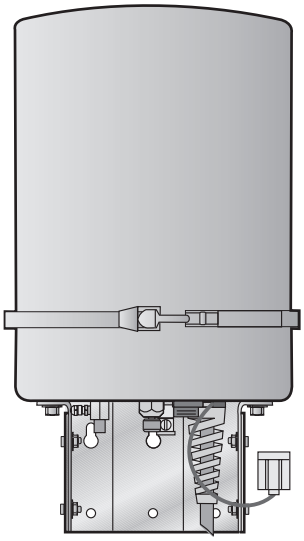
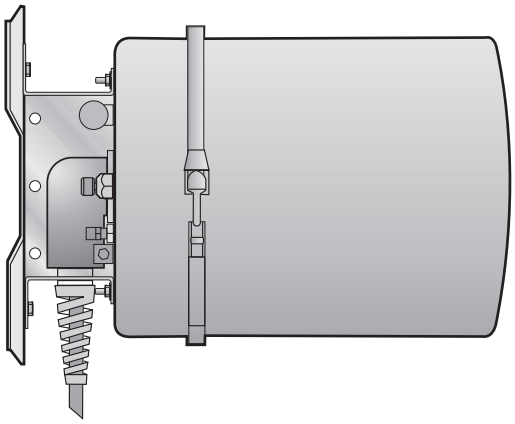
HiGain Remote Enclosures

User Manual

HRE-712 List 1



HRE-712 List 2



HRE-712 List 1
Part Number: 150-2257-01
CLEI Code: T1M1XL0C

HRE-712 List 2
Part Number: 150-2257-02
CLEI Code: T1M1YL0C

Revision History of This Manual

Revision	Release Date	Revisions Made
01	July 26, 2000	Initial Release
02	August 12, 2002	ADC Rebrand

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Trademark Information

USING THIS MANUAL

The following conventions are used in this manual:

- `Monospace type` indicates screen text, including text you type at a screen prompt.
- Keys you press are indicated by small icons such as ENTER. Key combinations to be pressed simultaneously are indicated with a plus sign as follows: CTRL + ESC.
- The items you type appear in **bold**.
- Three types of messages, identified by icons, appear in the text.

Notes contain information about special circumstances.

Caution symbols indicate the possibility of equipment damage or personal injury.

The Electrostatic Discharge (ESD) susceptibility symbol indicates that a device or assembly is susceptible to damage from electrostatic discharge.

For a list of abbreviations used in this document, refer to "Appendix D - Abbreviations" on page 42.

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 DSL Systems, Inc. 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 DSL Systems, Inc. as described in "Appendix C - Product Support" on page 41. 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 and provides installation instructions for the following HiGain® Remote Enclosures:

- HRE-712 List 1 (gel filled)
- HRE-712 List 2 (air filled)

FEATURES

- Aluminum card cage enclosure for up to 12 doublers. Each doubler slot's pair assignments are shown in Table 1 on page 15. See also "Card Cage" on page 19.
- Unique card guides that automatically adapt to accommodate the following form factors:
  - Full T1 (1.544 Mbps) doublers: HDU-437 and HDU-407 (Digital Data Service [DDS] mechanics), HDU-439 (dual 239 T1 mechanics) or HDU-409 (single T1 mechanics)
  - Fractional T1 (772 Mbps) doublers: HDU-217 (DDS mechanics) or HDU-219 (dual 239 T1 mechanics)
  - 239 T1 repeaters
  - Integrated Services Digital Network (ISDN) repeaters
- 30-foot (9.1 m), gel-filled or air-filled, 52-pair cable stubs
- Front leading profile for underground HRE-712 List 2 and standard vertical mounting for HRE-712 List 1 for aboveground applications.
- Primary surge protection
- Seamless, stainless steel cover that maintains weathertight integrity and provides efficient heat exchange to expel the heat generated within the HRE-712.
- HRE-712 List 2 has a stainless steel composite baseplate for the HRE-712 List 2 for easy replacement when used as a 4-slot HRE-454.

APPLICATIONS

The primary application of the HRE-712 is to house HiGain doubler units in an HDSL T1 transmission system. It is designed to protect HiGain doubler units from potentially harmful conditions found in outdoor environments.

- The HRE-712 List 1, shown in Figure 1 on page 2, contains a gel-core stub and is intended for aboveground applications that do not require pressurization through the cable stub. If you prefer to pressurize the enclosure, it can be locally pressurized using an optional pressure-relief valve.
- The HRE-712 List 2, shown in Figure 2 on page 3, contains an air-core stub and 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 enclosure models are similar in that they have primary gas-tube surge protection on all cable pairs. In addition, if you prefer not to pressurize the enclosure, you can use the optional breather-vent to allow it to breathe.

HRE-712 List 1 Gel-Filled Stub

The gel-filled cable stub on the HRE-712 List 1, shown in Figure 1, is equivalent to an ALP FTS-PIC, filled-core telephone cable. Table 2 on page 24 provides a description of the cable stub. The enclosure 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 gel-filled cable complies with the requirements of ANSI/ICEA S-84-608-1994 and REA PE-89.

The HRE-712 List 1 enclosure is equipped with three metal valves installed in the base section, shown in Figure 1. The breather-vent assembly allows the circulation of outside air through the HRE-712 List 1 enclosure when it is not pressurized. The enclosure must breathe to prevent excess moisture and other damaging contaminants from accumulating within the enclosure.

An optional external pressure-relief valve is included in the shipping kit for the HRE-712 List 1. Use the valve in place of the breather-vent assembly when sealing the enclosure for underground applications, or when locally pressurizing the HRE-712 List 1.

The combined Schrader air-stem and External Air Intake T-valve, shown in Figure 1, has both a Schrader air valve and an air intake port that accepts a tube for connection to an external air source. In addition, the Schrader valve can relieve the internal pressure of the dome when using an external air source. The external source must be able to be turned off upstream from the air intake port.

"HRE-712 List 1 Vented-to-Pressurized Conversion Procedure" on page 22 provides instructions on converting the enclosure to a pressurized enclosure. The Pressure Cutoff valve allows the external source of air to be cut off when the cover is to be removed.

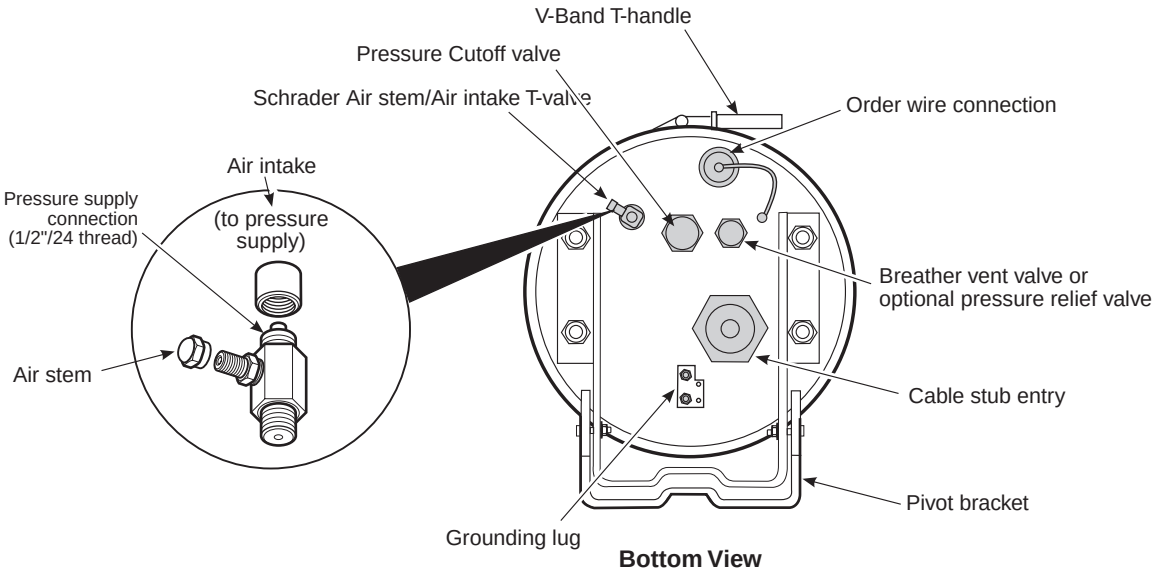


Figure 1. *HRE-712 List 1 Remote Gel-Filled Enclosure*

HRE-712 List 2 Air-Filled Stub

The air-filled cable stub on the HRE-712 List 2, shown in Figure 2, is equivalent to an ALP FTS-PIC air-core telephone cable. Table 2 on page 24 provides a complete description of the cable stub.

This enclosure is intended for underground 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 a protective covering that withstands exposure to sunlight, atmospheric temperatures, ground chemicals, and stresses expected in standard installations.

The air-filled cable complies with the requirements of ANSI/ICEA S-85-625-1994 and REA PE-22.

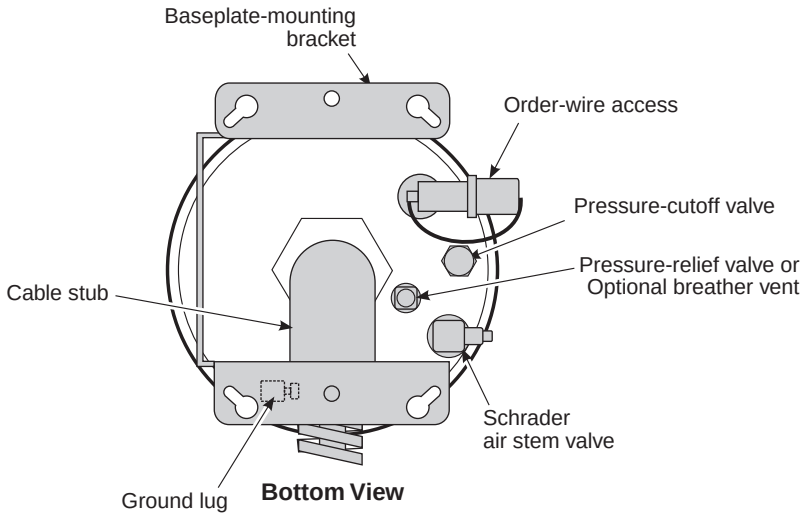


Figure 2. *HRE-712 List 2 Remote Air-Filled Enclosure*

The HRE-712 List 2 unit, similar to the HRE-712 List 1, contains three metal valves: internal air-pressure cutoff valve, Schrader air-stem valve, and pressure-relief valve. The air-pressure 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-712 enclosure.

- To shut off the inlet air supply, turn the air-pressure cutoff valve clockwise one full turn.
- To turn on the inlet air supply, turn the air-pressure cutoff valve counterclockwise one full turn.

PRESSURIZED APPLICATIONS

Depressurization 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.

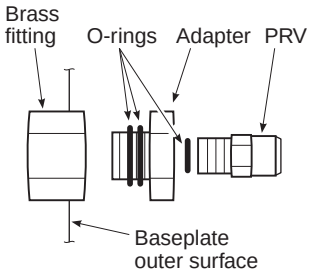
The HRE-712 List 2 can be pressurized either:

- through its air-filled cable stub when connected to a pressurized main feeder cable
- from the Schrader air-stem valve when connected to gel-filled feeder cables.

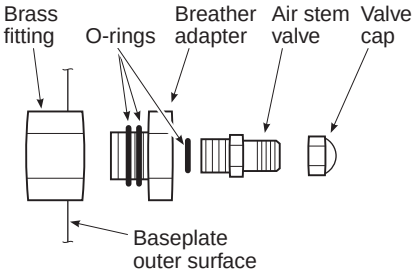
A pressure gauge can be attached to the air-stem valve for the purpose of measuring the internal pressure of the enclosure. The air-stem valve is also used to relieve the internal pressure prior to opening and removing the dome cover when pressurized through the stub. This can be done by pressing down on the valve's center pin. Figure 2 on page 3 and Figure 3 on page 5 show the air-stem valve and pin locations.

An optional breather-vent assembly is enclosed in the HRE-712 List 2 shipping kit. The kit is a small plastic bag that is attached to the spare pair (brown-white) shrink tab. This assembly is used to replace the pressure-relief valve when the HRE-712 List 2 is not pressurized. The assembly allows the enclosure to breathe and keeps the internal atmosphere free of harmful contaminants.

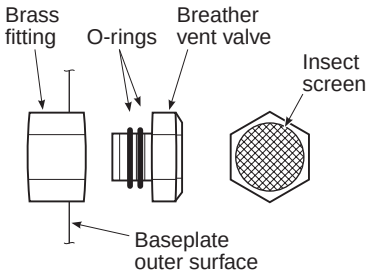
Unlike the HRE-712 List 1 unit, the air-pressure cutoff valve in the HRE-712 List 2 unit cannot be used to cut off an external air source that is applied to the Schrader air-stem valve. The HRE-712 List 2 air-pressure cutoff valve can only control the air source that is applied to the enclosure throughout the air-core stub.



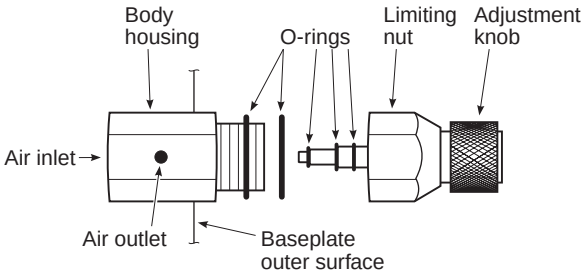
A. Pressure Relief Valve (PRV)



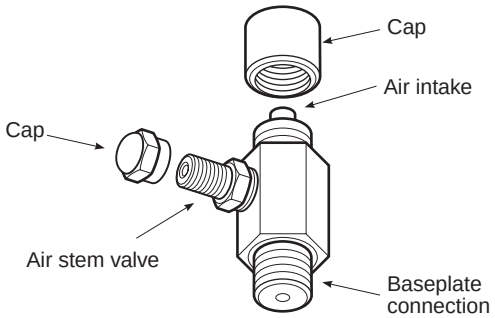
C. Air Stem Valve (ASV) (List 2 only)



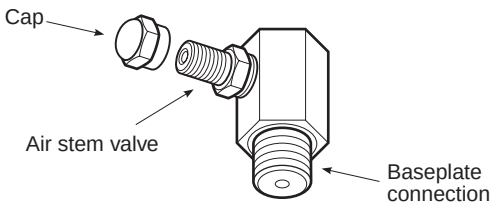
B. Breather Vent Valve (BVV)



D. Pressure Cutoff Valve (PCV)



E. Air Stem/Air Intake T-valve (List 1 only)



F. Air Stem/Air Intake T-valve (List 2 only)

Figure 3. *Metal Valves*

INSTALLATION

This section describes installation for the HRE-712 List 1 beginning on page 7 and HRE-712 List 2 beginning on page 11. The installation instructions include:

- Unpacking and Inspecting the Shipment (see "Inspecting Shipment" on page iii)
- Mounting the Enclosure
- Grounding the Enclosure
- Installing Doubler and Repeater Units
- Detaching the Enclosure from the Baseplate
- Opening the Enclosure
- Closing the Enclosure
- Pivoting the Enclosure

PRIOR TO MOUNTING

To prepare the enclosure:

1 Remove the HRE-712 from its shipping carton. The dome enclosures and mounting base are packaged separately within the shipping carton.

2 Verify that all equipment listed on the packing list is present.

3 Inspect the enclosure, card cage, and O-ring for shipping damage:

4 On the rearbase of the card cage, loosen the retaining screws.

5 Tilt the card cage on its hinge. Lower the card cage to its level position and tighten the screws to lock it in position. Always keep the card cage in a level, locked position.

In order to preserve the integrity of the sealed interface between the stub and the metal base, the stub should not be used as a handle to carry the enclosure or as a means to lower it into a manhole.

A test card, HTC-439 List 2, is provided free of charge with every HRE-712 to provide an easy method for you to test the four cable pairs connected to every HRE-712 slot.

The HTC-439 List 2 is shipped in a separate carton within the HRE-712 carton. For information on using the test card, refer to the accompanying technical practice.

MOUNTING THE HRE-712 LIST 1

The HRE-712 List 1 may be mounted in a rack, pole, pedestal, or flat surface using the enclosure mounting bracket assembly. Because of its weight, a vertical orientation is preferred to reduce the thermal stress on the plugs. In addition, a shady location is preferred. Table 4 on page 26 list the temperature specifications.

This section contains separate mounting instructions for each of these installations as follows:

- Pedestal or pole mounting with a pole diameter of less than or equal to 7 inches (17.78 cm), refer to "Pedestal or Small Pole Mounting the HRE-712 List 1" on page 8.
- Pole mounting with a diameter greater than 7 inches (17.78 cm), refer to "Large Pole Mounting the HRE-712 List 1" on page 9.
- Flat surface mounting, refer to "Flat Surface Mounting the HRE-712 List 1" on page 9.
- Rack mounting, refer to "Rack Mounting the HRE-712 List 1" on page 10.

While mounting the enclosure using any of these procedures, hold the enclosure securely to prevent personal injury or damage to the enclosure.

Because of the size and weight of the enclosure, you may want to remove the dome before beginning the mounting procedure. For more information, see "Detaching the Enclosure from the Baseplate" on page 15.

Figure 4 below shows the mounting brackets.

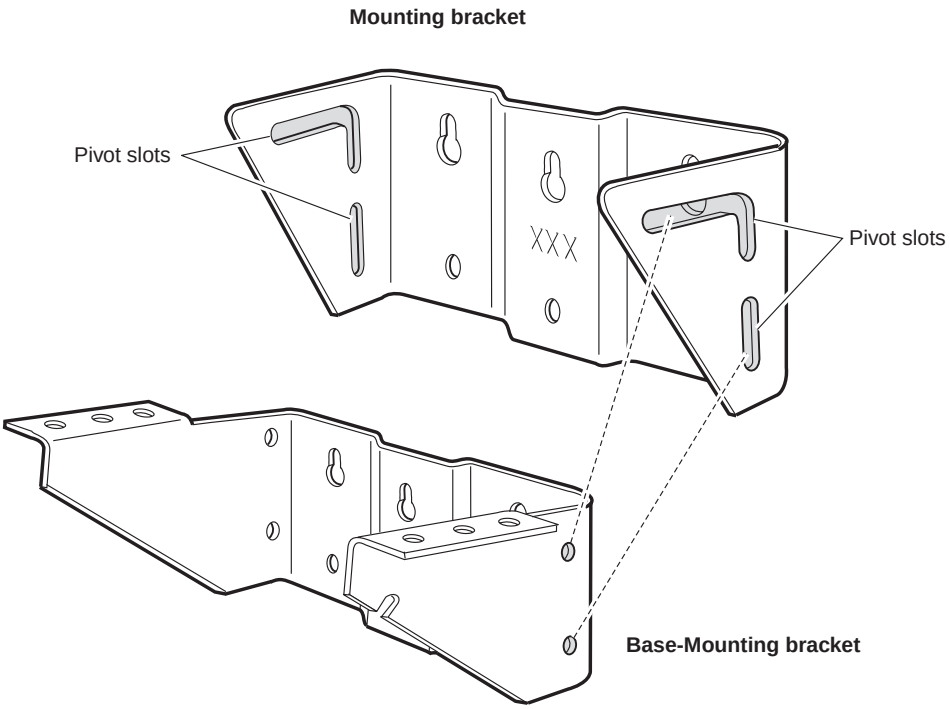


Figure 4. *Pivot-Mounting Bracket*

Pedestal or Small Pole Mounting the HRE-712 List 1

This procedure details how to mount the enclosure on a pole or pedestal where the pole is less than 7 inches (17.78 cm) in diameter.

Have the following equipment ready before you begin this procedure:

- Two $^{3}/_{8}$-inch (0.952 cm) lag 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

To mount the enclosure, follow these steps:

1 Select a mounting location on the pedestal or pole.

2 Remove the mounting bracket from the HRE-712 by removing the four bolts that connect each sideplate as shown in Figure 4 on page 7.

3 Position the mounting bracket against the pedestal or pole. The mounting bracket must be positioned so the stub will be down. Mark the location of the two center mounting holes. Remove the mounting bracket.

4 Drill two $^{1}/_{4}$-inch (0.635 cm) diameter holes at the locations marked in Step 3. Each hole should be drilled approximately 3 inches (7.62 cm) into the pole.

5 Start a lag bolt in the top center bottom mounting hole by tightening the lag bolt into the pole or pedestal approximately $^{2}/_{3}$- inch (1.70 cm).

6 Insert a lag bolt into the bottom hole of the mounting bracket and tighten the bolt.

7 Secure the enclosure bracket to the pole or pedestal by tightening the two lag bolts.

8 Reattach the enclosure to the mounting bracket and torque the four mounting bracket bolts 30 to 40 inch-pounds (3.4 to 4.5 Newton-meters).

9 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 Mounting the HRE-712 List 1

This procedure describes how to mount the enclosure on a pole with a diameter greater than 7 inches (17.78 cm). Figure 4 on page 7 shows the mounting bracket.

Have the following equipment ready before you begin:

- Four $^{3}/_{8}$-inch (0.952 cm) lag 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

To mount the enclosure, follow these steps:

1 Select a mounting location on the pole.

2 Remove the enclosure base mounting bracket from the mounting bracket by removing the four bolts that connect each side plate shown in Figure 4 on page 7.

3 Position the mounting bracket with the stub down against the pole and mark the location of the top outside mounting holes. Use the four corner mounting holes for this application. Remove the mounting bracket.

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

5 Start an anchor bolt in each of the two top matched mounting slots by tightening the bolts into the pole approximately $^{2}/_{3}$ of an inch.

6 Insert the lag bolts into the two holes on the outside bottom of the mounting bracket. Tighten the lag bolts.

7 Secure the enclosure bracket to the pole by securely tightening all lag bolts.

8 Reattach the enclosure base mounting brackets with the four side plate bolts and torque the mounting bracket bolts 30 to 40 inch-pounds (3.4 to 4.5 Newton-meters).

9 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 the HRE-712 List 1

This procedure describes how to mount the enclosure on a flat surface. You must allow room for enough top clearance to remove the cover. Allow at least 5 inches (12.7 cm) of clearance above the dome, if the 31° tilt feature is used. Allow at least 13 inches (33.1 cm) of clearance, if the tilt feature is not used. Figure 4 on page 7 shows the mounting bracket.

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

To mount the enclosure, perform these steps:

1 Select a mounting location on a wall.

2 Remove the enclosure base mounting bracket by removing the four bolts that connect each side plate, as shown in Figure 4 on page 7.

3 Position the mounting bracket against the wall and mark the location of the four outside mounting holes. Remove the mounting bracket.

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

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

6 Insert and tighten the anchor bolts in the two bottom mounting holes located on the outside of the mounting bracket.

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

8 Reattach the enclosure base mounting brackets to the mounting bracket with the four side plate bolts and torque the mounting bracket bolts 30 to 40 inch-pounds (3.4 to 4.5 Newton-meters).

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 the HRE-712 List 1

This procedure describes how to mount 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. Do not use the rack ground for the enclosure ground since its integrity is not 100 percent reliable.

- One wrench.

To rack mount the enclosure, follow these steps:

1 Select a location on the cable rack.

2 Position the enclosure so that the 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.

5 Dress out the stub and attach it to the main feeder cables as described in "Splicing Procedure" on page 29.

6 Activate the desiccant bag shipped with the HRE-712 prior to closing the lid by removing the bags from their plastic containers and placing them inside the enclosure.

MOUNTING THE HRE-712 LIST 2

The HRE-712 List 2 enclosure attaches to a laminated, stainless mounting base which attaches to a rack or flat mounting surface. The right angle dressing of the HRE-712 List 2 stub precludes vertical mounting to a pole.

This section contains separate mounting instructions for each of these installations as follows:

- Flat surface mounting
- Rack mounting

The domed enclosures and common mounting base are packaged separately and shipped in a single carton.

While mounting the enclosure using any of these procedures, hold the enclosure securely to prevent personal injury or damage to the enclosure.

Because of the size and weight of the enclosure, you may want to remove the dome before beginning the mounting procedure. For more information, see "Detaching the Enclosure from the Baseplate" on page 15.

Flat Surface Mounting the HRE-712 List 2

This procedure describes how to mount the enclosure on a flat surface. Allow at least 10 inches (25.4 cm) of clearance in front of the enclosure so the cover can be removed.

Have the following equipment ready before you begin this procedure:

- Four $^{5}/_{8}$-inch (16 mm) 16 NC anchor bolts, $2^{1}/_{2}$ inches (6.4 cm) long for wall mounting.
- Four $^{5}/_{8}$-inch (16 mm) washers
- One wrench
- A pencil
- One drill with a $^{1}/_{2}$-inch (13 mm) bit

To rack mount the enclosure, follow these steps:

1 Select a mounting location on a wall.

2 Remote the mounting bracket from the shipping carton.

3 Position the mounting bracket against the wall and mark the locations of the four outside mounting holes. Remove the mounting bracket.

4 Drill four $^{1}/_{2}$-inch (13 mm) diameter by $2^{1}/_{2}$ inches (6.4 cm) deep holes at the locations marked in Step 3.

5 Attach and secure the baseplate to the mounting surface with the four anchor bolts.

6 Attach the enclosure to the baseplate with the four $^{3}/_{8}$-inch (9.5 mm) mounting bolts and torque the bolts 30 to 40 inch-pounds (3.4 to 4.5 Newton-meters).

7 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 the HRE-712 List 2

This procedure describes how to mount the enclosure to the two rack-mounting rails that are customarily used in manholes.

Have the following equipment ready before you begin this procedure:

- Four $^{5}/_{8}$-inch (1.6 cm) thru bolts, $1^{1}/_{2}$-inches long for rack mounting.
- Four $^{5}/_{8}$-inch (1.6 cm) nonmetallic washers. Nonmetallic washers are required to avoid a ground loop that may result if both the rack and the enclosure are grounded. Do not use the rack ground for the enclosure ground since its integrity is not 100 percent reliable.
- One wrench

To rack mount the enclosure, follow these steps:

1 Position the baseplate on the two mounting rails.

2 Attach the baseplate to the mounting rails with the four $^{5}/_{8}$-inch (1.6 cm) mounting bolts.

3 Slide the thru-bolts with nonmetallic washers through the outside slots and holes of the mounting bracket shown in Figure 5. Begin tightening the bolts into the mounting holes.

4 Dress out the stub and attach it to the main feeder cables as described in "Splicing Procedure" on page 29.

5 Activate the desiccant bag shipped with the HRE-712 prior to closing the lid by removing the bags from their plastic containers and placing them inside the enclosure.

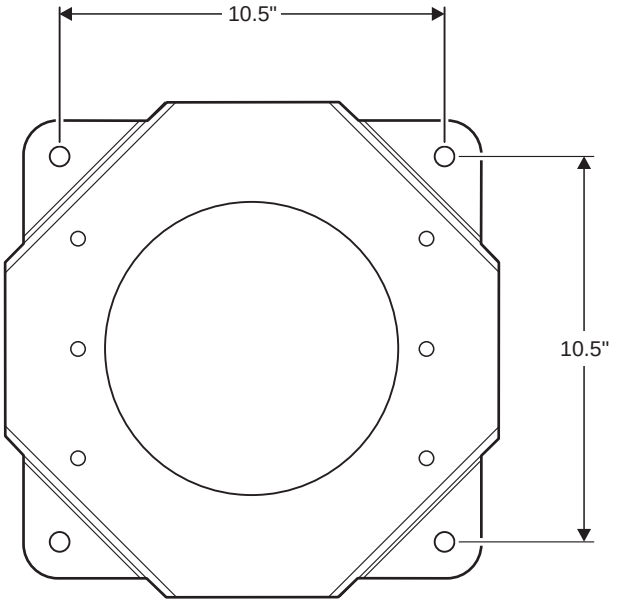


Figure 5. *Base Plate Mounting Bracket*

6 Ground the enclosure as described in "Grounding the HRE-712 List 1 and List 2" on page 13.

7 Install doublers or repeaters as described in "Installing Doubler and Repeater Units" on page 15.

8 Close the enclosure cover as described in "Detaching the Enclosure from the Baseplate" on page 15.

GROUNDING THE HRE-712 LIST 1 AND LIST 2

The HRE-712 List 1 and List 2 require a resistance of 25 Ω or less to ground as measured with a Megger-type ohmmeter.

Grounding the stub shield reduces the possibility of EMI interference and stub shield corrosion. Both units are shipped with their stub shield connected to the enclosure ground plane through the 8-mil aluminum, braded grounding strap (shown in Figure 7 on page 19).

The stub shield may also be grounded to the shield of the main feeder cable. If this is preferred the stub shield's internal braded grounding strap should be opened to prevent ground loops, which could cause service affecting noise interference. This braded aluminum shield may also need to be temporarily removed from the enclosure ground lug when troubleshooting ground faults. To do so, remove the screw that secures the braided ground strap to the mounting bracket on the card cage.

The stub's screen divider is an insulated floating divider separating the Group 1 and Group 2 pairs from the Group 3 and Group 4 pairs. DO NOT GROUND THIS SCREEN DIVIDER. Doing so could result in degraded performance.

Grounding the HRE-712 requires the use of the following equipment:

- One bullet bond
- One ground rod for pole mounted enclosures (may require more than one rod)
- One Megger-type ohmmeter
- A 24-inch, 6 AWG enclosure spaced jumper (shipped with the HRE-712)

To ground the HRE-712, refer to Figure 6 on page 14 and follow the steps below:

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

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

If the resistance is 25 Ω or less, proceed to Step 3.

If not, follow local practices to lower the resistance to ground to 25 Ω or less before proceeding to Step 3.

Ground the HRE-712 before splicing the cable stub into the main cable. This grounding method or an accepted local grounding method must be used at all times to safeguard personnel.

If the HRE-712 is improperly grounded, the LPU surge arrestors will not work and the enclosure will be unprotected.

3 Use a 6 AWG cable to connect the enclosure ground lug to the ground connection in the manhole. Torque the ground 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 resistance requirement in Step 5 is not met, ground the main cable shield every 2,000 feet (610m).

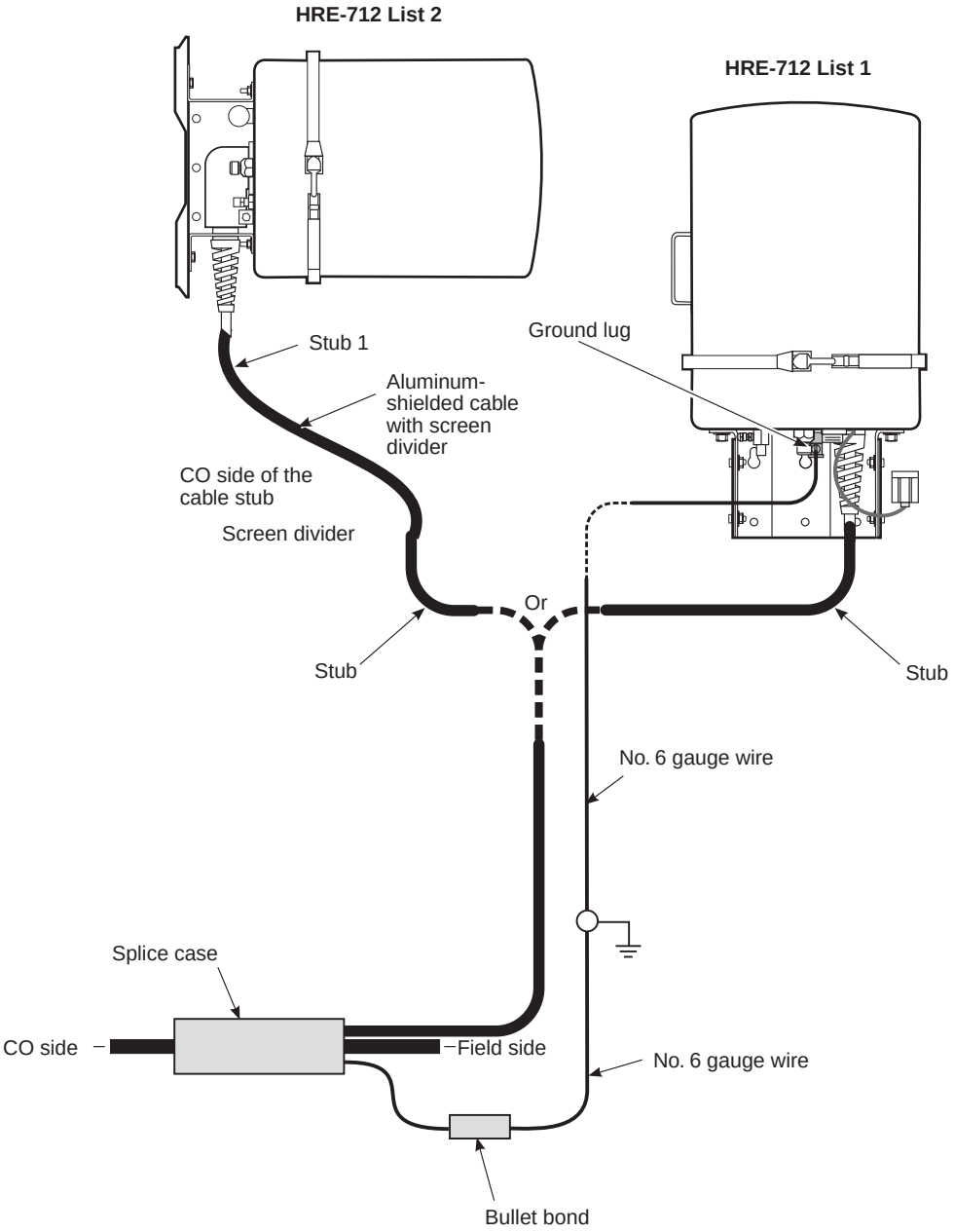


Figure 6. *Grounding the HRE-712*

INSTALLING DOUBLER AND REPEATER UNITS

To install either the doubler or repeater units, perform these steps:

1 Slide the unit into the card guides of the 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 card guide. The unit should snap into place, indicating that it is properly sealed.

Table 1 lists slot pair assignments for the doubler and repeater units supported by the HRE-712.

Table 1. *Slot Pair 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 ENCLOSURE FROM THE BASEPLATE

To detach either enclosure from the baseplate as shown in Figure 5 on page 12:

1 Remove the six baseplate mounting bolts.

2 Lift the enclosure.

OPENING THE ENCLOSURE

When handling the HRE-712 enclosure, always assume it is pressurized. Failure to relieve the pressure before removing its cover may result in serious personal injury.

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

Opening a Gel-filled Enclosure

You can open a gel-filled enclosure which is or is not being pressured.

To open a gel-filled HRE-712 List 1 enclosure, which is not being pressurized, perform these steps:

1 Unlock the enclosure.

2 Loosen the cover clamp and twist the stainless steel dome, then remove the cover clamp and stainless steel dome.

To open a gel-filled HRE-712 List 1 enclosure, which is being pressurized, perform these steps:

1 Confirm that the external pressure supply is off and verify that the pressure cutoff valve is in the open position, as shown in Figure 3 on page 5. If not, turn the cutoff valve counterclockwise until the pressure cutoff valve is in the open position. This is the standard position when operating a gel-filled enclosure in a pressurized application.

2 If you were able to turn off the external pressure supply, release the remaining pressure within the enclosure by depressing the center pin of the air stem. Unlock the enclosure. Loosen cover clamp and twist the stainless steel dome slightly to break the seal.

3 If you were unable to turn off the external pressure supply, locate the pressure cutoff valve as shown in Figure 3 on page 5. Close the pressure cutoff valve by rotating the valve clockwise one complete turn. This blocks the pressure from the external source.

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.

4 Remove the cover clamp and the stainless steel dome from the enclosure.

Opening an Air-filled Enclosure

To open an air-filled HRE-712 List 2, perform these steps:

1 Locate the pressure cutoff valve, as shown in Figure 3 on page 5.

2 Close the pressure cutoff valve by rotating the valve clockwise one complete turn. This blocks the pressure from the main cable.

3 Release the remaining pressure within the enclosure by depressing the center pin of the air stem.

4 Unlock the enclosure. Loosen cover clamp and twist the stainless steel dome slightly to break the seal.

5 Remove the cover clamp and 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 ENCLOSURE

To close the HRE-712 enclosure, perform these steps:

1 Inspect the enclosure cover and baseplate for dirt, moisture, or mechanical damage, especially around the baseplate flange and O-ring. Remove any accumulation of dirt or moisture from the cover and replace any damaged components.

2 Remove the two desiccant bags from the plastic storage bag and place them in the enclosure.

3 Fasten the slot retainer bracket in place.

4 Slide the stainless steel dome over the card cage and position it on the O-ring and baseplate.

5 Lubricate the threads of the cover clamp T-bolt with an anti-seize compound.

6 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 (1.1 and 1.7 Newton-meters).

7 If you are pressurizing an HRE-712 List 2 from a portable pressure bottle, block air from 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. Verify that the air-cutoff valve is off or turned fully clockwise. Turn on the pressure from the external source.

8 If you are pressurizing an HRE-712 List 2 from the main cable, open the air-inlet tube by turning the air valve one complete turn counterclockwise. Allow the enclosure to pressurize from the main cable through the cutoff stub.

9 If you are pressurizing an HRE-712 List 1 which has been converted to a pressurized version where the breather vent has been replaced with a pressure-relief valve, verify that the air cutoff valve is fully open or turned counterclockwise. Turn on the pressure from the external source.

10 If you are pressurizing the enclosure as described above and the unit will not monitor pressurization, 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.

11 Secure the HRE-712 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 HRE-712 LIST 1

The HRE-712 List 1 mounting plate allows the unit to be tilted 31° from its vertical position. This reduces the headroom required in manhole installations from 10 inches to less than 3 inches and the amount of valuable air space required for such underground applications.

To pivot the enclosure from its vertical position:

1 Loosen the four bolts that connect the pivot bracket to the enclosure base plate.

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 - TECHNICAL REFERENCE

Appendix A contains additional technical information about the HRE-712 List 1 and List 2 enclosures.

CARD CAGE

The card cage inside each enclosure, shown in Figure 7, has 12 mounting positions for doublers and repeaters. They are front loading, arranged in three rows of four slots each. Each row has its own 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 cards from disconnecting when the enclosure is subjected to severe vibrations.

You can access the doublers by loosening the side wing nuts and rotating the retainer bar. The enclosure has a mechanism that enables the card cage to tilt up approximately 45° to allow 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 stubs 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 breaks the ground loop created by connecting the two cable shields and prevents circulating ground currents from possibly causing service affecting noise.

The card cage grounds through a ribbon ground connection between the base of the card cage and its side.

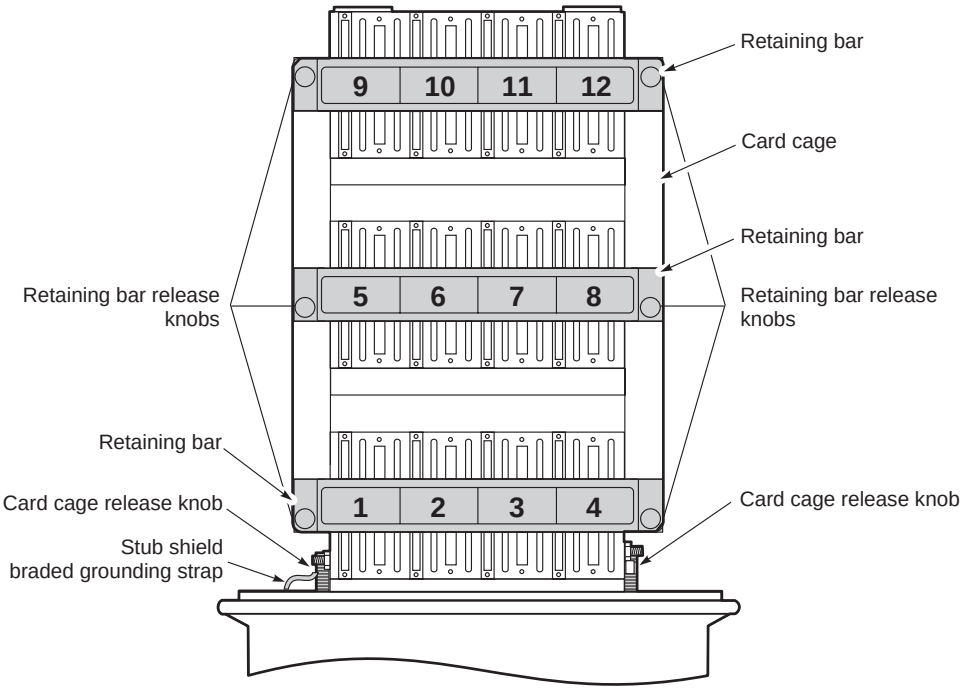


Figure 7. *Front View of HRE-712 12-slot Card Cage*

LIGHTNING PROTECTION UNIT

The Lightning Protection Unit (LPU), shown in Figure 8, 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-712 enclosures come equipped with 12 LPUs.

Each LPU contains four gas tubes that provide surge protection to each of the slots' four ports. The tubes have three leads that 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, 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 B - Specifications" on page 38 for details on replacing an LPU.

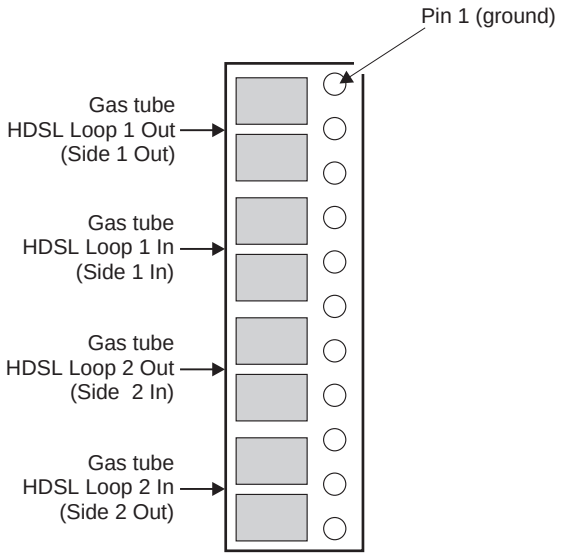


Figure 8. *Lightning Protection Unit*

CABLE STUB AND PRESSURIZATION

The HRE-712 List 1 and List 2 enclosures are equipped with a single 30-foot (9.1 m) screened cable stub. Table 2 on page 24 provides a complete description. The stub is available in an HRE-712 List 1 (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 HRE-712 List 2 enclosure is pressurized and 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, shown in Figure 2 on page 3, controls the flow through the air-inlet tube. For additional information, refer to "HRE-712 List 2 Air-Filled Stub" on page 3.

The HRE-712 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, impelling the dome away from the housing and potentially 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. The pressure-relief valve should be used as a safety device to limit the maximum internal pressure in the enclosure.

The pressure-relief 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 within any safety concerns that might apply to the housing, personnel, or cable.

HRE-712 List 1 Vented-to-Pressurized Conversion Procedure

The following instructions are for converting the HRE-712 List 1 gel-filled vented enclosures to external pressurized enclosures.

The HRE-712 List 1 enclosure can be converted to a pressurized housing that uses a continuous, local air pressure source. The conversion requires replacing the breather-vent valve with an optional pressure-relief valve. The breather-vent assembly, located in the base pan, allows the internal pressure to equalize with the outside pressure. The optional pressure-relief valve (provided in the shipping kit) replaces the breather-vent valve and prevents over pressurization when pressurizing from an external air source. The HRE-712 List 1 is equipped 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, with Figure 1 on page 2, to convert the HRE-712 List 1 enclosure from a vented housing to a pressurized one:

1 Locate the breather-vent valve on the bottom of the housing. Figure 3 on page 5 shows the metal valve located adjacent to the cable stub inlet.

2 Remove the valve by unscrewing it in a counterclockwise direction.

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

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

5 Remove the pressure-relief valve from the plastic bag. Verify that an O-ring is installed on the threaded end of the valve.

6 Carefully place the threaded end of the air-pressure cutoff valve into the threaded brass fitting from which the breather-vent assembly was removed.

7 Hold the valve straight and push it into the hole. Turn the valve clockwise to screw it in place.

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

8 Handtighten the valve until it is tight against the gasket material.

The housing is now ready to be pressurized either through the T-valve's Schrader air-stem valve, which accepts a standard tire valve chuck, or through its external air-intake stem, as shown in Figure 1 on page 2. A desiccant bag is also included with the air-pressure cutoff valve in the HRE-712 List 1 shipping kit. Remove this bag and place it in the HRE-712 prior to pressurization.

The tube and fitting assembly required for the conversion procedure is also called an Express Air Connection Fitting.

The plastic tube is not supplied by ADC.

1 Attach a $^{1}/_{4}$-inch (.64 cm) inner diameter by $^{3}/_{8}$-inch (.83 cm) outer diameter plastic tube (not included) to the $^{1}/_{4}$-inch (.64 cm) air-intake stem T-valve.

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

SPARE CONNECTIONS

The HRE-712 stub has three spare pairs and one order wire pair located in the Inner Statial (IS) group. All spare pairs are folded back for easy access.

ORDER WIRE CONNECTIONS

The access port for the external order wire pair in each enclosure 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. Unscrew the order wire protective cap to expose the wire terminals as shown in Figure 2 on page 3.

WIRING

A single cable stub on the HRE-712 provides access to the main cable. The stub is a 52-pair, 24-gauge, S-screened cable with four 12-pair binder groups and a 4-pair inner statial group. Table 2 below details the pair assignments, numbering, color codes, and other stub details of the four 12-pair binder groups. Table 3 on page 25 defines the four pair inner statial group. All four pair groups have the same color coding.

Table 2. *Binder Group Stub Cable Termination*

Stub Cable Termination for HRE-712 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
11	BL	BL-BK	BL	5	O	BL-BK	BL	3	G	BL-BK	BL	11	BR	BL-BK	BL	8
			BK	6			BK	4			BK	12			BK	9
12	BL	O-BK	O	5	O	O-BK	O	3	G	O-BK	O	11	BR	O-BK	O	8
			BK	6			BK	4			BK	12			O	9

Table 3. *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 12 shelf slots as shown in Table 2 on page 24. The HRE-712 is wired in a typical mini-repeater fashion and follows Side 1 and Side 2 terminology. The terminology adheres to conventional T1 terminology, which describes a unidirectional (simplex) service. HDSL is 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. The HRE-712 can be used to house HiGain doublers, ISDN, DDS, or 239 repeaters. The wiring diagram described in Table 2 on page 24 has been made into a gummed label, shown in Figure 9, that is attached to the inside of the stainless steel dome for easy reference.

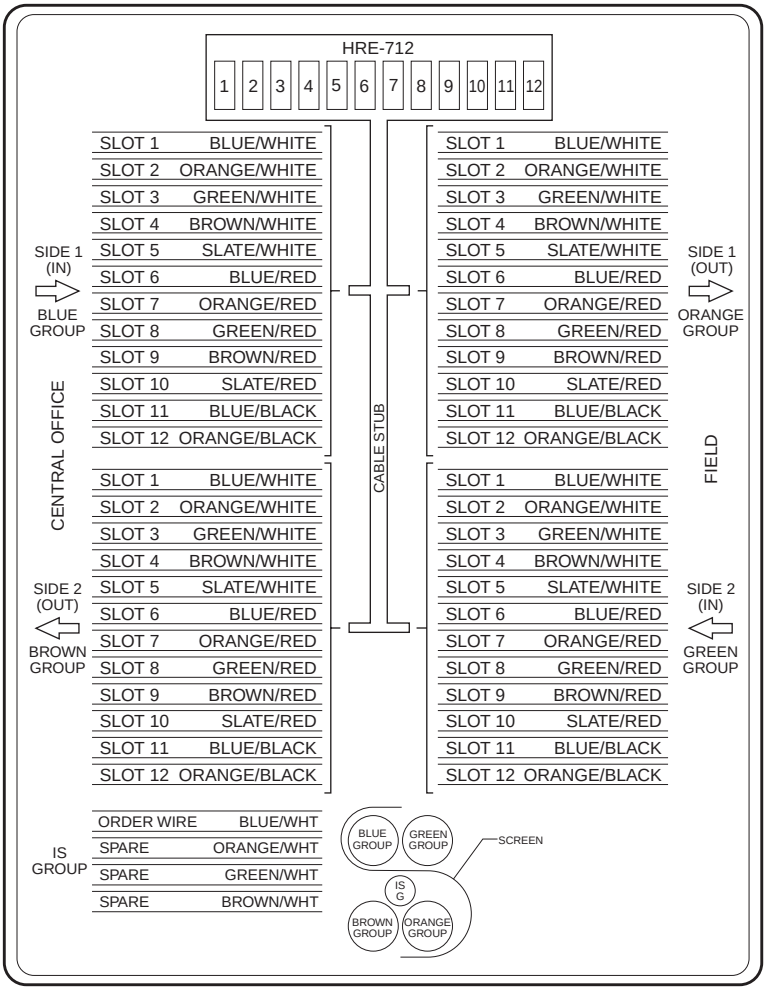


Figure 9. *Wiring Diagram Gummed Label*

GENERAL DEPLOYMENT RULES

The HRE-712 is an airtight enclosure. The ambient environment traps heat generated by the installed cards and causes a significant rise in temperature within the enclosure. The number of doublers or repeaters that can be reliably housed in the HRE-712 is a function of each plug type, doubler version and solar exposure. Table 4 lists the HRE-712 deployment rules.

- Even if the deployment rules are followed, the metal surfaces of the installed cards can feel hot when removed from an HRE-712 that is operating in elevated ambient temperatures. These conditions are normal for the plugs operating under these circumstances.
- When less than 12 slots are being used at initial start-up, assign the slots in the following sequence to reduce the hot spot temperature.

In order to comply with the requirements in TA-NWT-001210 (maximum ambient temperature of 115°F (46°C) with full solar load), the number of full T1 HDU-439 or HDU-437 doublers must be limited to ten per enclosure without full solar load or eight 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 12 slots are occupied with full solar load. The thermal equivalence relationships are:

1 (HDU-437,439) = 1.5 (HDU-217, 219, 407, 409) = 2 (DSS or ISDN repeater) = 4 (239 T1 repeater)

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

Unoccupied Slot Numbers	Max. Number of Occupied Slots per Enclosure	Solar 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	12	Full	90°F (32°C)	115 °F (46°C)
None	12	None	105°F (41°C)	125 °F (52°C)
	10	Full	105°F (41°C)	125 °F (52°C)
	10	None	115°F (46°C)	135 °F (57°C)
	8	Full	115°F (46°C)	135 °F (57°C)
	8	None	125°F (52°C)	145 °F (63°C)
	6	Full	125°F (52°C)	145 °F (63°C)
	6	None	135°F (57°C)	150 °F (66°C)

(a) Thermal Load: FULL = maximum sunlight exposure per TR-TSY-000057. NONE = indoor or fully shaded.
(b) All maximum ambient temperatures of 115°F (46°C) or more with full solar load comply with the outside deployment requirements of section (10.2.1.3) in TA-NWT-001210.

The physical locations of the HRE-712 doubler enclosures are determined 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 places:

- 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 to be realized, if the fifth span to the remote unit is also 35 dB.

Only the HDU-409 and HDU-407 doublers can be used in circuits with more than three spans (three or four doublers).

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 ensures the maximum operating margin, resulting in optimum transmission performances. Use Rule 3 if specific application constraints prevent using Rule 2, or if two different circuit layout choices have the same maximum span loss.

3 The third rule minimizes the power consumption and dissipation of the HLU which provides the doubler power. 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 HLU.

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

MAINTENANCE

The splicing maintenance consists of connecting the wire pairs of the HRE-712 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, see "Pre-Splicing Procedure" on this page.
- Splicing the stubs into the main cable, see "Splicing Procedure" on page 29.
- Dressing and taping the final splice in the splice case, see "Post-Splicing Procedure" on page 31.

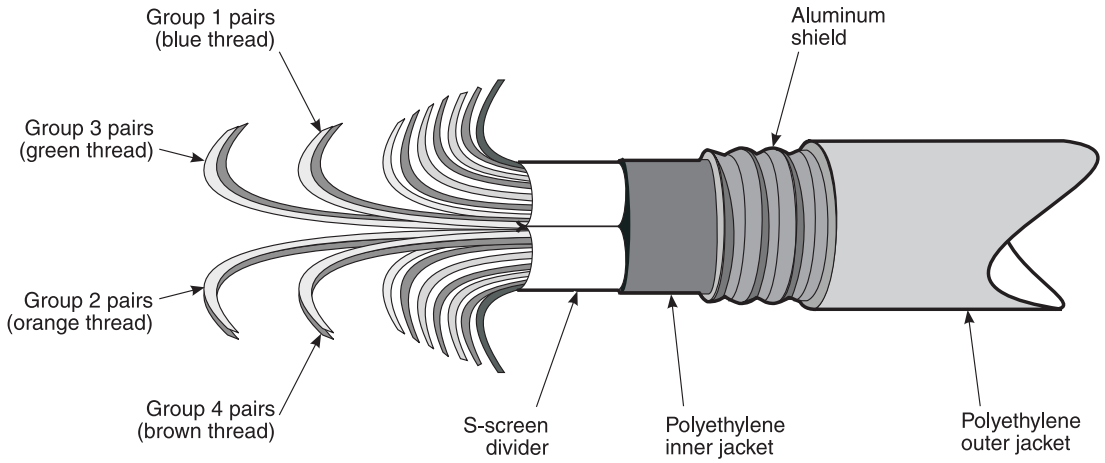


Figure 10. *Cable Stub Construction*

When using these procedures to splice stub pairs into the main cable, maintain cable pair integrity by following local practices as required.

Pre-Splicing Procedure

Perform the following steps to pre-splice the enclosure cable stub:

Ground the HRE-712 enclosure before splicing the cable stubs into the main cable. The grounding method discussed in "Grounding the HRE-712 List 1 and List 2" on page 13 or an accepted local grounding method must be in effect at all times to safeguard personnel.

The HRE-712 comes with a screened cable stub that is precut and capped.

The cable butt is considered to be the end of the cable stub most distant from the enclosure.

1 Strip a sufficient length of outer jacket, aluminum shield, and mylar sheath from the cable stub.

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

3 Install shield bonding connectors in accordance with standard practices.

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.

If 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 weather if it is left unattended prior to completion.

Splicing Procedure

Certain applications involve splicing the cables on the HRE-712. The following section describes splicing procedures and wire list information.

1 Splice the cable stub to the main cable using the wire identification information in Table 2 on page 24.

2 Visually inspect each splice for split pairs, opens, and shorts.

Do not cross-splice defective pairs between enclosures. 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, as shown in Figure 11 on page 30.

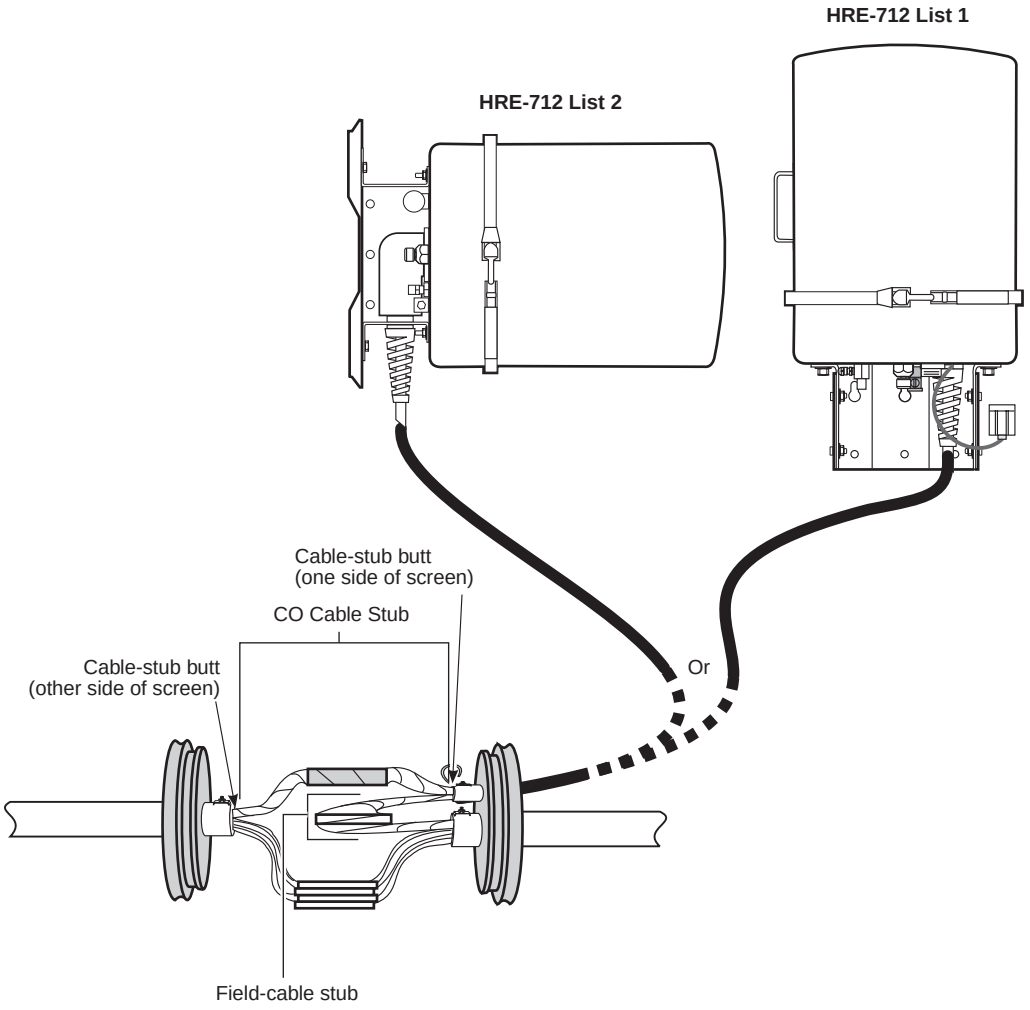


Figure 11. *Dress Splice in Splice Case*

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 as shown in Figure 11 above or dress out the splice according to local procedures.

7 Repair or correct defective or wandering pairs before closing the splice. These corrections help maintain the validity of the color code sequence of the cable stub in relation to the pair count and main cable.

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

The post-splice procedure involves the following steps:

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, as shown in Figure 12.

2 Repeat Step 1, wrapping the pairs on the other side of the screen of the CO cable stub in the same manner.

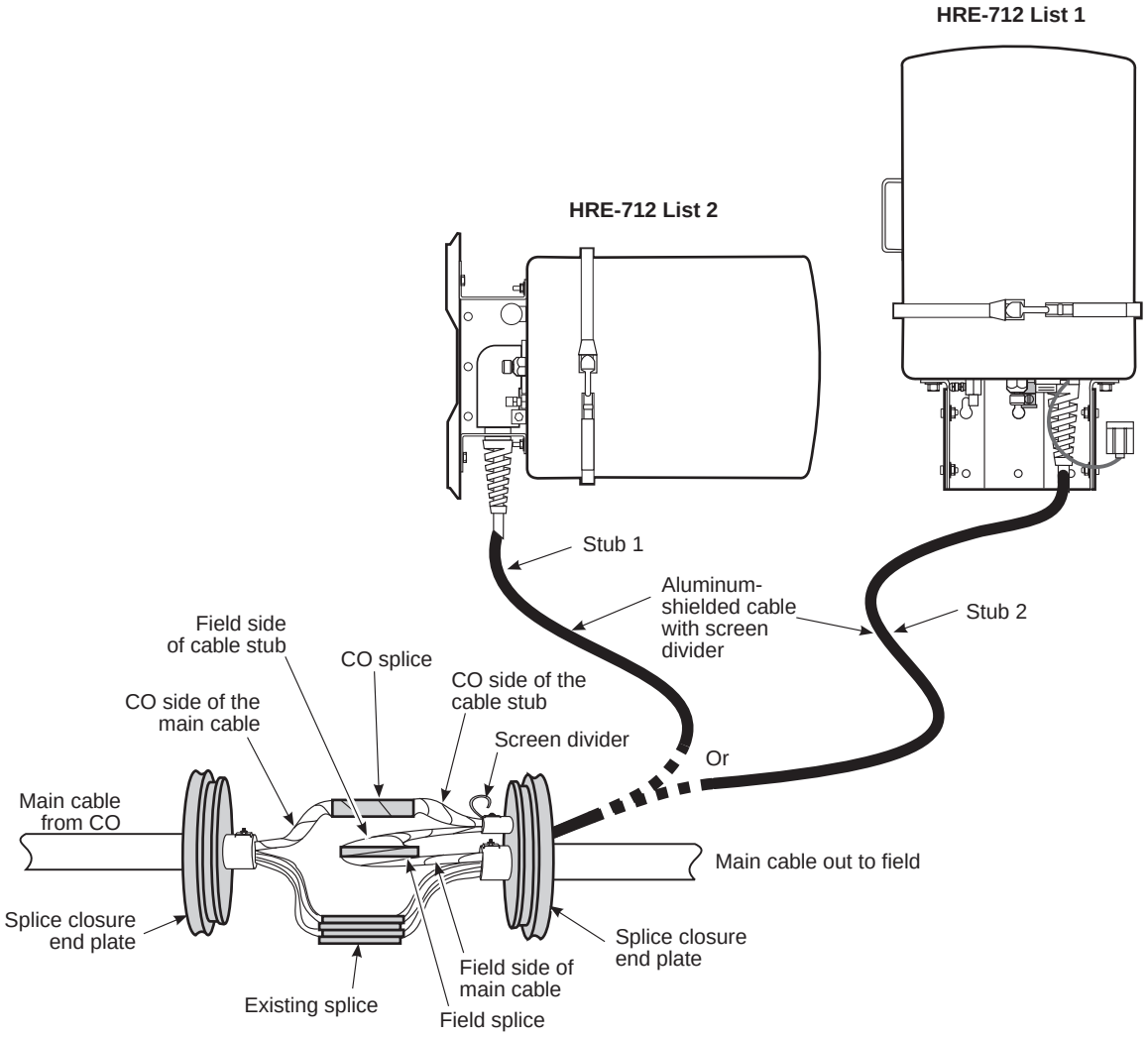


Figure 12. *Post-Splicing Procedure*

3 Starting at the cable stub butt shown in Figure 12, 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 EMI sources. For these applications, dress out the splice per local practices.

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

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

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 manner.

The screen divider is an insulated floating divider that isolates Group 1 (blue thread sides 1 and 2 in) from Group 2 (orange thread sides 1 and 2 out).

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.

8 Fold each corner at a 45° angle to the center of the screen as shown in Figure 13.

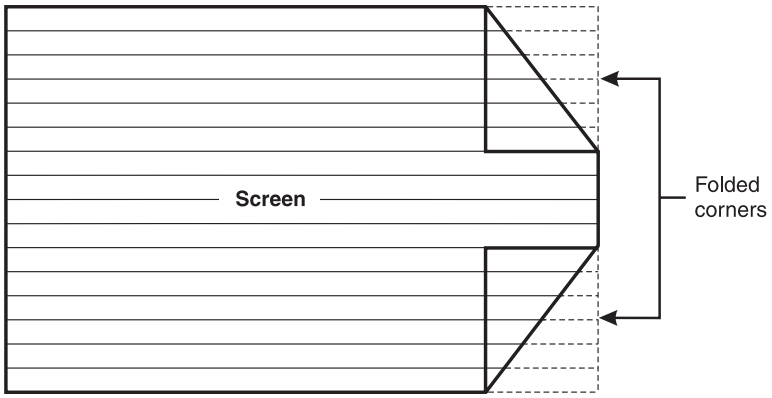


Figure 13. *Screen Folding Diagram*

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

10 Position the folded 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-712 contains LPU surge arrestors that can be replaced in the field if needed. Additionally, 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 can be replaced in the field if they become damaged. Table 5 on page 34 lists replacement part numbers.

When replacing the stainless steel dome cover, it is necessary to replace the 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.

To replace LPU arrestor boards:

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

1. Clean the dome cover and clamp of dust and debris.
2. Remove the clamp and dome cover.
3. Remove the defective LPU board.
4. Insert a new LPU board in the vacant position.
5. Replace other defective LPU boards in the same manner.

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 O-ring, if damaged.
7. Replace cover and clamp and repressurize housing if required per “Detaching the Enclosure from the Baseplate” on page 15.

Table 5. *Replacement Part Kits*

Number	Quantity	Part
132-1029-01		Cover, Metal Locking Clamp, O-Ring, Desiccant
	1	Dome Cover
	1	Dome Cover O-Ring
	1	V-Band Locking Clamp
	2	Desiccant (2-unit bag)
132-1011-01		O-Ring, Desiccant
	1	Dome Cover O-Ring
	2	Desiccant (2-unit bag)
132-1034-01		LPU Surge Arrestor, Desiccant
	1	Single Slot, 4 Port, Protection LPU Board
	2	Desiccant (2-unit bag)
132-1014-01		Metal Locking Clamp, O-Ring, Desiccant
	1	Dome Cover O-Ring
	1	V-Band Locking Clamp
	2	Desiccant (2-unit bag)
132-1038-01		Valve Kit
	2	Pressure-Relief Valves
	2	Breather-Vent Valves
	2	Air-Stem Valves
	2	External Air-Pressure Cutoff Valves
	2	Air Intake T-Valve Caps
	2	Desiccant (2-unit bag)
132-1016-01		Hardware Installation Kit
	4	1 inch (2.54 cm) long, $^3/_8$-inch (2.54 cm) mounting bolt
	4	$^3/_8$-inch (2.54 cm) mounting nut
	4	$^3/_8$-inch (2.54 cm) mounting washers
	4	4-inch (10.16 cm) mounting lag bolts
	2	Desiccant (two-unit) bag

VALVE REPLACEMENT PROCEDURES

All four of the metal valves shown in Figure 3 on page 5 can be replaced if needed. Order the valve replacement kit #132-1038-01 (listed in Table 5 on page 34) to obtain new valves. Use the following procedures when replacing any of the four valves.

Replacing the Pressure Relief Valve

The Pressure Relief Valve (PRV) is part of an all metal, nickel plated brass assembly shown in Figure 3 on page 5. The valve acts as a guard against excessive pressure within 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 base plate 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 $^{3}/_{4}$-inch wrench and the PRV with a $^{1}/_{2}$-inch wrench.

2 While holding the adapter nut steady (it should not be moved), loosen the PRV by turning it counterclockwise then remove the PRV 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 Grip the adapter nut with a $^{3}/_{4}$-inch wrench and the PRV with a $^{1}/_{2}$-inch wrench and tighten the PRV to 120 inch-pounds of torque. Do not overtighten. Excessive torque does not improve the seal and may damage the PCV.

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

Replacing the Breather-Vent Valve

The Breather-vent Valve (BVV) is an all-metal, nickel plated brass unit shown in Figure 3 on page 5. The BVV allows air to circulate into the enclosure so it can breath and avoid the build up of excessive moisture and other contaminates. It has a hollow threaded stem that connects into a brass fitting located at the bottom of the base. An O-ring is located on its outer threaded stem that connects to the brass fitting. The hollow stem contains a piece of plastic screen to prevent insects from migrating into the enclosure.

To remove and replace the breather vent:

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

2 Verify that the new BVV is equipped with its O-ring.

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

4 Grip the BVV with a $^{3}/_{4}$-inch wrench and tighten the valve to 60 inch-pounds of torque. Do not overtighten. Excessive torque does not improve the seal and may damage the PCV.

Replacing the Air-Stem Valve

The Air-stem Valve (ASV) is part of an all metal, nickel plated brass assembly shown in Figure 3 on page 5. The ASV pressurizes the enclosure from an external air supply or release the internal pressure.

The assembly consists of an adapter that screws into a brass fitting located at the bottom of the base. The ASV itself, which screws into this adapter and the cap, connects to 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 $^{3}/_{4}$-inch wrench and the ASV with a $^{7}/_{8}$-inch wrench.

2 While holding the adapter nut steady (it should not be moved), loosen the ASV by turning it counterclockwise and then remove the valve 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 adapters inner well has remained in place. If not, reseat it.

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

5 Grip the adapter nut with a $^{3}/_{4}$-inch wrench and the PRV with a $^{7}/_{8}$-inch wrench and tighten the latter to 120 inch-pounds of torque. Do not overtighten. Excessive torque does not improve the seal and may damage the PCV.

6 Pressurize the chamber and check entire assembly for leaks.

The identical ASV is used in the Air-stem/Air Inlet T-valve assembly. Only the ASV in the T assembly may be replaced.

Replacing the Pressure-Cutoff Valve

The Pressure-Cutoff Valve (PCV) is part of an all-metal, nickel plated brass 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 interlocked 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 tip has thread O-rings that open and close the air flow through the base of the body housing.

When the adjusting nut is fully clockwise, the air flow is OFF. When it is rotated one turn clockwise, the airflow is ON. The body housing also has a thread O-ring to create an airtight seal when the limiting nut is tight.

To remove and replace the PCV:

1 Loosen the limiting nut with a 1-inch (2.54 cm) wrench by turning it 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. Turn them 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 completely disengaged. Some resistance will occur as the stem's O-rings rub against the walls of the body housing.

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, which includes the limiting nut, adjustment knob, and all O-rings. Do not attempt to disassemble it.

Insert the valve stem into the body housing's threaded tip as far as possible. Some resistance will occur as the O-rings contact the inner housing threads.

6 Rotate the limiting nut one-half turn clockwise.

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

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

9 Use the 1-inch (2.54 cm) 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.

10 Check that the adjusting knob has at least $1^{1}/_{2}$ turns of free movement in and out.

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

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

13 Pressurize the chamber and check the entire assembly for leaks.

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

APPENDIX B - SPECIFICATIONS

Environment

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

Dimensions

Domed stainless steel enclosure with stainless steel composite baseplate

Height:	19 in (48.3 cm)
Diameter:	12.4 in (31.5 cm)
Volume:	1.55 ft^3 (.042m^3)
Weight:	41 lbs (18.6 kg), boxed shipping weight 43 lbs (19.9 kg)
Baseplate Length	13.5 in (34.3 cm)
Baseplate Width	13.5 in (34.3 cm)

Stub Diameters

Gel:	1 in (25.4 mm) maximum
Air:	0.8 in (20 mm) maximum

Figure 14 below and Figure 15 on page 40 show the location of the CLEI code and P1 label on the HRE-712 List 1 and List 2. Table 6 on page 40 describes the label.

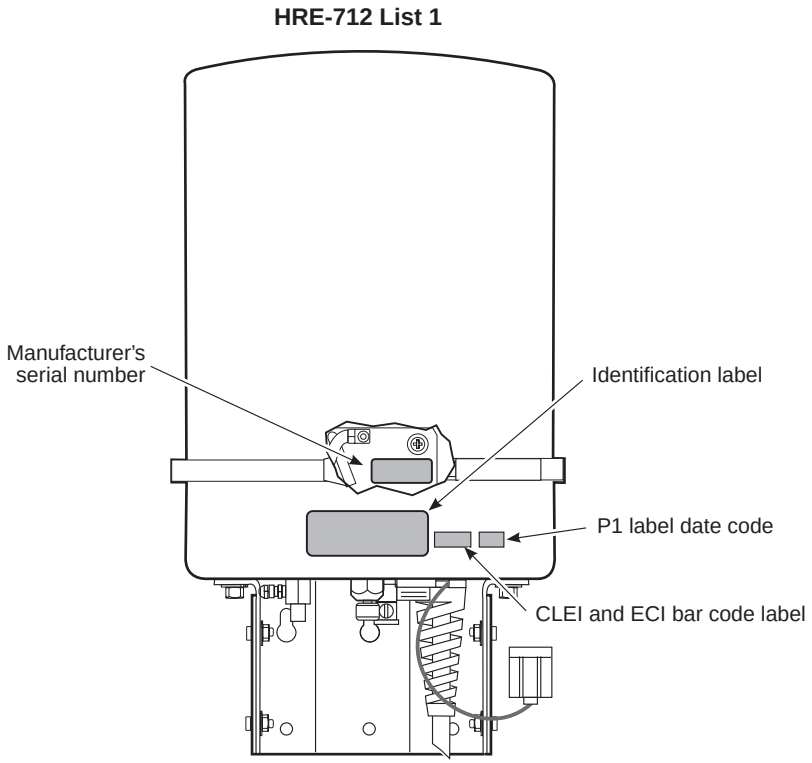


Figure 14. *HRE-712 List 1 Bar Code and P1 Label Locations*

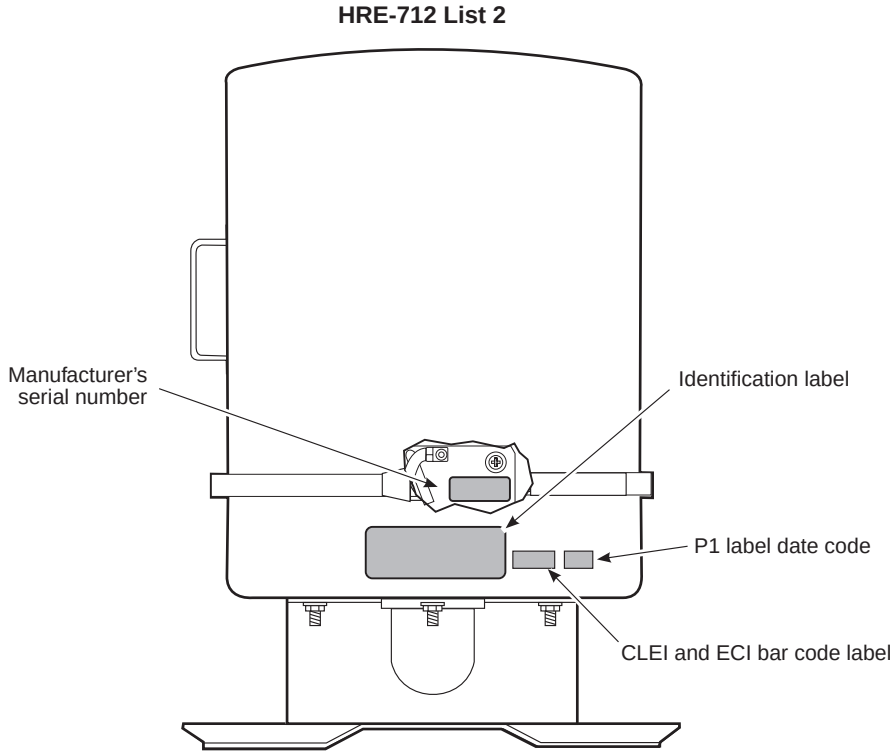


Figure 15. *HRE-712 List 2 Bar Code and P1 Label Locations*

Table 6. *Bar Code and P1 Label Information*

Name	Description
CLEI and 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	Contains the serial number, date code, and configuration code. Date code consists of: • YY: Last two digits of shipment year. • DDD: Julian date Configuration code consists of : • Part number • Xnn: Configuration code
Manufacturer's Identification Label	Contains the identification number supplied by the customer.
Manufacturer's Identification Label	Contains the part number and manufacturer's address.

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.

Sales Assistance 800.366.3891 extension 73000 (USA and Canada) 952.917.3000 Fax: 952.917.3237	• Quotation Proposals • Ordering and Delivery • General Product Information
Systems Integration 800.366.3891, extension 73000 (USA and Canada) 952.917.3000	• Complete Solutions (from concept to installation) • Network Design and Integration Testing • System Turn-Up and Testing • Network Monitoring (upstream or downstream) • Power Monitoring and Remote Surveillance • Service/Maintenance Agreements • Systems Operation
Technical Assistance Center 800.366.3891, ext.73223 952.917.3223 Fax: 952.917.3244 Email: technical@adc.com	• Technical Information • System/Network Configuration • Product Specification and Application • Training (product-specific) • Installation and Operation Assistance • 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 800.366.3891 ext. 73748 or 952.917.3748 Fax: 952.917.3237 Email: repair&return@adc.com	• ADC Return Material Authorization (RMA) number and instructions must be obtained before returning products.

All 800 lines are toll-free in the USA and Canada.

APPENDIX D - ABBREVIATIONS

A

ANSI: American National Standards Institute

ASV: Air Stem Valve

AWG: American Wire Gauge

B

BVV: Breather Vent Valve

C

CLEI: Common Language Equipment Identifier

CO: Central Office

D

DDS: Digital Data Service

E

ECI: Equipment Catalog Item

EMI: Electromagnetic Interference

H

HDSL: High-bit-rate Digital Subscriber Line

HRE: HiGain Remote Enclosures

I

ICEA: Insulated Cable Engineers Association

IS: Inner Statial

ISDN: Integrated Services Digital Network

L

LPU: Logical Processing Unit

P

PCV: Pressure Cutoff Valve

PRV: Pressure Relief Valve

R

REA: Rural Electrification Association

CERTIFICATION AND WARRANTY

FCC COMPLIANCE

This equipment does not have a clocking source and are passive devices per FCC guidelines. When a unit is 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 60-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.

MODIFICATIONS

Any changes or modifications made to this device that are not expressly approved by ADC DSL Systems, 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 this standard:

- TR-TSY-000056 Repeater Housings for T1, T1C, T1D, T1G Carrier Systems.

For technical assistance, refer to “Appendix C - Product Support” on page 41.

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