage base through a short braided wire. This braided wire should be disconnected if the enclosure stub’s shield is bonded to the shield of the main feeder cable. This will break the ground loop, created by connecting the two cable shields, and prevent circulating ground currents from possibly causing service affecting noise.

The card cage is grounded through a ribbon ground connected between the base of the card cage and its side.

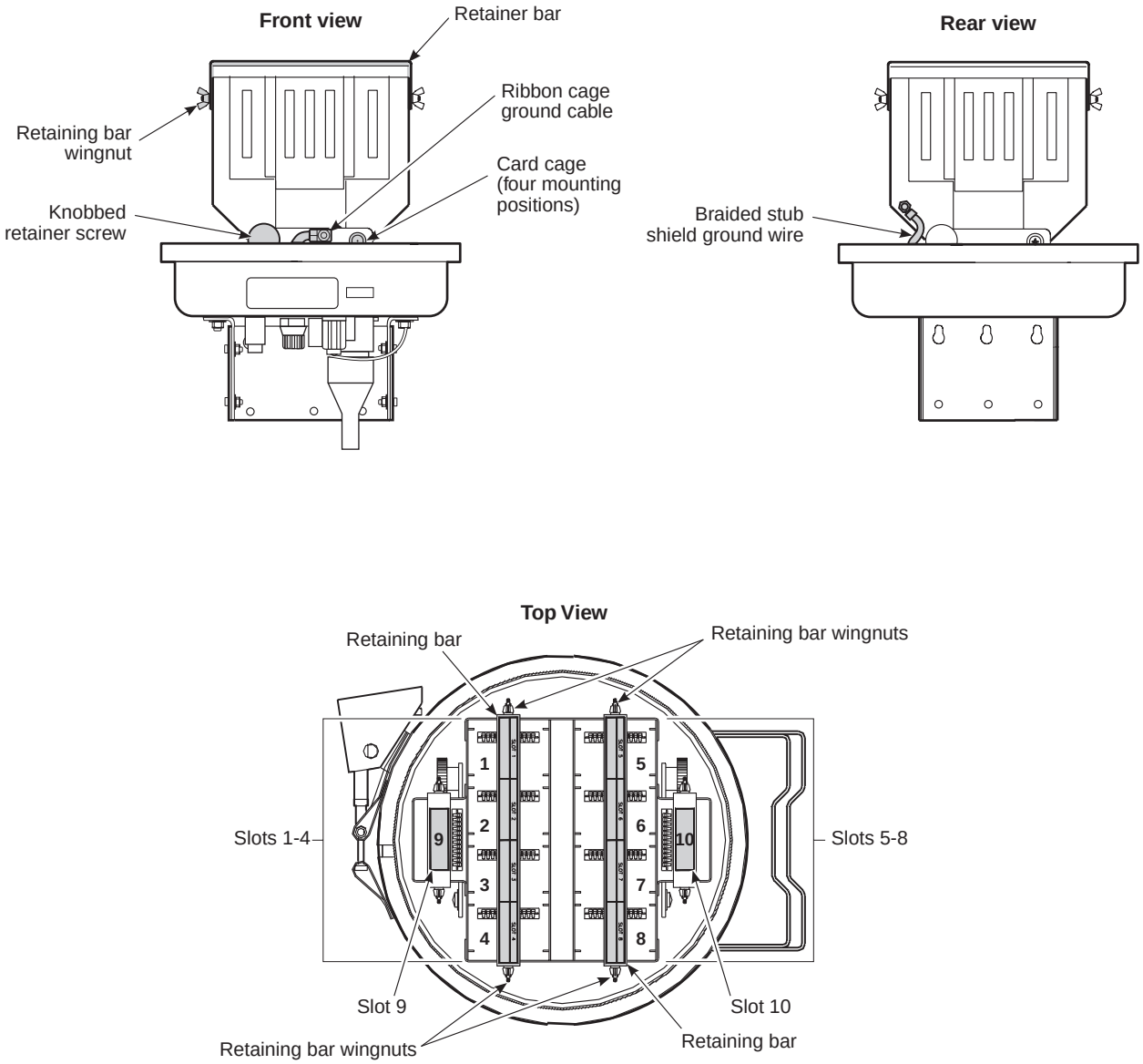



***Figure 9.*** *HRE-458 with Cover Removed*

## Lightning Protection Unit (LPU)

The LPU, shown in Figure 10 on page 23, is a printed circuit board assembly that attaches to the card-edge connector of each slot. The LPU is used primarily for protecting the HDSL loops from lightning activity. All HRE-458 units come equipped with ten LPUs.

Each LPU contains four gas tubes which provide surge protection to each of the slots' four ports. The tubes have three leads which provide protection from Tip and Ring to ground. The ground pin is connected to pin 1 of each slot. The gas tube parameters are equivalent to a TII 47 BT. The dc breakdown ranges from 300 to 500 volts. The tube can withstand at least 400, 10/1000, and 500 amp discharges. Although the individual gas tubes are field-replaceable components, ADC recommends replacing the entire LPU when any of its protector tubes are suspected of functioning improperly. (See "Appendix A - Specifications" on page 19 for details on replacing an LPU.

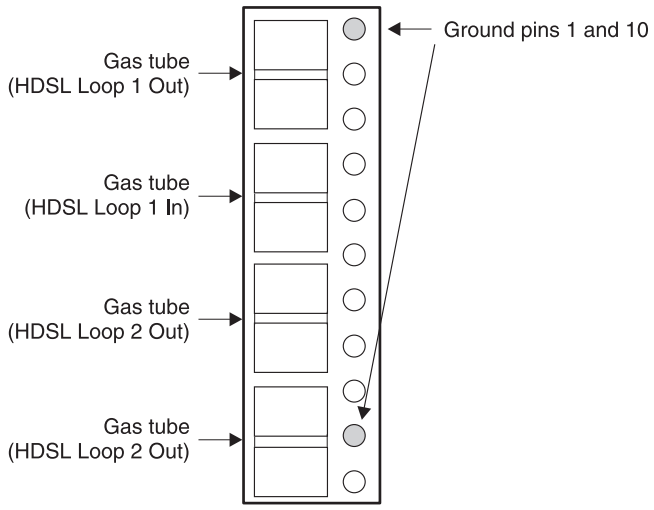



***Figure 10.*** *Lightning Protection Unit (LPU)*

## Cable Stub and Pressurization

Every HRE-458 comes equipped with a single 30-foot (9.144 m), screened, cable stub (refer to Table 5 on page 27 for a complete description of the cable stub). The stub is available as List 1, List 1B (gel-filled) or List 2 (air-filled).

The stub is secured to the enclosure baseplate by a cable strain relief adapter. The cable pair is splayed out and encapsulated in the polyurethane that is poured into the enclosure base. This provides an airtight seal at the cable entry point.

The List 2 cable-pressurized enclosure has an air inlet tube that accompanies the air-filled stub. The air inlet tube connects the inside of the enclosure to the main feeder cable. This tube enables dry air or dry nitrogen to flow from the main cable into the cable stub through the air cutoff valve and into the enclosure. The air cutoff valve (Figure 2 on page 4) controls the flow through the air inlet tube as described in the "Functional Description" section beginning on page 2.

**The HRE-458 enclosures have been safety tested to 36 PSI. This amount of pressure can severely damage most cables and cable stubs. Pressure above 60 PSI is dangerous because the v-band is forced away from the flange and the dome could be impelled away from the housing causing damage and injury.**

**The common pressure supplied through the air core cable is about 9 PSI. This is sufficient pressure to prevent any water from entering the housing. ADC recommends pressurizing the enclosure to a maximum of 12 PSI.**

The pressure relief valve is not intended to control the pressure that is supplied to the enclosure. The external network pressure control system, usually located at the front end of the main feeder cable in the servicing CO, performs this function. Instead, the pressure relief valve should be used as a safety device for limiting the maximum internal pressure in the enclosure.

**The pressure release valve is set to release at a maximum pressure of 15 PSI. Due to manufacturing tolerances of the springs, this maximum 15 PSI pressure has a tolerance of ±3 PSI. This pressure and tolerance are well within any safety concerns that might apply to the housing, personnel, or cable.**

## Vented-to-Pressurized Conversion Procedure

The following instructions are for converting the HRE-458 List 1, List 1B gel-filled vented enclosure to an external pressurized enclosure.

The List 1, List 1B enclosure can be converted to a pressurized housing that uses a continuous, local pressure source. The conversion requires replacing the breather vent valve with an optional external pressure relief valve. The breather vent valve, located in the base pan, allows the internal pressure to equalize with the outside pressure. The optional external pressure relief valve is included in the shipping kit. List 1, List 1B comes with a gel-filled cable which precludes pressurizing through the cable stub.

**Static pressurization requires monitoring and maintenance as the pressure decreases over time.**

Use the following instructions along with Figure 1 on page 2 to convert the List 1, List 1B enclosure from a vented housing to a pressurized housing:

**1** Locate the breather vent valve on the bottom of the housing.

**2** Remove the valve by unscrewing it counterclockwise.

**3** Look inside the valve to confirm that the vent has been removed. The vent contains an internal screen mesh. Refer to Figure 3 on page 5 for further details.

**4** Save the vent or store it inside the housing for future conversions.

**5** Check the threaded hole for debris and clean it if necessary.

**6** Remove the external pressure relief valve from the plastic bag. Verify that an O-ring is installed on the threaded end of the valve and on the brass fitting in the base of the enclosure for a total of two O-rings.

**7** Carefully place the threaded end of the air pressure relief valve into the threaded hole on the bottom of the housing.

**8** Hold the valve straight and push it into the hole. Begin to turn it clockwise to screw it in place.

**If there are any signs of resistance while screwing the valve into place, you could be crossthreading the part. Remove the valve and restart.**

**9** Turn the valve until it is handtight with compression against the gasket material.

The housing is now ready to be pressurized either through the Schrader air stem valve which accepts a standard tire valve chuck or through the external air inlet stem using a feeder tube with a $^{1}/_{2}$"/24 thread connection, as shown in Figure 2 on page 4. A two-unit desiccant bag is also included in the List 1, List 1B shipping kit along with the pressure relief valve. Remove the desiccant bag and place it in the HRE-458 prior to pressurization.

**1** Attach a plastic tube, $^{1}/_{4}$-inch (.64 cm) inner diameter (ID) by $^{3}/_{8}$-inch(.83 cm) outer diameter (OD), from the external air source to the $^{1}/_{4}$-inch (.64 cm) air intake protrusion of the T-valve. (The plastic tube is not included.)

**2** Secure the tube to the valve with the hex bolt and ferrule.

**The tube, hex bolt, and ferrule fitting assembly is also called an Express Air Connection Fitting. These parts are not supplied by ADC.**

## Spare Connections

The HRE-458 stub has 11 spare pairs and one order wire pair. Each stub group has two spare pairs. The other three spare pairs and order wire pairs are located in the Inner Statial (IS) group. All of these spare pairs are located in the IS group and are folded back for easy access if needed.

## Order Wire Connections

The access port for the external order wire pair is connected to its surge protector by the black and white jumper wire. The black and white order wire pairs also terminate on this protector. This permits access to the order wire without opening the enclosure. Simply unscrew the order wire protective cap (see Figure 2 on page 4) to expose the order wire terminals.

## General Deployment Rules

The HRE-458 is an airtight enclosure. The environment surrounding the enclosure traps the heat generated by the installed units and, in effect, causes a significant rise in temperature within the enclosure. The number of doublers or repeaters that can be reliably housed in the HRE-458 is a function of each plug type, doubler version, and solar exposure (see Table 4 on page 26 for a list of the HRE-458 deployment rules).

- Even when the deployment rules are followed, the metal surfaces of the installed units can feel hot to the touch when removed from an HRE-458 that is operating in elevated ambient temperatures. These conditions are normal for the plugs operating under these circumstances.
- When less than ten slots are being used at initial turnup, assign the slots in the following sequence to reduce the *hot spot* temperature (10, 9, 1, 5, 4, 8, 2, 6, 3, 7).

In order to comply with the requirements in TA-NWT-0012101 (maximum ambient temperature of 115 °F with full solar load), the number of full T1 HDU-439 or HDU-437 doublers must be limited to eight without full solar load or six with full solar load. The fractional doublers, HDU-219 and HDU-217, and the full T1 microdoublers, HDU-409 and HDU-407, comply with the TA when all ten slots are occupied with full solar load.

When mixing HDU-437 and HDU-439 doublers with HDU-217, HDU-219, HDU-409, and HDU-407 doublers, use the HDU-437 and HDU-439 deployment rules for all the doublers. When mixing 239T1, ISDN, or DDS repeaters with HiGain doublers in this enclosure, assign a thermal load of one-fourth the load of the doubler to the 239T1 repeater and one-half the thermal load of a doubler to the DDS/IDSN repeaters.

**Four T1 repeaters and two DDS ISDN repeaters are thermally equivalent to one HDU-439 or one HDU-409 doubler.**

***Table 4.*** *Deployment Rules for Doublers and Remote Units*

| Unoccupied Slot Numbers | Max. Number of Occupied Slots | Thermal Load[a] | HDU-437 and HDU 439 Max. Ambient Temp[b] | HDU-217, HDU-219, HDU-409, HDU-407 Max. Ambient Temp[b] |
|---|---|---|---|---|
| None | 10 | Full | 90 | 115 |
| None | 10 | None | 105 | 125 |
| 3 & 6 or 2 & 7 | 8 | Full | 105 | 125 |
| 3 & 6 or 2 & 7 | 8 | None | 115 | 135 |
| 2, 3, 6, & 7 | 6 | Full | 115 | 135 |
| 2, 3, 6, & 7 | 6 | None | 125 | 145 |
| 1, 2, 3, 4, 6, 7, & 8 | 4 | Full | 125 | 145 |
| 1, 2, 3, 4, 6, 7, & 8 | 4 | None | 135 | 155 |

(a) Thermal Load: Full = maximum sunlight exposure per TR-TSY-000057. None = indoor or fully shaded.
(b) All maximum ambient temperatures of 115 °F or more with full solar load comply with the outside deployment requirements of Section 10.2.1.3 in TA-NWT-001210. Those that do not comply are shaded.

The physical location of the HRE-458 doubler enclosures is driven by three deployment rules:

**1** The first and most important deployment rule is to place the enclosures at the electrical limits of 35 dB of each span. This would place the:

- First doubler at the 35 dB location
- Second doubler at the 70 dB location
- Third doubler at the 105 dB location
- Fourth doubler at the 140 dB location

This allows the maximum range of 175 dB, if the fifth span to the remote unit is also 35 dB, to be realized.

**Only the HDU-409 and HDU-407 doublers can be used in circuits with more than three spans.**

**2** If the first rule is not applicable and 35 dB spans cannot be implemented, the second rule is to make all the spans the same electrical length (same 196 kHz loss). This minimizes the maximum span loss and assures the maximum operating margin resulting in the optimum transmission performances. If specific application constraints preclude using rule 2 or two different circuit layout choices have the same maximum span loss, then use rule 3.

**3** The third rule minimizes the power consumption and dissipation of the HLU which provides power to the doubler. Rule 3 requires Span 1 to be a minimum and Span 3 to be a maximum. This choice minimizes the $I^2R$ loss in the cable pairs and reduces the thermal stress on the HiGain Line Unit (HLU).

Refer to the HiGain ADC technical advisory number TA-015, titled HiGain Operating Ranges, for more detailed information regarding doubler deployment rules.

# HRE-458 WIRING

A single cable stub on the HRE-458 provides access to the main cable. The stub is a 52-pair, 24-gauge, "S-screened cable with four 12-pair binder groups and 4-pair inner statial groups. Table 5 on page 27 shows the pair assignments, numbering, color codes, and other stub details of the four 12-pair binder groups. Table 6 on page 28 defines the 4-pair inner statial group. All 4-pair groups have the same color coding.

***Table 5.*** *Binder Group Stub Cable Termination*

| Stub Cable Termination for HRE-458 Enclosure | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Side 1 (IN) CO | | | | Side 1 (OUT) FIELD | | | | Side 2 (IN) FIELD | | | | Side 2 (OUT) CO | | | |
| Doubler Slot | Binder Group BLUE | Pair | Wire | Pin No. in Housing | Binder Group ORANGE | Pair | Wire | Pin No. in Housing | Binder Group GREEN | Pair | Wire | Pin No. in Housing | Binder Group BROWN | Pair | Wire | Pin No. in Housing |
| 1 | BL | BL-W | BL | 5 | O | BL-W | BL | 3 | G | BL-W | BL | 11 | BR | BL-W | BL | 8 |
| | | | W | 6 | | | W | 4 | | | W | 12 | | | W | 9 |
| 2 | BL | O-W | O | 5 | O | O-W | O | 3 | G | O-W | O | 11 | BR | O-W | O | 8 |
| | | | W | 6 | | | W | 4 | | | W | 12 | | | W | 9 |
| 3 | BL | G-W | G | 5 | O | G-W | G | 3 | G | G-W | G | 11 | BR | G-W | G | 8 |
| | | | W | 6 | | | W | 4 | | | W | 12 | | | W | 9 |
| 4 | BL | BR-W | BR | 5 | O | BR-W | BR | 3 | G | BR-W | BR | 11 | BR | BR-W | BR | 8 |
| | | | W | 6 | | | W | 4 | | | W | 12 | | | W | 9 |
| 5 | BL | S-W | S | 5 | O | S-W | S | 3 | G | S-W | S | 11 | BR | S-W | S | 8 |
| | | | W | 6 | | | W | 4 | | | W | 12 | | | W | 9 |
| 6 | BL | BL-R | BL | 5 | O | BL-R | BL | 3 | G | BL-R | BL | 11 | BR | BL-R | BL | 8 |
| | | | R | 6 | | | R | 4 | | | R | 12 | | | R | 9 |
| 7 | BL | O-R | O | 5 | O | O-R | BR | 3 | G | O-R | O | 11 | BR | O-R | O | 8 |
| | | | R | 6 | | | W | 4 | | | R | 12 | | | R | 9 |
| 8 | BL | G-R | G | 5 | O | G-R | S | 3 | G | G-R | G | 11 | BR | G-R | G | 8 |
| | | | R | 6 | | | W | 4 | | | R | 12 | | | R | 9 |
| 9 | BL | BR-R | BR | 5 | O | BR-R | BL | 3 | G | BR-R | BR | 11 | BR | BR-R | BR | 8 |
| | | | R | 6 | | | R | 4 | | | R | 12 | | | R | 9 |
| 10 | BL | S-R | S | 5 | O | S-R | S | 3 | G | S-R | S | 11 | BR | S-R | S | 8 |
| | | | R | 6 | | | R | 4 | | | R | 12 | | | R | 9 |
| Spare | BL | BL-BK | BL | - | O | BL-BK | BL | - | G | BL-BK | BL | - | BR | BL-BK | BL | - |
| | | | BK | - | | | BK | - | | | BK | - | | | BK | - |
| Spare | BL | O-BK | O | - | O | O-BK | O | - | G | O-BK | O | - | BR | O-BK | O | - |
| | | | BK | - | | | BK | - | | | BK | - | | | O | - |

***Table 6.*** *Inner Statial Pair Cable Stub Wire Assignment*

| Pair ID | Pair | Wire |
|---|---|---|
| Order Wire | BL-W | BL |
| | | W |
| Spare | O-W | O |
| | | W |
| Spare | G-W | G |
| | | W |
| Spare | BR-W | BR |
| | | W |

The stub pairs connect to the ten shelf slots as shown in Table 5 on page 27. The HRE-458 is wired in a typical minirepeater fashion and follows Side 1 and Side 2 terminology. The terminology adheres to conventional T1 terminology, which describe a unidirectional (simplex) service. HDSL is in fact a bidirectional (duplex) service. The wiring from the cable stub entry to the card cage connectors and to the order wire connector is factory installed.

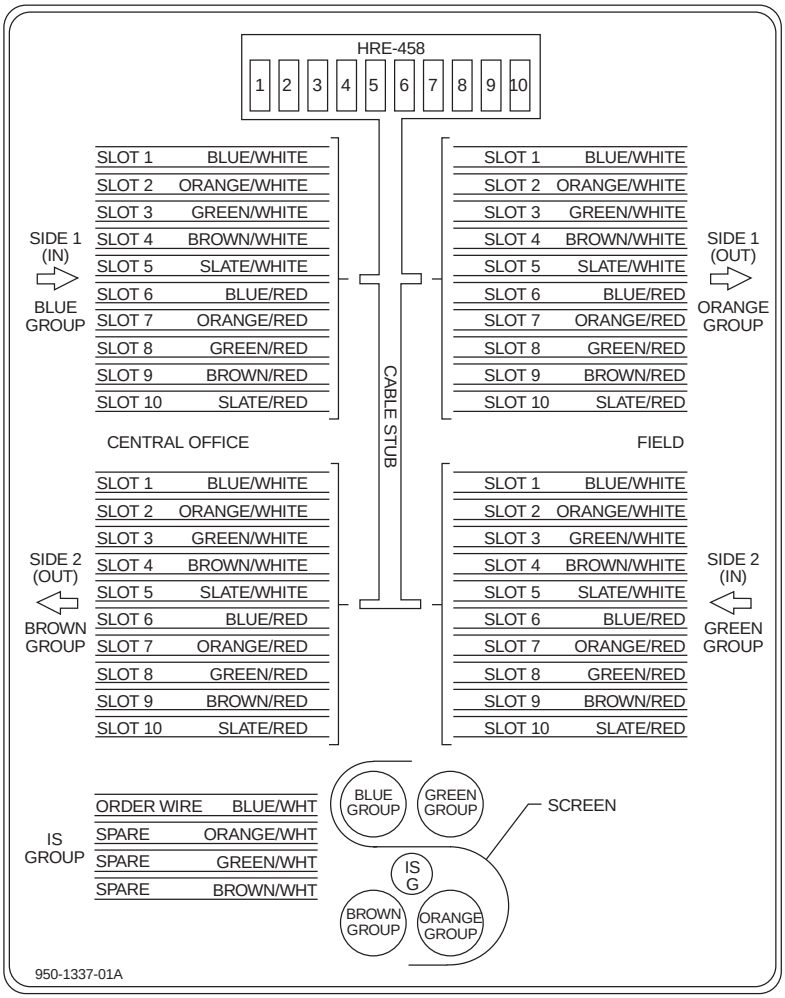



***Figure 11.*** *Wiring Diagram Gummed Label*

The HRE-458 can be used to house either HiGain doublers, ISDN, DDS, or 239 repeaters.

The wiring information shown in Table 5 on page 27 has been made into a gummed label (Figure 11 on page 28), that is attached to the inside of the stainless steel dome for easy reference.

# HRE-458 MAINTENANCE

This section covers various maintenance procedures for the HRE-458.

## Splicing

Splicing consists of connecting the wire pairs of the HRE-458 cable stub to the main cable located in the splice case. The following sections contain step-by-step procedures for:

- Preparing the stubs for splicing into the main cable (pre-splice procedure)
- Splicing the stubs into the main cable (splicing procedure)
- Dressing and taping the final splice in the splice case (post-splicing procedure)

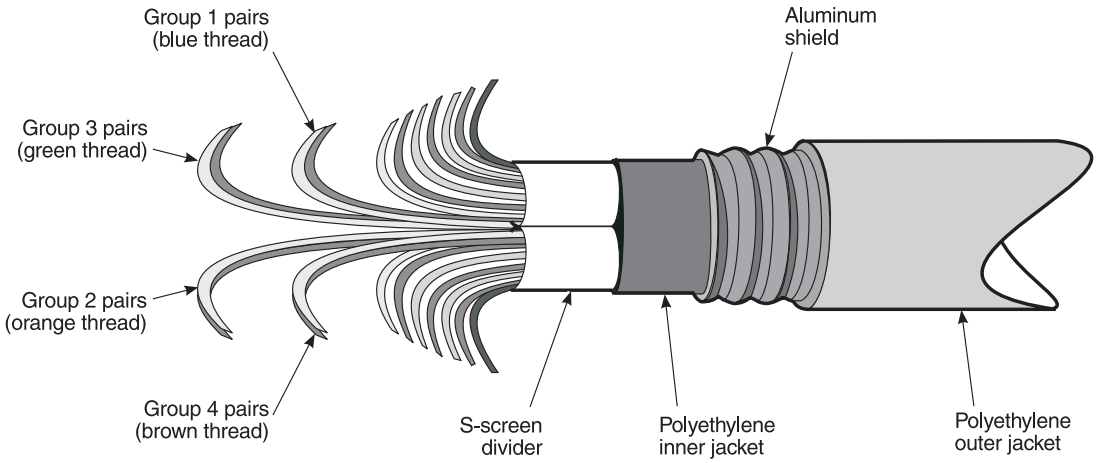



***Figure 12.*** *Cable Stub Construction*

When using these splicing procedures, be sure to maintain cable pair integrity when splicing stub pairs into the main cable. Follow local practices as required.

## Pre-splicing Procedure

**Ground the HRE-458 enclosure before splicing the cable stubs into the main cable. The grounding method discussed in "Grounding" on page 11 (or an accepted local grounding method) must be in effect at all times to safeguard personnel.**

**The HRE-458 comes with a screened cable stub that is precut and capped.**

1 Strip sufficient length of outer jacket, aluminum shield, and mylar sheath from the cable stub (see Figure 13 on page 31).

2 Strip the main cable as required by the cable manufacturer.

3 Install shield bonding connectors in accordance with standard practices.

**In this document the cable butt is considered to be the end of the cable stub most distant from the enclosure.**

4 To avoid split pairs, tie or band the ends of the group 1 and group 2 pairs. Cut off pair ends and the cable butt to aid in the removal of grease.

5 Separate pairs between the tied ends and the cable butt to aid in the removal of grease.

6 Remove grease by wiping the tied ends and the cable butt with a clean cloth or paper towel.

**When the air temperature is low, warm the cable pairs to aid in removing grease by cleaning the stub in a heated enclosure or by using a heat gun to apply warm air to the pairs. Avoid applying excessive heat which could deform the insulation on the pairs.**

7 Keep cable pairs dry and cover the exposed splice to protect it from the elements if it is left unattended prior to completion.

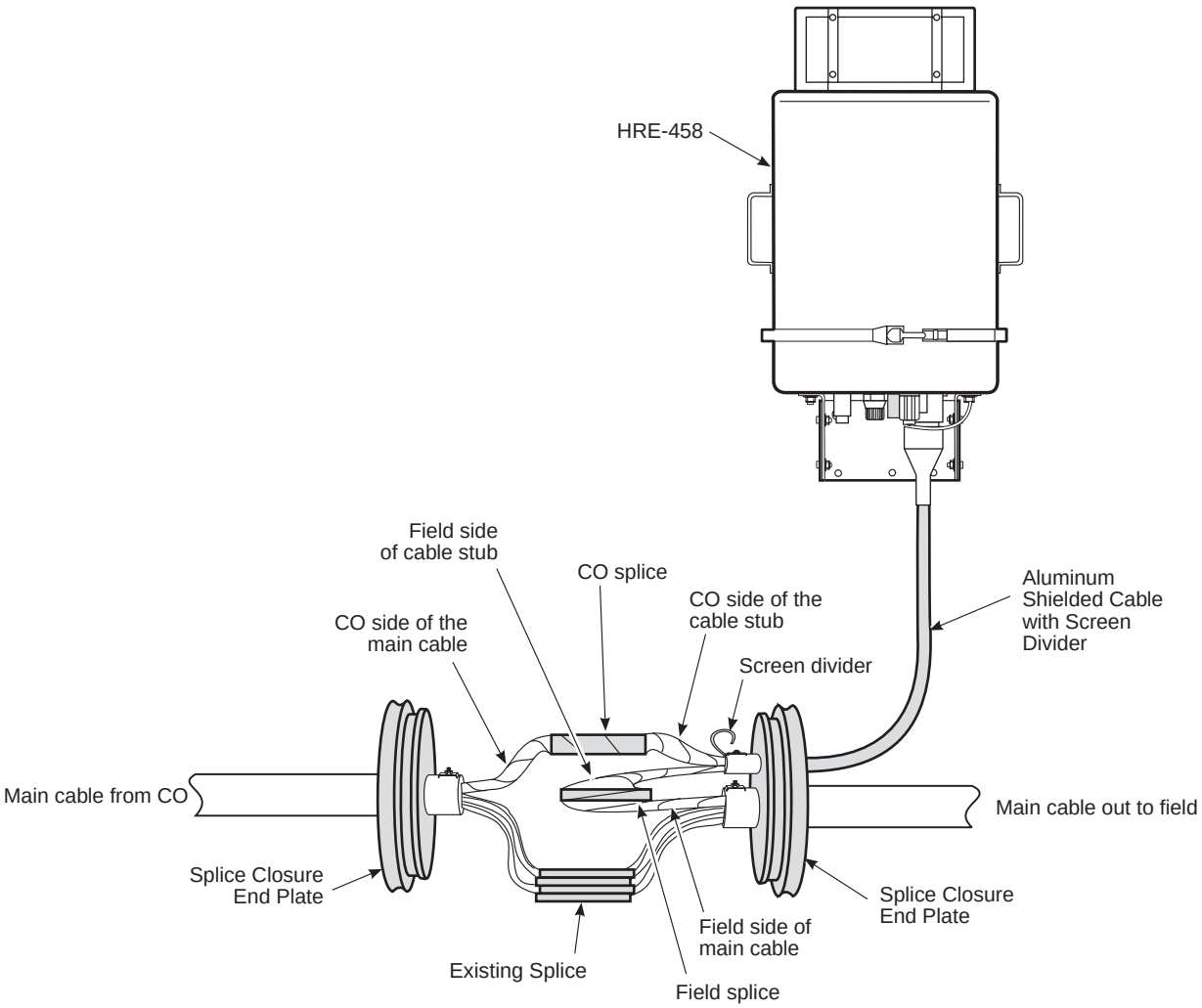



***Figure 13.*** *Dress Splice in Splice Case*

## Splicing Procedure

1. Splice the cable stub to the main cable using the wire identification information in Table 5 on page 27 and Table 6 on page 28.
2. Visually inspect each splice for split pairs, opens, and shorts.

**Maintenance personnel sometimes cross-splice defective pairs between units. These pairs are referred to as "wandering pairs" and may cause problems.**

3. Connect the CO side of the main cable to the CO side of the cable stub with a straight splice (see Figure 13).
4. Once the cables are connected, wrap the CO splice with aluminum tape or dress out the splice according to local procedures.
5. Connect the field side of the cable stub to the field side of the main cable with a straight splice.

**6** Once the cables are connected, wrap the field splice with aluminum tape or dress out the splice according to local procedures.

**7** Repair or correct defective or wandering pairs before closing the splice. Otherwise, the color code sequence of the cable stub in relation to the pair count or the main cable will no longer be valid.

**8** Roll back and tape the screen divider from the cable stub.

**9** Perform any cable tests required by local practice.

**Maintain cable pair integrity for all applications.**

## Post-splicing Procedure

**1** Starting at the cable stub butt of the CO cable stub, wrap the pairs on one side of the screen with $^{3}/_{4}$-inch, self-bonding rubber tape. Overlap the tape by one-half its width (Figure 14).

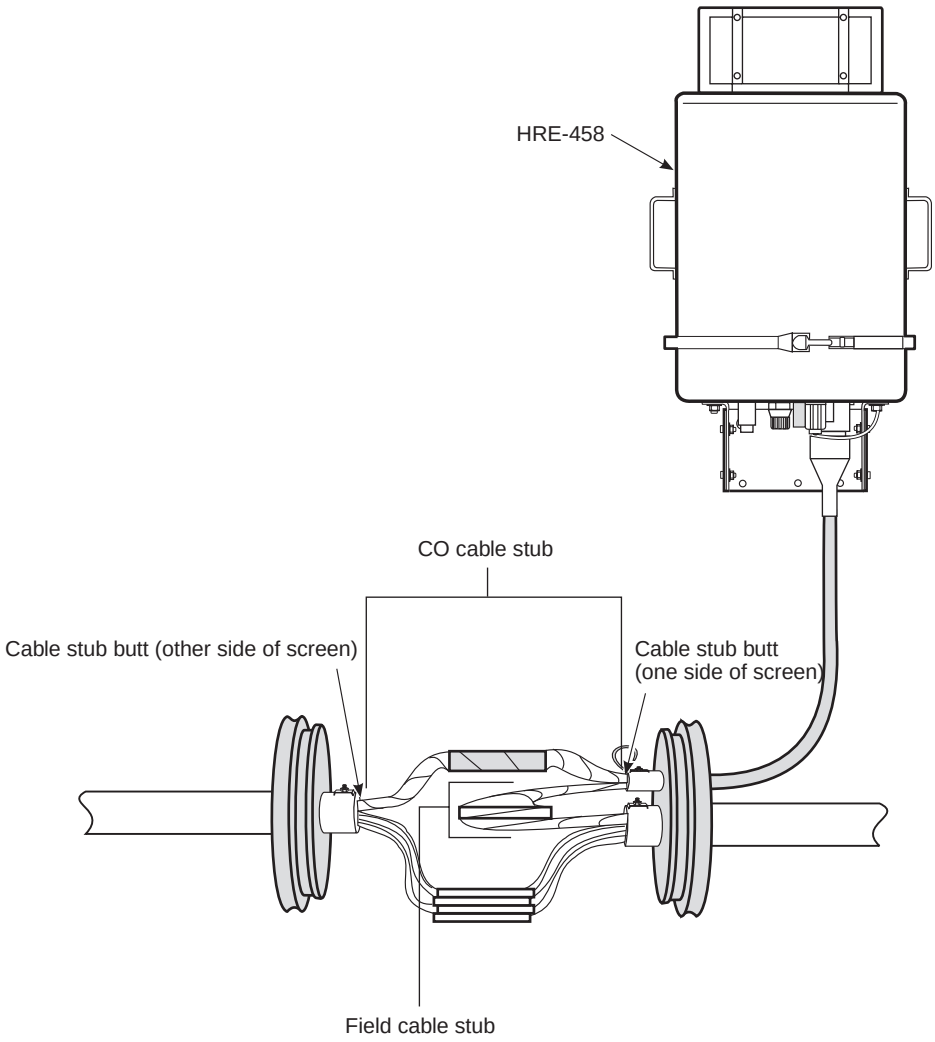



***Figure 14.*** *Post-splicing Procedure*

2 Repeat Step 1, wrapping the pairs on the other side of the screen of the Central Office (CO) cable stub in the same way.

3 Starting at the cable stub butt, wrap the pairs on one side of the screen with 2-inch, pressure sensitive, aluminum tape. Overlay the tape by one-half its width and form the tape in place. Aluminum tape provides electrical isolation from outside Electromagnetic Interference (EMI) sources. For these applications, dress out the splice per local practices.

**Aluminum tape may present a potential shorting hazard when splicing paper pulp insulated cables.**

4 Repeat Step 3, wrapping the pairs on the other side of the screen in the same way.

5 Starting at the cable stub butt of the field cable stub, wrap the pairs on one side of the screen with two layers of $^{3}/_{4}$-inch vinyl tape. Overlap the tape by one-half its width.

6 Repeat Step 5, wrapping the pairs on the other side of the field cable stub screen in the same way.

**The screen divider is an insulated floating divider that isolates Group 1 (blue thread side 1 in) and Group 2 (green thread side 2 in) from Group 3 (orange thread side 1 out) and Group 4 (brown thread side 2 out) in the cable stub. Do not ground the divider or connect it to the screen divider of the main cable. This may result in poor performance. The aluminum tape used to wrap the input and output pairs provides the necessary isolation.**

7 Cut the cable stub screen divider approximately 6 inches from the cable stub butt.

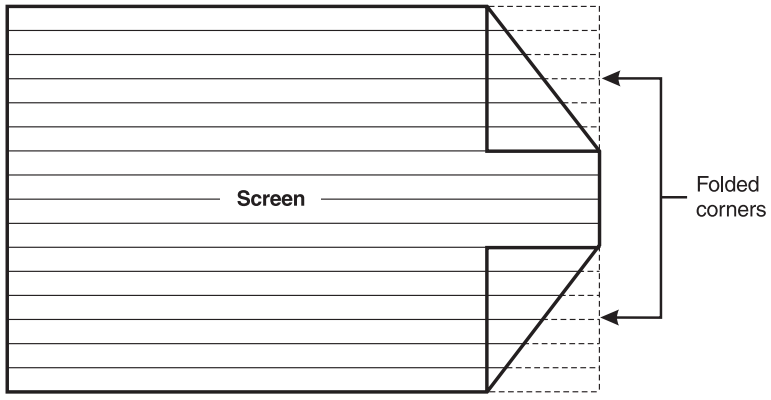



***Figure 15.*** *Screen Folding Diagram*

8 Fold each corner at a 45° angle to the center of the screen.

9 Fold the screen divider back on itself several times and tape it to prevent it from unfolding.

10 Position the folded and taped screen divider between the spliced and taped Group 1 and Group 2 pairs.

11 Seal and close the splice case according to the splice case instructions.

# REPLACEMENT PARTS

The HRE-458 contains LPU surge arrestors which may be replaced in the field if needed. ADC recommends that the O-ring be closely examined whenever the housing is opened for maintenance. Replace the O-ring if damaged.

**The cover, clamp, O-ring, and LPU surge arrestors may be replaced in the field if they become damaged. See Table 7 on page 34 for replacement part numbers**

**If an enclosure plug receives severe lightning stress, ADC recommends replacing the LPU board for that plug.**

## Replacing the Stainless Steel Dome Cover

To replace the stainless steel dome cover, it is necessary to replace the following items: stainless steel dome cover, metal locking clamp, and O-ring. It is recommended that the desiccant bags be replaced when the enclosure is opened. Use Davison Chemical Corp. *Proteck-Sorb-121* or equivalent desiccant.

## Replacing LPU Arrestor Boards

Perform the following steps for replacing the LPU surge arrestors:

**1** Clean the dome cover and clamp of dust and debris.

**2** Remove the clamp and dome cover as described in "Opening the HRE-458 Enclosure" on page 17.

**3** Remove the defective LPU board.

**4** Insert a new LPU board in the vacant position.

**5** Repeat steps 1 through 5 to replace other defective LPU boards.

**The LPU board must be reattached so that pin 1 of the LPU board is connected to the edge connector pin attached to the green ground wire. If pin 1 is attached in any other way, protection will not be provided.**

**6** Replace the O-ring if damaged.

**7** Place cover and clamp and repressurize housing, if required, per "Closing the HRE-458 Enclosure" on page 17.

***Table 7.*** *Replacement Part Kits*

| Number | Part |
|---|---|
| **132-1029-01** | **Cover, Metal Locking Clamp, O-Ring, Desiccant** |
| Qty 1 | Therm-O-Nator Dome Cover |
| Qty 1 | Dome Cover O-Ring |
| Qty 1 | V-Band Locking Clamp |
| Qty 2 | Desiccant (2-unit bag) |
| **132-1011-01** | **O-Ring, Desiccant** |
| Qty 1 | Dome Cover O-Ring |
| Qty 2 | Desiccant (2-unit bag) |
| **132-1034-01** | **LPU Surge Arrestor, Desiccant** |
| Qty 1 | Single Slot, 4 Port, Protection LPU Board |
| Qty 2 | Desiccant (2-unit bag) |
| **132-1013-01** | **List 2 Security Cover** |

***Table 7.*** *Replacement Part Kits (Cont.)*

| Number | Part |
|---|---|
| Qty 1 | Security Cover |
| **132-1014-01** | **Metal Locking Clamp, O-Ring, Desiccant** |
| Qty 1 | Dome Cover O-Ring |
| Qty 1 | V-Band Locking Clamp |
| Qty 2 | Desiccant (2-unit bag) |
| **132-1038-01** | **Valve Kit** |
| Qty 2 | Pressure Release Valves |
| Qty 2 | Breather Valves |
| Qty 2 | Air Stem Valves |
| Qty 2 | External Pressure Cutoff Valves |
| Qty 2 | Air Intake T-Valve Caps |
| Qty 2 | Desiccant (2-unit bag) |
| **132-1016-01** | **Hardware Installation Kit** |
| Qty 4 | 1-inch long, $^3/_8$-inch mounting bolts |
| Qty 4 | $^3/_8$-inch mounting nuts |
| Qty 4 | $^3/_8$-inch mounting washers |
| Qty 4 | 4-inch mounting lug bolts |
| Qty 2 | Desiccant (2-unit bag) |
| **132-1030-01** | **Protector Tube Kit** |
| Qty 25 | 47BT Gas Tube Protectors or equivalent |

# VALVE REPLACEMENT PROCEDURES

All but the Air Stem/Air Intake T-valve shown in Figure 3 on page 5 can be replaced, if needed. Order the valve replacement kit #132-1038-01 listed in Table 7 on page 34 to obtain new valves. Use the following procedures when replacing any of the four replaceable valves.

## Pressure Relief Valve

The pressure relief valve (PRV) is part of an all-metal, nickel-plated brass assembly as shown in Figure 3 on page 5**.** The valve acts as a guard against excessive pressure on the enclosure and releases the internal pressure when it exceeds a nominal level of 15 PSI. The assembly consists of an adapter that screws into a brass fitting, located in the bottom of the baseplate, and the PRV valve itself which screws into this adapter. The adapter has two O-rings that are required to create an airtight seal. One is located on its outer threaded stem that connects to the brass fitting; the other is located at the base of its inner well where it seals the PRV to the adapter.

To remove and replace the PRV, proceed as follows:

**1** Grip the adapter nut with a $^3/_4$" wrench and the PRV with a $^1/_2$" wrench.

**2** While holding the adapter nut steady (it should not be moved), loosen the PRV by turning it counterclockwise, then remove it by hand. If the adapter nut becomes loose, tighten it to a torque of 60 inch-pounds.

**3** Check that the O-ring in the adapter's inner well has remained in place. If not, reseat it.

**4** Thread the new PRV into the adapter. Do not crossthread.

**5** Again grip the adapter nut with a $^3/_4$" wrench and the PRV with a $^1/_2$" wrench. Tighten the PRV to a torque of 120 inch-pounds.

**Do not overtighten. Excessive torque does not improve the seal and may damage the PRV.**

**6** Pressurize the chamber and check the entire assembly for leaks.

## Breather Vent Valve

The breather vent valve (BVV) is an all-metal, nickel-plated brass unit as shown in Figure 3 on page 5**.** It allows air to circulate into the enclosure so it can breathe and avoid the buildup of excessive moisture and other contaminants. It has a hollow-threaded stem that screws into a brass fitting located on the bottom of the base. The replacement unit has two O-rings. One O-ring is located on its outer threaded stem that connects to the brass fitting; the other is located at the base of its inner well where it seals the BVV to the adapter. The hollow stem contains a piece of plastic screen to prevent insects from migrating into the enclosure.

To remove and replace the breather vent, proceed as follows:

**1** Grip the BVV with a $^{3}/_{4}$" wrench and loosen by turning it counterclockwise, then remove it by hand.

**2** Check that the new BVV came equipped with its O-ring.

**3** Thread the new BVV into the brass fitting. Do not crossthread.

**4** Again grip the BVV with a $^{3}/_{4}$" wrench and tighten to a torque of 60 inch-pounds.

**Do not overtighten. Excessive torque does not improve the seal and may damage the BVV.**

## Air Stem Valve

The air stem valve (ASV) is part of an all-metal, nickel-plated brass assembly as shown in Figure 3 on page 5. It is used to pressurize the enclosure from an external air supply or to release the internal pressure. The assembly consists of an adapter that screws into a brass fitting located on the bottom of the base. The ASV itself screws into this adapter, and the cap screws onto the top of the ASV. The adapter has two O-rings that are required to create an airtight seal. One is located on its outer threaded stem that connects to the brass fitting. The other is located at the base of its inner well where it seals the ASV to the adapter.

To remove and replace the ASV, proceed as follows:

**1** Grip the adapter nut with a $^{3}/_{4}$" wrench and the ASV with a $^{7}/_{16}$" wrench.

**2** While holding the adapter nut steady (it should not be moved), loosen the ASV by turning it counterclockwise, then remove it by hand. If the adapter nut becomes loose, tighten it to a torque of 60 inch-pounds.

**3** Check that the O-ring in the adapter's inner well has remained in place. If not, reseat it.

**4** Thread the new ASV into the adapter. Do not crossthread.

**5** Again grip the adapter nut with a $^{3}/_{4}$" wrench and the PRV with a $^{7}/_{16}$" wrench. Tighten the PRV to a torque of 120 inch-pounds.

**Do not overtighten. Excessive torque does not improve the seal and may damage the ASV.**

**6** Pressurize the chamber and check the entire assembly for leaks.

## Pressure Cutoff Valve

The pressure cutoff valve (PCV) is part of an all-metal, nickel-plated assembly as shown in Figure 3 on page 5**.** The valve controls the flow of air from the air core stub (air-filled unit) or the external air inlet valve ((gel-filled unit) into the enclosure. The assembly consists of an adjusting knob with stem that is inner-locked to a limiting nut. The outer limiting nut screws into the outer threads of the body housing connected to the enclosure's baseplate. The stem screws into the inner threads of the housing. The stem's tip has three O-rings that work to open and close the airflow through the base of the body housing and another O-ring embedded in the limiting nut. When the adjusting nut is fully clockwise, the airflow is OFF. When it is rotated one turn clockwise, the airflow is ON. The body housing also has an O-ring on its threads to create an airtight seal when the limiting nut is tightened down upon it.

To remove and replace the PCV, proceed as follows:

**1** Grip the limiting nut with a 1" wrench and loosen it by turning one-half turn counterclockwise.

**2** Since the valve stem is internally threaded to the body housing, both the limiting nut and adjustment knob must next be turned together counterclockwise until both are fully unthreaded from the body housing.

**3** Pull the adjusting knob and limiting nut subassembly away from the body housing until it is completely disengaged. Some resistance will be noticed as the stem's O-rings rub against the walls of the body housing while the stem is withdrawn.

**4** Check that the O-ring remains attached to the threaded tip of the body housing.

**5** The replacement PCV assembly comes as a unit. It includes the limiting nut, adjustment knob, and all O-rings. Do not attempt to disassemble it.

**6** Insert the valve stem into the body housing's threaded tip as far as it will go. Some resistance will be encountered as the O-rings contact the inner housing threads.

**7** Rotate the limiting nut one-half turn clockwise.

**8** Grasp both the limiting nut and the adjustment knob. Screw this subassembly into the housing until the adjusting nut tightens the O-ring against the body housing. Do not crossthread.

**9** Turn the adjusting knob clockwise until contact is felt between the stem's O-rings and the inner threads of the body housing.

**10** Use the 1" wrench to torque the limiting nut to 200 inch-pounds.

**Do not overtighten. Excessive torque does not improve the seal and may damage the PCV.**

**11** Check that the adjusting knob has at least one and one-half turns of free movement in and out.

**12** If any binding occurs, loosen the limiting nut and turn the adjustment knob until it moves freely. Retighten the limiting nut.

**13** Rotate the adjustment knob a full turn counterclockwise from its full clockwise position. This should turn the pressure ON.

**14** Pressurize the chamber and check the entire assembly for leaks.

**15** Rotate the adjustment knob back and forth and determine that it does turn the airflow OFF when fully clockwise and back ON when backed off one turn counterclockwise.

# APPENDIX C - PRODUCT SUPPORT

ADC Customer Service Group provides expert pre-sales and post-sales support and training for all its products.

Technical support is available 24 hours a day, 7 days a week by contacting the ADC Technical Assistance Center (TAC).

| | |
|---|---|
| **Sales Assistance**<br>800.366.3891 extension 73000<br>(USA and Canada)<br>952.917.3000<br>Fax: 952.917.3237 | • Quotation Proposals<br>• Ordering and Delivery<br>• General Product Information |
| **Systems Integration**<br>800.366.3891, extension 73000<br>(USA and Canada)<br>952.917.3000 | • Complete Solutions (from concept to installation)<br>• Network Design and Integration Testing<br>• System Turn-Up and Testing<br>• Network Monitoring (upstream or downstream)<br>• Power Monitoring and Remote Surveillance<br>• Service/Maintenance Agreements<br>• Systems Operation |
| **ADC Technical Assistance Center**<br>800.638.0031<br>714.730.3222<br>Fax: 714.730.2400<br>Email: wsd_support@adc.com | • Technical Information<br>• System/Network Configuration<br>• Product Specification and Application<br>• Training (product-specific)<br>• Installation and Operation Assistance<br>• Troubleshooting and Repair/Field Assistance |
| **Online Technical Support** | • www.adc.com/Knowledge_Base/index.jsp |
| **Online Technical Publications** | • www.adc.com/library1/ |
| **Product Return Department**<br>800.366.3891 ext. 73748 or<br>952.917.3748<br>Fax: 952.917.3237<br>Email: repair&return@adc.com | • ADC Return Material Authorization (RMA) number and instructions must be obtained before returning products. |

*All telephone numbers with an 800 prefix are toll-free in the USA and Canada.*

# APPENDIX D - GLOSSARY

The following abbreviations are used throughout this technical practice.

| | |
|---|---|
| **Amp** | Amperes |
| **ANSI** | American National Standards Institute |
| **ASV** | Air Stem Valve and Cap |
| **AWG** | American Wire Gauge |
| **BT** | Burst Tolerance |
| **BVV** | Breather Vent Valve |
| **CLEI** | Common Language Equipment Identified |
| **cm** | Centimeter |
| **CO** | Central Office |
| **dB** | Decibel |
| **DDS** | Digital Data System |
| **ECI** | Equipment Catalog Item |
| **EMI** | Electromagnetic Interference |
| **HDSL** | High bit-rate Digital Subscriber Line |
| **HLU** | HiGain Line Unit |
| **HTC** | HiGain Test Card |
| **ICEA** | Insulated Cable Engineers Association |
| **IS** | Inner Statial |
| **ISDN** | Integrated Services Digital Network |
| **kHz** | Kilohertz |
| **k Ω** | Kilohm |
| **LPU** | Lightning Protection Unit |
| **MIL** | 1/1000 of an inch |
| **mm** | millimeter |
| **Ohms** | Measures of resistance |
| **PCV** | Pressure Cutoff Valve |

| | |
|---|---|
| **PE** | Processing Element |
| **PRV** | Pressure Relief Valve |
| **PSI** | Pounds per Square Inch |
| **REA** | Rural Electrification Administration |
| **RMA** | Return Material Authorization |

# CERTIFICATION AND WARRANTY

## FCC COMPLIANCE

This equipment does not have any clocking source and is a passive device per FCC guidelines. When used in conjunction with any clocking devices, this combined system may radiate radio frequency energy that causes harmful interference to radio communications. Operating such a system in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

## LIMITED WARRANTY

ADC DSL Systems, Incorporated (“ADC”) warrants that, for a period of sixty (60) months from the date of shipment, the hardware portion of its products will be free of material defects and faulty workmanship under normal use. ADC's obligation, under this warranty, is limited to replacing or repairing, at ADC's option, any such hardware product which is returned during the 12-month warranty period per ADC's instructions and which product is confirmed by ADC not to comply with the foregoing warranty.

ADC warrants that, for a period of 90 days from the date of purchase, the software furnished with its products will operate substantially in accordance with the ADC published specifications and documentation for such software. ADC’s entire liability for software that does not comply with the foregoing warranty and is reported to ADC during the 90-day warranty period is, at ADC’s option, either (a) return of the price paid or (b) repair or replace of the software. ADC also warrants that, for a period of thirty (30) days from the date of purchase, the media on which software is stored will be free from material defects under normal use. ADC will replace defective media at no charge if it is returned to ADC during the 30-day warranty period along with proof of the date of shipment.

The transportation charges for shipment of returned products to ADC will be prepaid by the Buyer. ADC will pay transportation charges for shipment of replacement products to Buyer, unless no trouble is found (NTF), in which case the Buyer will pay transportation charges.

ADC may use reconditioned parts for such repair or replacement. This warranty ***does not*** apply to any product which has been repaired, worked upon, or altered by persons not authorized by ADC or in ADC's sole judgment has subjected to misuse, accident, fire or other casualty, or operation beyond its design range.

Repaired products have a 90-day warranty, or until the end of the original warranty period—whichever period is greater.

ADC DISCLAIMS ALL OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO ITS PRODUCTS AND ANY ACCOMPANYING WRITTEN MATERIALS. FURTHER, ADC DOES NOT WARRANT THAT SOFTWARE WILL BE FREE FROM BUGS OR THAT ITS USE WILL BE UNINTERRUPTED OR REGARDING THE USE, OR THE RESULTS OF THE USE, OF THE SOFTWARE IN TERMS OF CORRECTNESS, ACCURACY, RELIABILITY OR OTHERWISE.

## RETURNS

ADC continues to repair faulty modules beyond the warranty program at a nominal charge. Contact your ADC sales representative for details and pricing. Refer to the instructions under *“Appendix C - Product Support”* on page 38 for complete return instructions.

## MODIFICATIONS

Any changes or modifications made to this device that are not expressly approved by ADC Telecommunications, Inc. voids the user's warranty.

All wiring external to the products should follow the provisions of the current edition of the National Electrical Code.

## STANDARDS COMPLIANCE

This equipment has been tested and verified to comply with the applicable sections of the following standard:

- TR-TSY-00056: Repeater Housings for T1, T1C, T1D, and T1G Carrier Systems

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14402 Franklin Avenue
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Fax: 714.832.9924

**Technical Assistance**

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