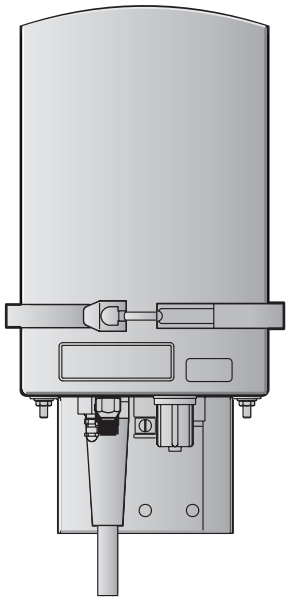
HiGain Remote Enclosure

User Manual



HRE-504

List 1
Part Number: 150-2202-01
CLEI: T1MF3004

List 1B
Part Number: 150-2202-12
CLEI: N/A

List 2
Part Number: 150-2202-02
CLEI: T1MF4004

REVISION HISTORY OF THIS Manual

Revision	Release Date	Revisions Made
01	January 20, 1999	Initial release
02	May 10, 2000	Changed from plastic to metal control valves and added HRE-504 List 1B.
03	August 01, 2002	ADC Rebranding

USING THIS Manual

Three types of messages, identified by icons, appear in text.

Notes contain information about special circumstances.

Cautions 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 45.

INSPECTING THE 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.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

OVERVIEW

The ADC® HRE-504 List 1, List 1B, and List 2 are outdoor, stainless steel, weatherproof enclosures designed to house up to four HiGain® remote or doubler units. The HRE-504 is part of a HiGain system.

FEATURES

The following features are included on the HRE-504 weatherproof enclosures:

- Four doubler card slots
- 30 foot (9.14 m) gel- or air-filled 28-pair cable stub (HRE-504 List 1 and List 2) or 100 foot (4,000 m) gel-filled 28-pair cable stub (HRE-504 List 1B)
- Flat surface, rack, or pole mount
- Primary surge protection
- Seamless stainless steel cover
- Single stub access
- Unique card guides automatically adapt every slot to three mechanics

APPLICATIONS

The primary application of the HRE-504 remote enclosure is to house HiGain doubler units in an HDSL/T1 transmission system. The HRE-504 is an outdoor enclosure with four single-width mechanical slots. It has a single gel-filled stub (HRE-504 List 1 and List 1B) or air-filled stub (HRE-504 List 2).

The gel-filled 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 pressure relief valve, as shown in Figure 1 on page 2.

The air-filled 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 have primary gas-tube surge protection on all cable pairs.

The HRE-504 can be used to house the following doubler and repeater units:

- HDU-439, HDU-437, HDU-409 or HDU-407 Full T1 unit (1.544 Mbps)
- HDU-219 or HDU-217 Fractional T1 unit (0.772 Mbps)
- EDU-842 ETSI unit (2.048 Mbps) and EDU-409 E1 unit (2.048 Mbps)
- ISDN repeater
- DDS repeater
- 239 T1 repeater

All doublers and repeaters share the same generic slot pair assignments as shown in Table 1 on page 16.

PRESSURIZED APPLICATIONS

For pressurized applications on the HRE-504 List 2, the Schrader air stem valve is used. A pressure gauge attaches 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. Figure 1 below and Figure 2 on page 3 show the Schrader air stem valve location.

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

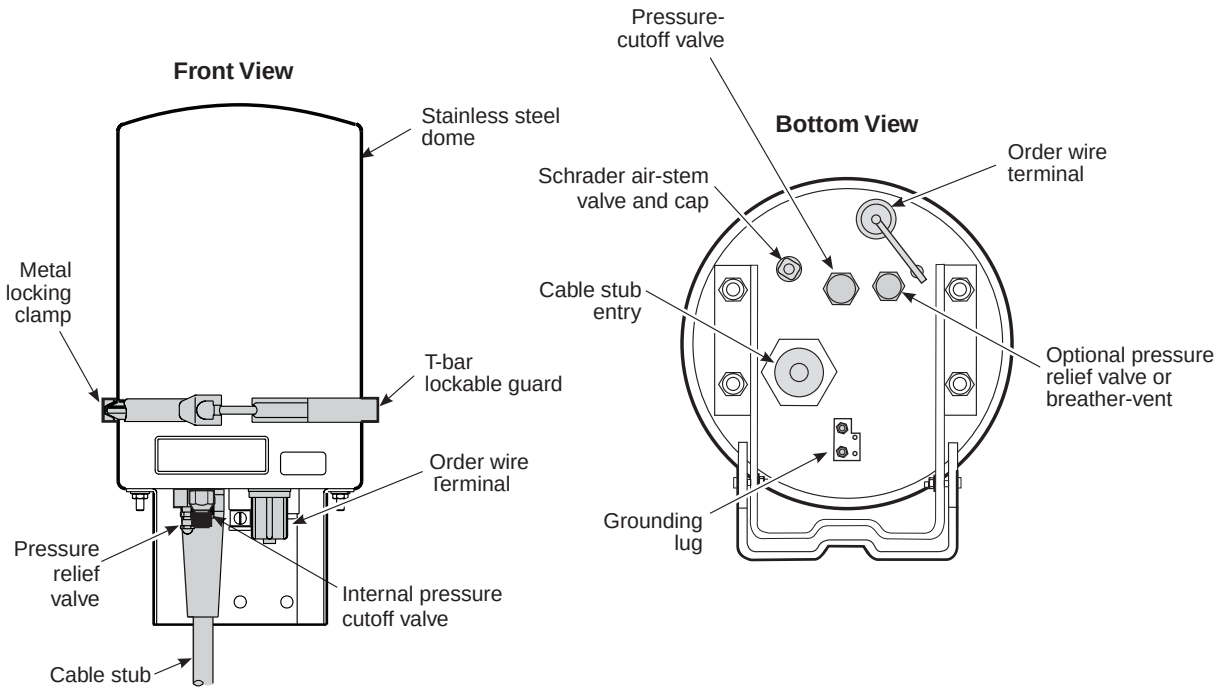
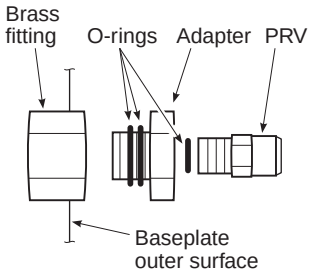


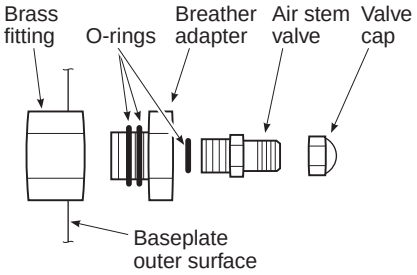
Figure 1. *HRE-504 List 2 Air-filled Remote Enclosure*

An optional breather vent assembly is enclosed in the air-filled HRE-504 List 2 shipping kit. The kit is a small plastic bag attached to a red and brown-colored spare pairs shrink tube. The breather vent replaces the pressure relief valve, if the air-filled unit is not pressurized. The assembly allows the enclosure to breathe and keeps the internal atmosphere free of harmful contaminants. Figure 2 on page 3 shows the four metal valves.

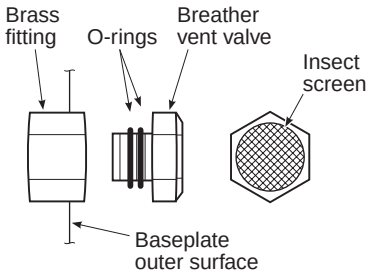
Unlike the gel-filled unit, the pressure cutoff valve in the air-filled unit cannot be used to cut off an external source that is applied to the Schrader air stem valve. The air-filled unit pressure cutoff valve can only control the air source that is applied to the enclosure through the air core stub.



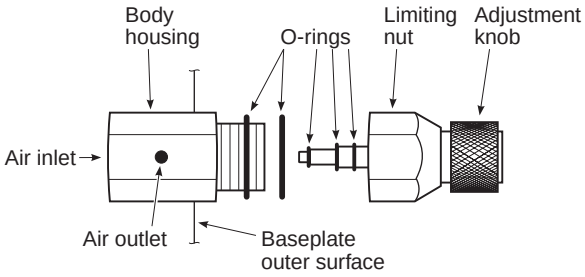
A. Pressure Relief Valve (PRV)



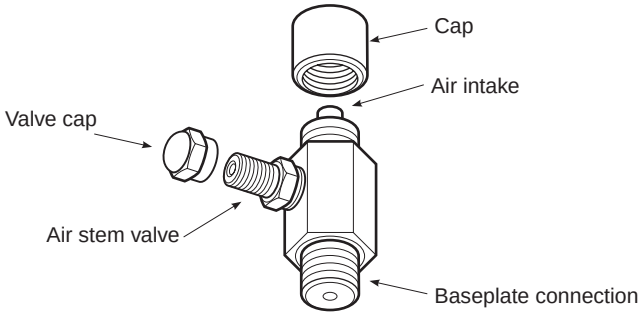
C. Air Stem Valve (ASV) (List 2 only)



B. Breather Vent Valve (BVV)



D. Pressure Cutoff Valve (PCV)



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

Figure 2. *Metal Valves*

FUNCTIONAL DESCRIPTION

The following section discusses the function of each component on the HRE-504. The enclosure consists of an aluminum card cage with a holding capacity for up to four doubler units, a stainless steel composite baseplate, and a stainless steel cover that maintains weathertight integrity.

Gel-filled Stub Unit

The gel-filled HRE-504 List 1 and List 1B stub units are equipped with three metal valves installed in the base section, as shown in Figure 3. The gel-filled screened 28-pair, 24 American Wire Gauge (AWG) cable stub on the gel-filled units are equivalent to an ALP FTS-PIC filled-core telephone cable. The unit has foam skin insulation with a single-filled jacket. This insulation allows the cable stub on the gel-filled unit to be used in buried, aerial, and duct applications.

The gel-filled HRE-504 List 1 and List 1B are identical, except for the cable stub. The cable stub for the HRE-504 List 1 is 30 ft (9.14 m) and for the HRE-504 List 1B is 100 ft (30.48 m).

Standard color codes are used for pair identification with color compounds chosen for electrical balance and permanency. 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.

The gel-filled unit is similar to the air-filled unit, except that the gel-filled unit has a breather vent valve instead of a pressure relief valve. The breather vent valve allows the circulation of outside air through the gel-filled enclosure when it is not pressurized. The enclosure must breathe to prevent excess moisture and other damaging contaminants from accumulating within the enclosure.

A combined Schrader air stem and external air intake T-valve is also indicated with the gel-filled unit. The Schrader air stem valve can be used to connect to an external air source or release the internal pressure whenever the dome is to be removed. Adjacent to the Schrader valve, the external air intake valve accepts tubing for connection to an external air source. The pressure cutoff valve allows the external source of air to be cut off, when the valve is closed.

An optional external pressure relief valve is included in the shipping kit for the gel-filled unit. The kit comes in a small plastic bag that is attached to the shrink tabs of one of the spare pairs. Use the pressure relief valve in place of the breather vent assembly when the gel-filled unit is to be locally pressurized.

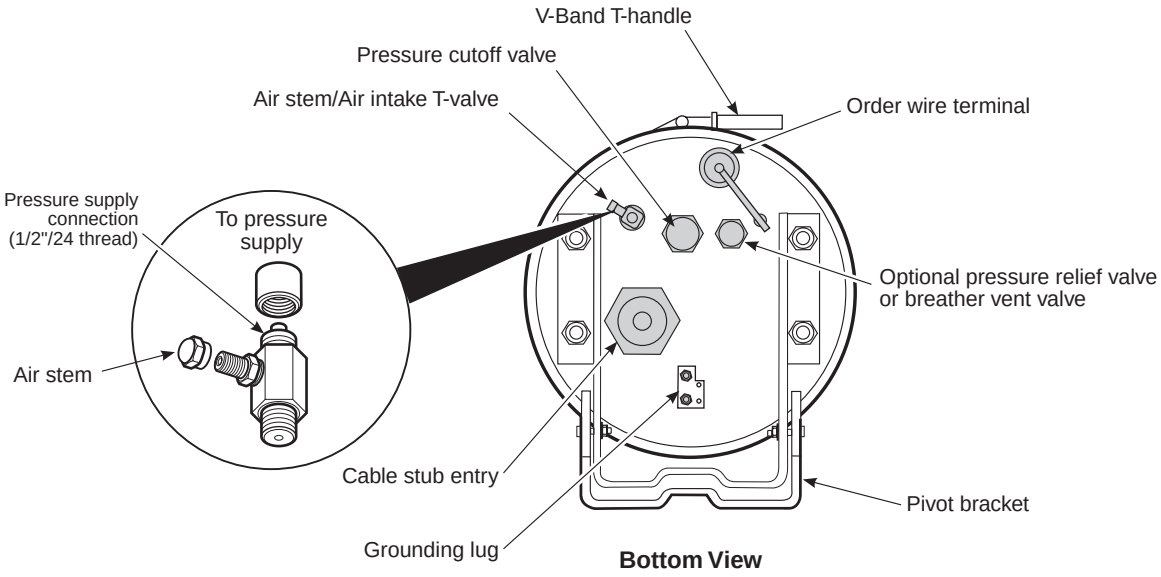


Figure 3. *HRE-504 List 1 Gel-Filled Remote Enclosure*

Air-filled Stub Unit

The air-filled cable stub on the HRE-504 List 2 unit, as shown in Figure 1 on page 2, is equivalent to an ALP FTS-PIC air-core telephone cable. The unit comes with three metal valves: internal air pressure cutoff valve, Schrader air stem valve, 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 (9.14 m) stub into the HRE-504 enclosure.

The air-filled HRE-504 List 2 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-core jacket protects the core and provides improved mechanical and electrical characteristics. The outer jacket provides protective covering that withstands exposure to sunlight, atmospheric temperatures, ground chemicals, and stresses expected in standard installations.

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

The HRE-504 cable sealing, O-ring, and V-Band seal have been safely tested to 36 pounds per square inch (PSI). Most cables become ruptured or damaged at this pressure level. However, the HRE-504 cable sealing is designed to handle this amount of pressure.

Avoid using pressures above 36 PSI. Such pressures could force the V-Band away from the flange and, in effect, impel the dome away from the housing. This could cause damage or injury.

The common pressure supplied through the cable is approximately 9 PSI. This is sufficient to prevent water from entering the cable or housing. ADC recommends pressurizing the enclosure to a maximum of 12 PSI.

To avoid pressure buildup, the pressure relief valve is set to release air at a maximum pressure of 15 PSI. Due to manufacturing tolerances of the springs, this maximum pressure has a tolerance of ± 3 PSI. This pressure and tolerance are well within the safety concerns that may apply to the housing, personnel, or cable.

The pressure relief valve is not intended for controlling the air pressure that is being applied to the housing cable.

Air-filled Stub Presentation

This unit has an air pressure cutoff valve, air stem Schrader valve, and pressure relief valve. In the HRE-504 enclosure, 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 (9.14 m) stub.

- To shut off the inlet air supply, turn the air-cutoff valve clockwise 1 full turn.
- To turn on the inlet air supply, turn the air-cutoff valve counterclockwise 1 full turn.

INSTALLATION

This section describes HRE-504 installation, including the following:

UNPACKING AND INSPECTING THE 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 ADC. For additional information, see "Appendix C - Product Support" on page 43.

Your shipment should consist of:

- One HRE-504
- HiGain Remote Enclosure HRE-504 List 1 and List 2 Technical Practice

Before installing the HRE-504, unpack and inspect the shipment for missing components and physical damage that may have occurred during shipping.

To unpack the enclosure:

1. Remove the HRE-504 from its shipping carton. Verify that all the equipment listed on the packing list is present.
2. Inspect the enclosure, card cage, and O-ring for shipping damage.
3. If the equipment has been damaged in transit, immediately report the damage to the transportation company and to your sales representative. Order replacement equipment, if necessary.
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 in position. ADC recommends that the card cage be kept in a level, locked position.

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

MOUNTING THE ENCLOSURE

The HRE-504 may be mounted in a rack, pole, pedestal, or flat surface using the enclosure mounting bracket assembly. Figure 4 below shows the mounting bracket.

For all installations, the enclosure must be mounted vertically. In addition, a shady location is preferred to minimize thermal stress. Refer to Table 4 on page 30 for thermal load capacity information.

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

- Pedestal or pole mounting with a diameter less than or equal to 7 inches (17.78 cm), see "Pedestal or Small Pole Mounting" on page 9.
- Pole mounting with a diameter greater than 7 inches or (17.78 cm), see "Large Pole Mounting" on page 10.
- Flat surface mounting, see "Flat Surface Mounting" on page 10.
- Rack mounting, see "Rack Mounting" on page 11.

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 Dome from the Baseplate" on page 17.

A mounting template drawing is included with the bracket to help you locate the correct mounting hole for each installation.

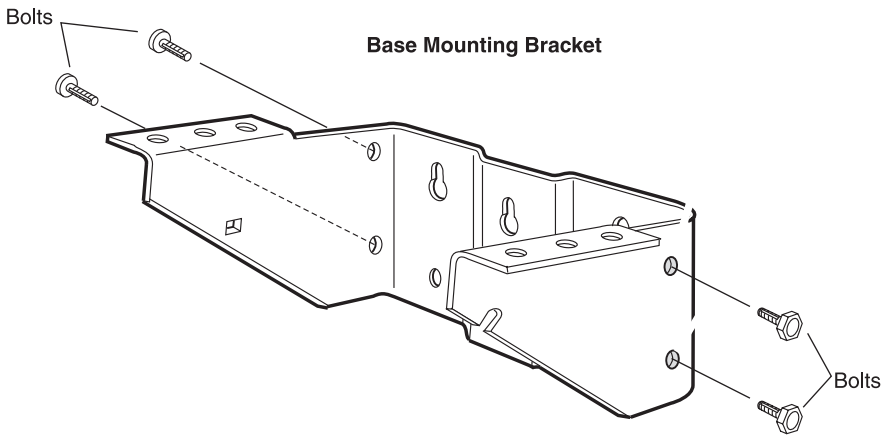


Figure 4. *Mounting Bracket*

Pedestal or Small Pole Mounting

Use the procedure below 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 pole or pedestal.

2 Remove the mounting bracket from the HRE-504 by removing the four bolts that connect each side plate, as shown in Figure 4 on page 8.

3 Position the mounting bracket with the stub down against the pole or pedestal (stub down) and mark the location of the center mounting holes. Use the two middle mounting holes for this application. Remove the mounting bracket.

4 Drill two $^{1}/_{4}$-inch (0.635 cm) diameter mounting 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 mounting hole by tightening the lag bolt into the pole or pedestal approximately $^{2}/_{3}$-inch (1.7 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 securely tightening the two lag bolts.

8 Reattach the enclosure to the mounting bracket and torque the four mounting bracket bolts to 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

Use the procedure below to mount the enclosure on a pole with a diameter greater than 7 inches (17.78 cm). Figure 4 on page 8 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 convenient mounting location on the pole.

2 Remove the enclosure base mounting bracket by removing the four bolts that connect each side plate, as shown in Figure 4 on page 8.

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

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

5 Start a lag bolt in each of the two top matched bolt mounting slots by tightening them 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 to 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

Use the procedure below to mount the enclosure on a flat surface or in a manhole. You must allow room for enough top clearance to remove 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

To mount the enclosure, follow these steps:

1 Select a mounting location on a flat surface.

2 Remove the enclosure base mounting bracket by removing the four bolts that connect each side plate, as shown in Figure 4 on page 8.

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

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

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

7 Secure the enclosure bracket to the wall by securely 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 to 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

Have the following equipment ready before you begin this procedure:

- Four $^{3}/_{8}$-inch (.95 cm) thru-bolts for rack mounting.
- Four $^{3}/_{8}$-inch (.95 cm) non-metallic washers. Non-metallic 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 mount the enclosure, follow these steps:

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 unit 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 ENCLOSURE

Use the standard grounding procedure in "Grounding a Pole Mounted Enclosure" below.

The HRE-504 requires a resistance of 25 Ω or less to ground as measured with a Megger-type ohmmeter.

The 8 MIL aluminum shield on the stub is connected to the card cage mounting brackets by a braided shield ground wire. This wire connects the shield to the enclosure ground lug. The wire may be temporarily removed from the enclosure ground lug when troubleshooting ground faults. Loosen the enclosure screws that secure the braided shield ground wire to the card cage mounting bracket.

Have the following equipment ready before you begin:

- One bullet bond
- One ground rod for pole mounted enclosures (may require more than one rod)
- One Megger-type ohmmeter
- One 6 AWG cable

To establish enclosure ground, the cable stub's 8 mil aluminum shield is attached to the card cage mounting brackets through a braided jumper wire. This jumper wire connects the stub aluminum shield to the enclosure ground lug, as shown in Figure 11 on page 24. The jumper 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 jumper wire to the card cage mounting bracket.

The braided shield ground wire should be reconnected to the card cage bracket after completing the ground fault test. This ensures that the stub's shield is properly grounded (required to reduce the possibility of shield corrosion and lightning damage).

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 a Pole Mounted Enclosure

Use the following procedure to ground a pole or pedestal mounted enclosure, as shown in Figure 5 on page 13.

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.

Ground the HRE-504 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-504 is improperly grounded, the LPU surge arrestors will not work and the enclosure will be unprotected.

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 requirement is not met, follow local practices 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 to 18 and 22 inch-pounds (2.0 and 2.5 Newton/meters).

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

If the main feeder cable's shield is bonded to the stub's shield, the green insulated or bonded stub shield wire should be disconnected from the metal card cage base. This is recommended to reduce service affecting noise from being injected into the doubler circuits from circulating ground loop currents and help inhibit corrosion.

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 resistance requirement in Step 8 is not met, ground the main cable shield every 2,000 feet (610 m).

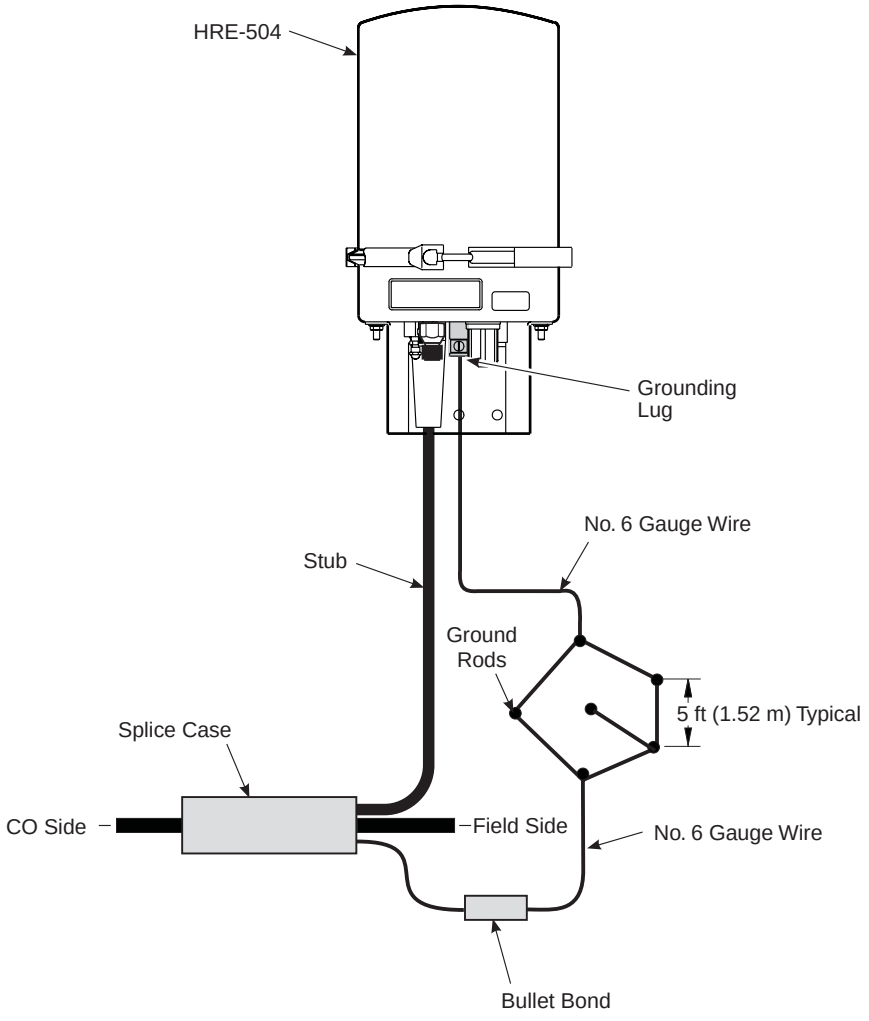


Figure 5. *Grounding for Pole Mounted Unit*

Grounding a Flat Surface Mounted Enclosure

To ground a flat surface mounted enclosure, perform the following steps:

1 Bond the main cable shield through the splice case using bullet bond, as shown in Figure 6 on page 15.

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

Ground the HRE-504 before splicing the cable stub into the main cable. This grounding method or an accepted local grounding method must be in effect to safeguard personnel.

If the HRE-504 is improperly grounded, the Lightning Protection Unit (LPU) surge arrestors will not work and the enclosure will be unprotected.

3 If the resistance is not 25 Ω or less, follow the procedure used for mounting the enclosure to lower the resistance to ground. If the resistance is 25 Ω or less, continue to step 4.

4 Use a 6 AWG cable to connect the ground lug on the HRE-504 to the ground connection in the manhole. Torque the grounding lug to 18 and 22 inch-pounds (2.0 and 2.5 Newton/meters).

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

If the main feeder cable's shield is bonded to the stub's shield, the green insulated or bonded stub shield wire should be disconnected from the metal card cage base. This is recommended to reduce service affecting noise from being injected into the doubler circuits from circulating ground loop currents and help inhibit corrosion.

6 Using a Megger-type ohmmeter, measure the main cable shield resistance to manhole ground. The resistance must be 5 Ω or less.

7 If the resistance requirement in Step 5 is not met, ground the main cable shield every 2,000 feet (610 m).

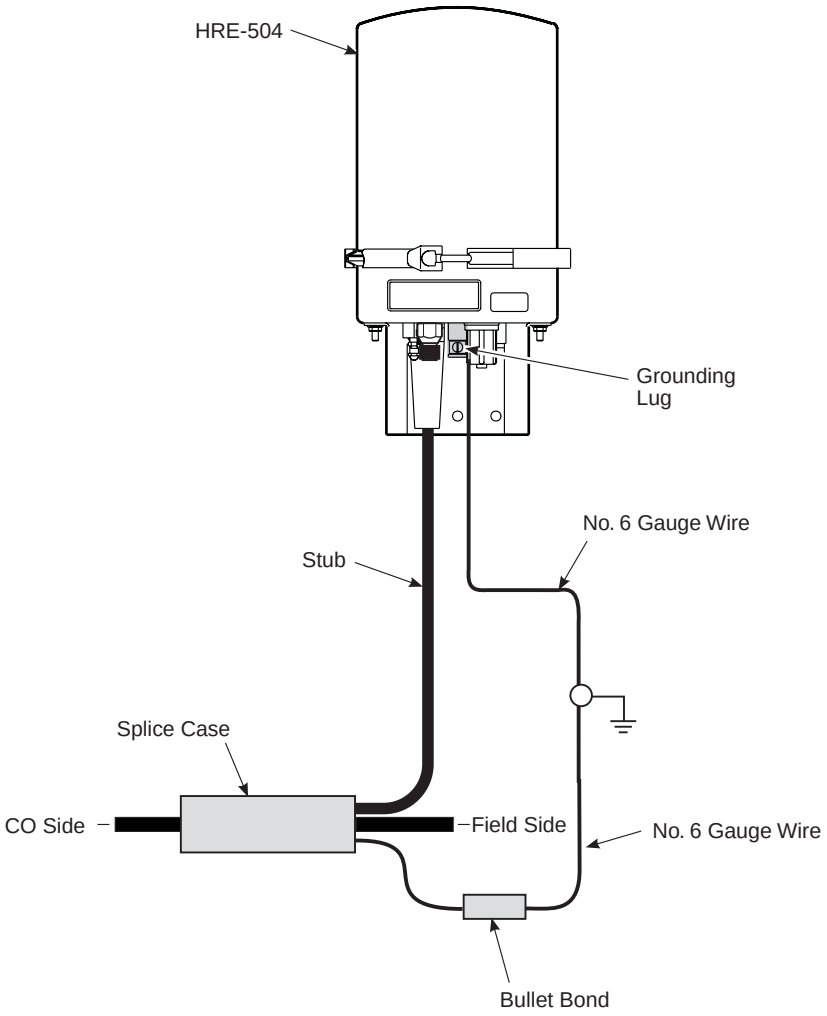


Figure 6. *Grounding for Flat Surface Mounted Unit*

INSTALLING DOUBLER OR REPEATER UNITS

To install either the doubler or repeater unit, 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 seated.

Table 1 lists the slot pair assignments for the doubler and repeater units supported by the HRE-504.

Table 1. *Slot Pin Assignments*

Signal	Side	Direction	Connector Pin
Tip	1	Input	6
Ring	1	Input	5
Tip	2	Input	12
Ring	2	Input	11
Tip	1	Output	4
Ring	1	Output	3
Tip	2	Output	9
Ring	2	Output	8
Ground	--	--	1
Ground	--	--	10

DETACHING THE DOME FROM THE BASEPLATE

Figure 9 on page 22 illustrates how to detach the dome.

Follow these steps to detach the dome from the enclosure baseplate:

1 Release internal pressure.

2 Unclamp the dome from the baseplate.

3 Lift the dome away from the baseplate.

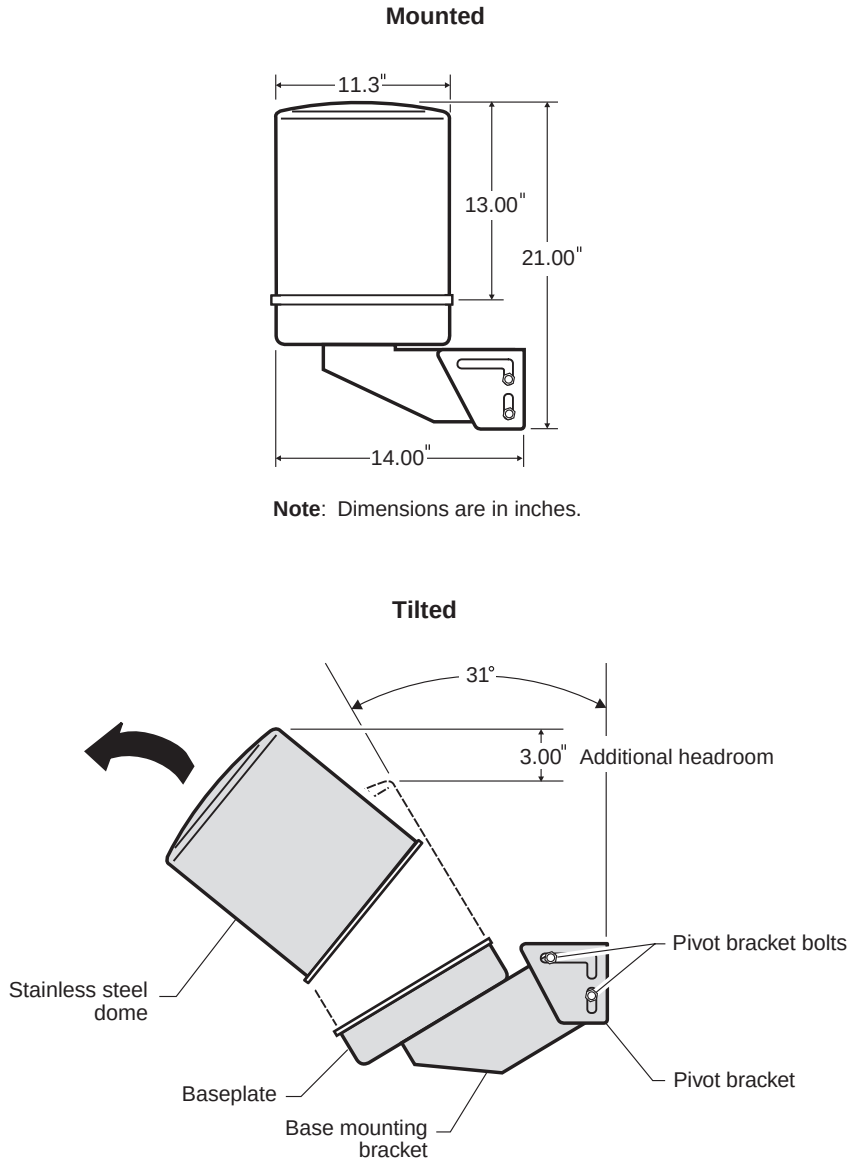


Figure 7. *Detaching the Dome from the Baseplate*

OPENING THE ENCLOSURE

When handling an HRE-504 List 1 or List 2 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 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-504 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-504 List 1 enclosure, which is being pressurized, perform these steps:

1 Confirm that the external pressure supply is off and verify the pressure cutoff valve is in the open position, as shown in Figure 2 on page 3. 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 full 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-504 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 full 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-504 enclosure, follow 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 to between 10 and 15 inch-pounds (1.1 and 1.7 Newton-meters).

7 If you are pressurizing an HRE-504 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 closed or turned fully clockwise. Turn on the pressure from the external source.

8 If you are pressurizing an HRE-504 List 2 from the main cable, open the air-inlet tube by turning the air cutoff valve 1 full turn counterclockwise. Allow the enclosure to pressurize from the main cable through the cutoff stub.

9 If you are pressurizing an HRE-504 List 1 which has been converted to a pressurized version (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-504 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

All HRE-504 units have access to an order wire terminal pair, as shown in Figure 1 on page 2 and Figure 3 on page 5. The enclosure mounting plate allows the unit to be tilted 31° from its vertical position, as shown in Figure 4 on page 8. 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 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 - TECHNICAL REFERENCE

BAR CODE AND CONFIGURATION NUMBER INFORMATION

Figure 7 shows the location of the CLEI code labels on HRE-504 List 1 and List 2 units. Table 2 provides a brief description of the label.

Front view
(HRE-504 shown with cover removed)

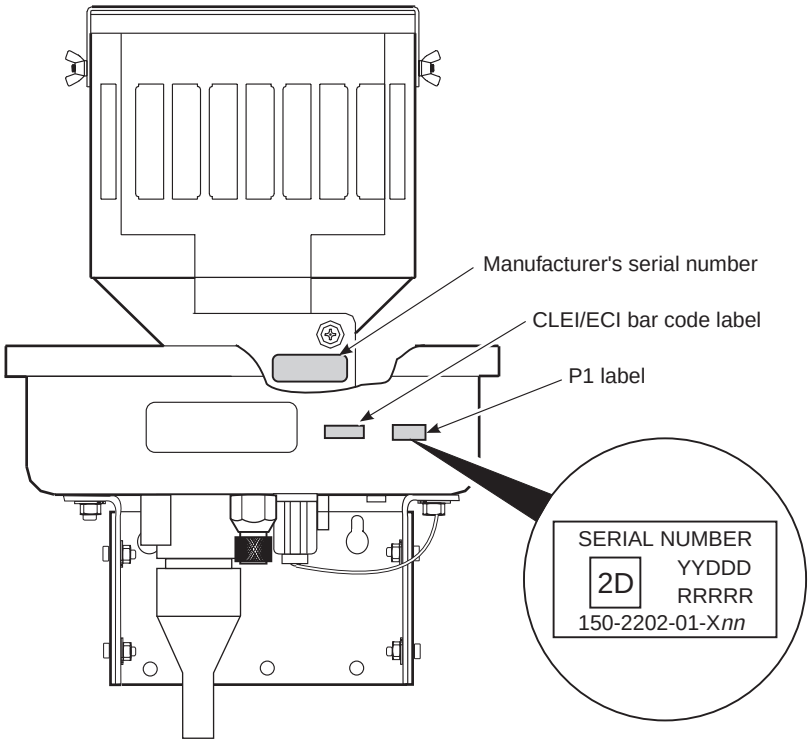


Figure 8. *Label Locations*

Table 2. *HRE-504 Label Description*

Label	Description
P1 label date code	Contains the serial number, date code, and configuration code. The date code consists of: • YY: Last two digits of shipment year • DDD: Julian date The configuration code consists of: • Part number • Xnn: Configuration code
CLEI code label	Contains the Common Language Equipment Identifier (CLEI) code number and Equipment Catalog Item (ECI) bar code number.
Manufacturer's serial number	Contains the number supplied by the customer.

ENCLOSURE INFORMATION

Both the HRE-504 List 1 and List 2 units have access to an order wire pair shown in Figure 3 on page 5 and Figure 1 on page 2. The enclosure mounting plate allows the unit to be tilted 31° from its vertical position. This reduces the headroom required in manhole installations from 10 inches (25.4 cm) to less than 3 inches (7.6 cm) and also reduces the amount of valuable air space required for such underground applications.

Stainless Steel 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 to between 10 and 15 inch-pounds (1.1 and 1.7 Newton/meters) for proper sealing.

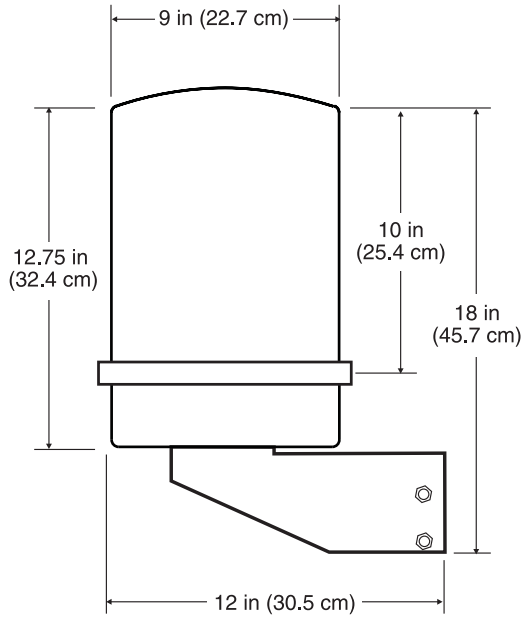


Figure 9. *HRE-504 List 1 and List 2 Enclosure Dimensions*

Card Cage

The card cage inside the enclosure, shown in Figure 10 below and Figure 11 on page 24, has four mounting positions to hold up to four doubler units.

The cage also has a retainer bar which serves the following purposes:

- Writing the circuit ID of each slot on the label attached to each retainer bar.
- Preventing the doubler or remote units from disconnecting when the enclosure is subjected to severe vibrations.
- Accessing the doubler or remote units by loosening the side wingnuts and rotating the retainer bar forward.

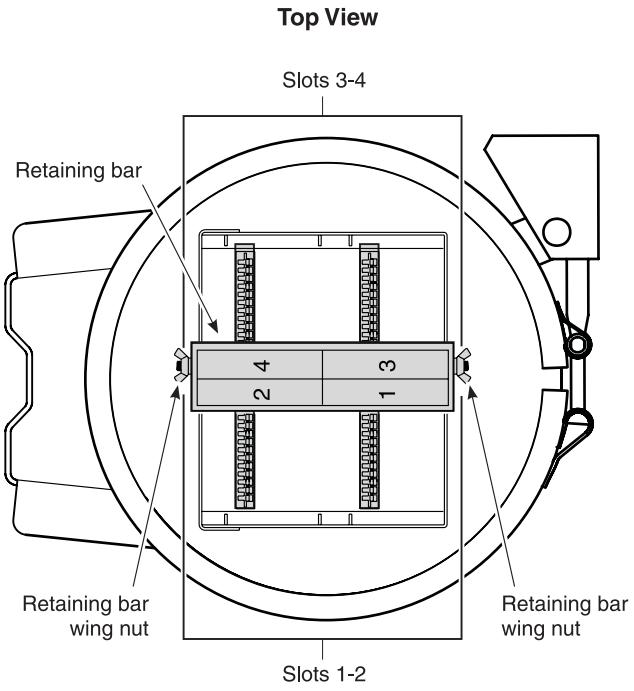


Figure 10. *HRE-504 Top View with Cover Removed*

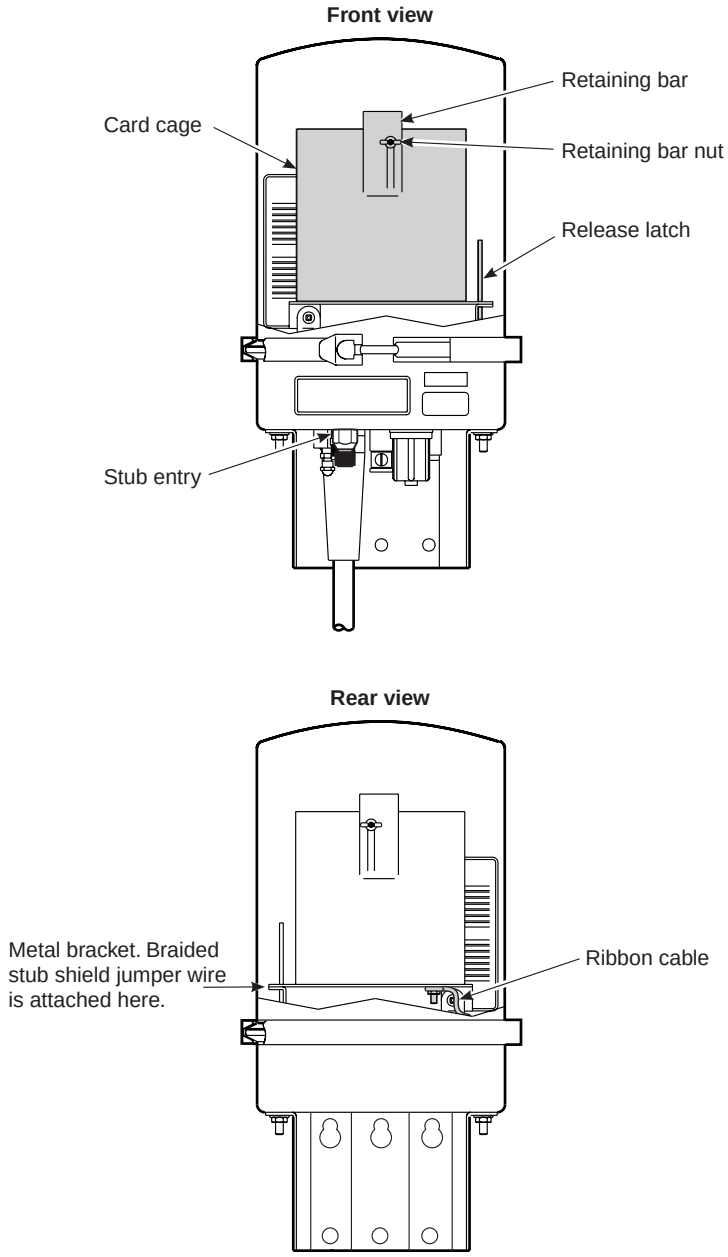


Figure 11. *HRE-504 Front and Rear Views*

The enclosure has a mechanism that enables the card cage to tilt approximately 45° for easy access to facilitate Lightning Protection Unit (LPU) service. For more information, refer to "Lightning Protection Unit" on page 25. Two knobbed retainer screws at the base of the card cage (one on each side) lock the card cage in its normal level position which helps prevent tilting during severe vibrations. The cable stubs shield is grounded to the card cage base through a short braided wire which is connected to the card cage base. The card cage itself is grounded through a ribbon ground connected between the card cage base and side..

Lightning Protection Unit

The Lightning Protection Unit (LPU), shown in Figure 12, is a printed circuit board assembly that attaches to the card edge connector of each slot and provides primarily lightning protection for the HDSL loops and customer T1 circuits.

All HRE-504 units come equipped with four LPUs. Each LPU contains four gas tubes that provide surge protection to the four ports in each slot. 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. These slots are connected to the enclosure ground plane.

The gas tube parameters are equivalent to a TII 47 BT. The Vdc breakdown ranges from 300 to 500 volts. The tube can withstand at least 400 repetitions at 10/1000 rise-time, with 500 amp discharges. Amp discharges are quantities that occur before system degradation.

Although the individual gas tubes are field-replaceable components, replace the entire LPU when any of its protector tubes are functioning improperly. See “Replacement Parts” on page 37 for details on replacing an LPU.

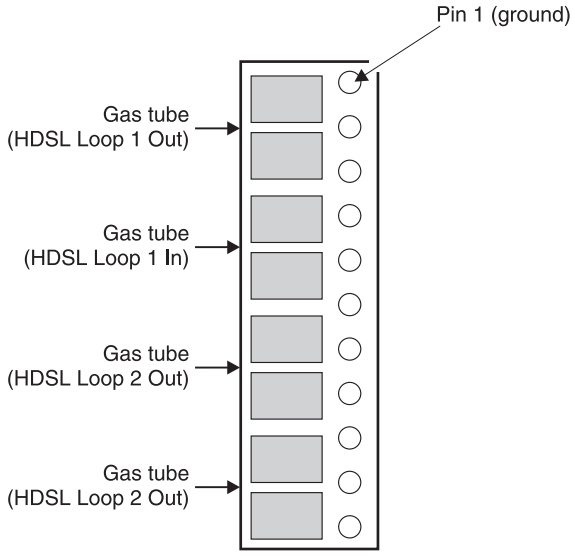


Figure 12. *Lightning Protection Unit*

Cable Stub and Pressurization

Every HRE-504 is equipped with a single-screened cable stub. Table 3 on page 28 provides a complete description of the cable stub. The stub is available as a gel- or air-filled unit. It is secured to the enclosure baseplate by a cable strain relief adapter. The cable pair is spliced and encapsulated in the polyurethane that is poured into the enclosure base. This provides an airtight seal at the cable entry point.

The pressurized enclosure has an air-inlet tube that accompanies the air-filled stub. The tube connects the inside of the enclosure to the main feeder cable which enables dry air or dry nitrogen to flow from the main cable to the cable stub through the air cutoff valve. The air cutoff valve controls the dry air or nitrogen flow through the air-inlet tube as described in “Air-filled Stub Unit” on page 5.

The maximum pressure for an air-filled enclosure is 12 PSI.

Vented-to-Pressurized Conversion Procedure

The following instructions are for converting the HRE-504 List 1 gel-filled vented enclosure to an external pressurized enclosure.

The HRE-504 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, included in the shipping kit, replaces the breather vent valve and prevents over- pressurization when pressurizing from an external air source. The HRE504 List 1 has 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 to convert the HRE 5-4 List 1 enclosure from a vented to pressurized housing:

1 Locate the breather vent valve on the bottom of the housing. It is a metal valve located adjacent to the cable stub inlet, as shown in Figure 2 on page 3 .

2 Remove the valve by untightening 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 where the breather vent assembly was removed.

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

If there are any signs of resistance while tightening the valve, 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, which accepts a standard tire valve chuck, or the external air intake stem of the T-valve, as shown in Figure 3 on page 5. A desiccant bag is also included in the HRE-504 List 1 shipping kit with the pressure relief valve. Remove this bag and place it in the HRE-504 prior to pressurization.

To pressurize the enclosure:

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 in the kit.

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

The plastic tube and fitting assembly is also called an Express Air Connection Fitting. These parts are not supplied by ADC.

Spare Connections

The HRE-504 stub has 11 spare pairs and 1 order wire pair. Five spares and the order wire are in the blue group; the remaining six spares are in the orange group.

Order Wire Connections

The external order wire pair access port is connected to its surge protector by the red and brown jumper wire. The black and white order wire pair also terminates on this protector. This permits access to the order wire without opening the enclosure. Simply untighten the order wire protective cap to expose the order wire terminals.

WIRING PROCEDURES

A single cable stub on the HRE-504 provides access to the main cable. The stub is a 28-pair, 24-gauge, T-screened cable with two 14-pair binder groups.

Table 3 shows the pair assignments, numbering, color codes, and other stub details. Both pair groups have the same color coding.

Table 3. *HRE-504 Cable Stud Wire Pair Assignments for Doubler and Remote Units*

HRE-504 Slot	HDSL Loop #	HDSL Direction	T1 Direction	Side	Connection	Group	Color Tip/Pin	Color Ring/Pin	Pair #
1	Loop 1	In	In	1	CO	Blue	White/6	Blue/5	1
2	Loop 1	In	In	1	CO	Blue	White/6	Orange/5	2
3	Loop 1	In	In	1	CO	Blue	White/6	Green/5	3
4	Loop 1	In	In	1	CO	Blue	White/6	Brown/5	4
1	Loop 2	In	Out	2	CO	Orange	White/9	Slate/8	5
2	Loop 2	In	Out	2	CO	Orange	Red/9	Blue/8	6
3	Loop 2	In	Out	2	CO	Orange	Red/9	Orange/8	7
4	Loop 2	In	Out	2	CO	Orange	Red/9	Green/8	8
Spare						Blue	Red	Brown	9
Spare						Blue	Red	Slate	10
Spare						Blue	Black	Blue	11
Spare						Blue	Black	Orange	12
Spare						Blue	White	Red	SP1
Order Wire						Blue	White	Black	SP2
1	Loop 1	Out	Out	1	Field	Orange	White/4	Blue/3	1
2	Loop 1	Out	Out	1	Field	Orange	White/4	Orange/3	2
3	Loop 1	Out	Out	1	Field	Orange	White /4	Green/3	3
4	Loop 1	Out	Out	1	Field	Orange	White/4	Brown/3	4
1	Loop 2	Out	In	2	Field	Blue	White/12	Slate/11	5
2	Loop 2	Out	In	2	Field	Blue	Red/12	Blue/11	6
3	Loop 2	Out	In	2	Field	Blue	Red/12	Orange/11	7
4	Loop 2	Out	In	2	Field	Blue	Red/12	Green/11	8
Spare						Orange	Red	Brown	9
Spare						Orange	Red	Slate	10
Spare						Orange	Black	Blue	11
Spare						Orange	Black	Orange	12
Spare						Orange	White	Red	SP1
Spare						Orange	White	Black	SP2

The first eight pairs in each group connect to the four shelf slots, as shown in Figure 13 on page 29. The HRE-504 is shown as being wired in a typical mini-repeater fashion, using Side 1 and Side 2 terminology. This adheres to conventional T1 terminology which describes a unidirectional (simplex) service. HDSL is a bidirectional (duplex) service and could be shown with bidirectional doubler header arrows.

The HDSL Side 2 In pair in Table 3 corresponds to the T1 Side 2 Out pair in Figure 13. The HDSL Side 2 Out pair in Table 3 corresponds to the T1 Side 2 In pair in Figure 13. The black and white pair in the Blue group is used to access the order wire pair, as described in "Grounding the Enclosure" on page 12.

The wiring from the cable stub entry to the card cage connectors and order wire connector is factory-installed. The wiring diagram shown in Figure 13 is located on the inside of the stainless steel dome for easy reference.

All pairs from the Blue binder are to pass through one EMI Shielding Ferrite Bead, and all pairs from the Orange binder are to pass through a second EMI Shielding Ferrite Bead.

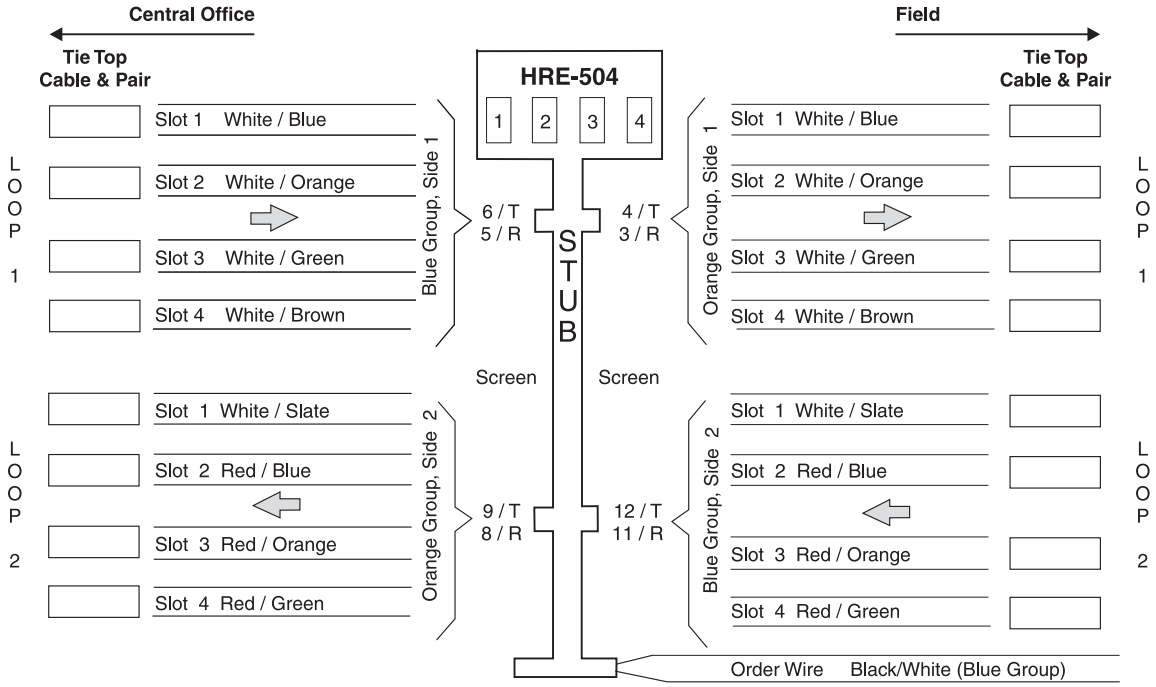


Figure 13. *HRE-504 Interface Wiring Diagram and Cable Assignments*

GENERAL DEPLOYMENT RULES

The HRE-504 is an airtight enclosure. The breather valve on the gel-filled units and the pressure relief valve on the air-filled units allow minimum ventilation to the atmosphere. This environment traps the heat generated by the installed plugs and, in effect, causes the heat temperature to significantly rise within the enclosure. The number of doublers or remote units that can be housed in the HRE-504 is dependent on:

- Plug type
- Doubler version (the list number of the doubler version will also affect the number of doubler units housed in the HRE-504)
- Solar exposure
- Unit orientation

Table 4 lists the deployment rules for doubler and remote unit applications. Even if the deployment rules are followed, the metal surfaces of the installed units can feel hot to the touch when removed from an HRE-504 that is operating in elevated ambient temperatures. This is a normal condition for the plugs operating in these circumstances. The plugs were designed to withstand these elevated temperatures.

When less than four slots are used, always try to leave empty slots between adjacent units. This reduces the hot spot temperature. Also, always use the last column deployment rules when mixing units from both columns in the same enclosure.

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 two without full solar load or three 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 four slots are occupied with full solar load.

Four T1 repeaters or two DDS ISDN repeaters are thermally equivalent to one HDU-439 doubler. Also, one HDU-439 or HDU-437 doubler is thermally equivalent to 1.5 HDU-217, 219, 407, or 409 doublers. When fractional values result from applying these equivalent relationships, always round up to the nearest whole number.

Table 4. *Doubler Deployment Rules*

Maximum Number of Occupied Slots	Solar Load [a]	HDU-437, EDU-842, and HDU 439 Maximum Ambient Temp [b]	HDU-217, HDU-219, HDU-409, EDU-409, and HDU-407 Maximum Ambient Temp [b]
4	Full	95 °F (35 °C)	115 °F (46 °C)
4	None	105 °F (41 °C)	125 °F (52 °C)
3	Full	105 °F (41 °C)	125 °F (52 °C)
3	None	115 °F (46 °C)	135 °F (57 °C)
2	Full	115 °F (46 °C)	135 °F (57 °C)
2	None	125 °F (52 °C)	145 °F (63 °C)
1	Full	125 °F (52 °C)	145 °F (63 °C)
1	None	135 °F (57 °C)	155 °F (68 °C)

(a) Solar Load: FULL = maximum sunlight exposure per TA-TSY-001210. 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 of TA-NWT-001210.

The physical location of the HRE-504 doubler enclosures is driven by one of three deployment rules:

1 The first and most important rule is to place each enclosure span to the electrical limits of 35 dB. This places the first doubler at the 35 dB location, the second at 70 dB, and the third at 105 dB. These electrical settings allow the maximum range of 140 dB if the fourth span to the remote unit is also 35 dB.

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

2 If the first rule is not applicable, then make all the spans the same electrical length (same 196 kHz loss). This minimizes span loss and maximizes 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 If the first two rules are not applicable, use rule 3. To minimize the power consumption and dissipation of the line unit that powers the doubler or remote units, Span 1 must be a minimum and Span 3 must be a maximum. This choice minimizes the I^2R loss in the cable pairs and reduces the thermal stress on the line unit.

MAINTENANCE PROCEDURES

This section covers maintenance procedures for the HRE-504.

Splicing

Splicing consists of connecting the wire pairs of the HRE-504 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, as described in "Pre-splicing Procedure" below.
- Splicing the stubs into the main cable, as described in "Splicing Procedure" on page 34.
- Dressing and taping the final splice in the splice case, as described in "Post-splicing Procedure" on page 35.

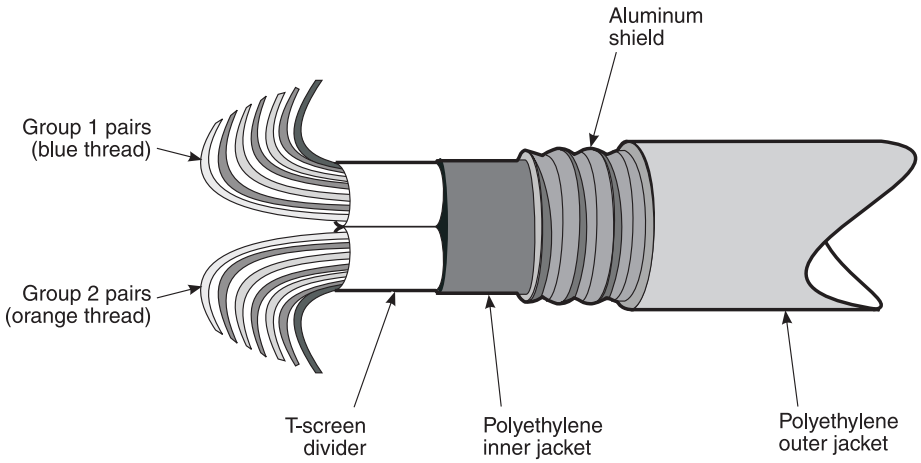


Figure 14. *Cable Stub Construction*

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

Pre-splicing Procedure

To pre-splice the enclosure cable stub, perform the following steps:

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

Ground the HRE-504 enclosure before splicing the cable stubs into the main cable. The grounding method discussed in "Grounding the Enclosure" on page 12 or an accepted local grounding method must be in effect at all times to safeguard personnel.

The HRE-504 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.

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.

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. Cover the exposed splice to protect it from the elements if it is left unattended prior to completion.

Splicing Procedure

Certain applications involve splicing the cables on the HRE-504. 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 3 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.

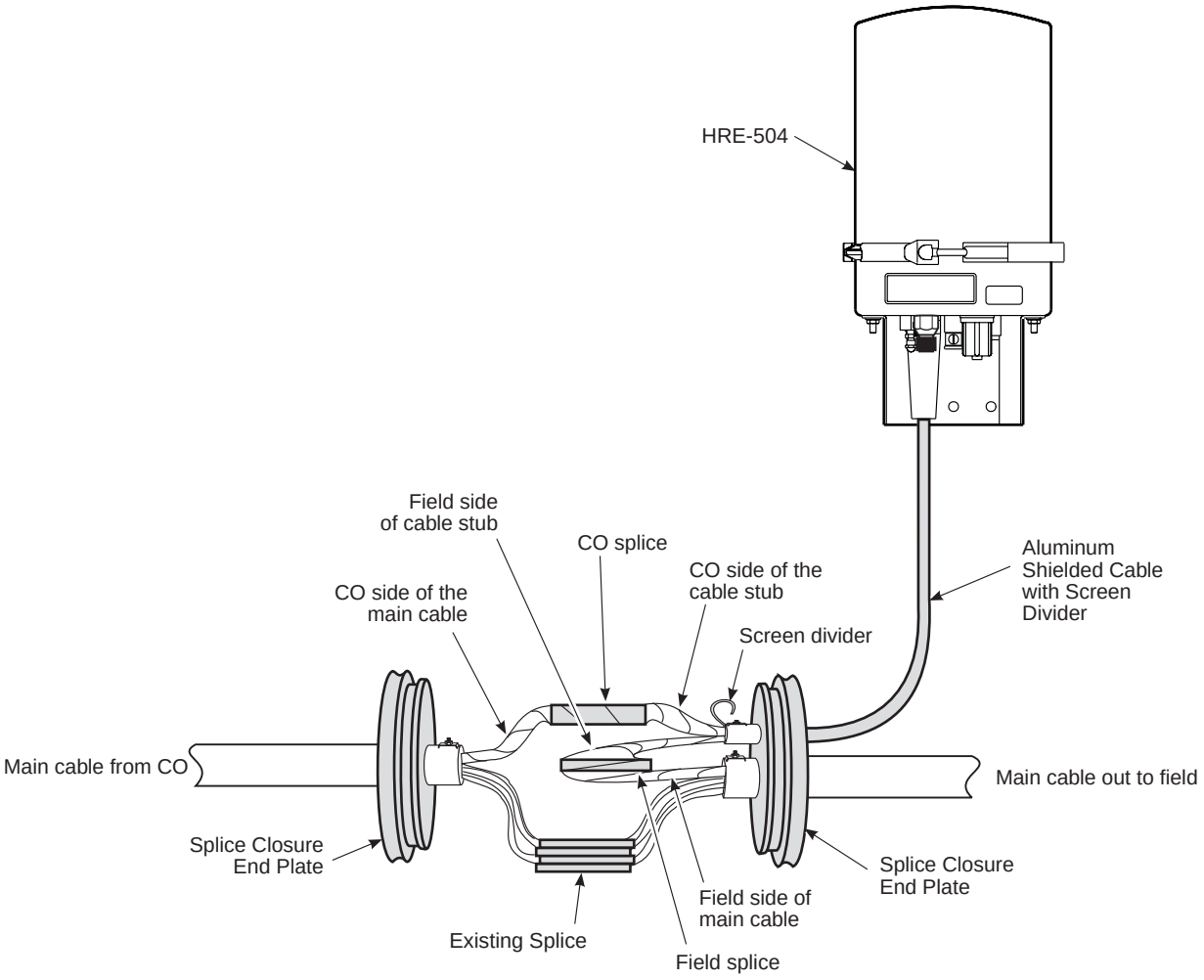


Figure 15. *Dress Splice in Splice Case*

3 Connect the CO side of the main cable to the CO side of the cable stub with a straight splice.

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 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 and 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 on the HDSL and T1/G.703 sides.

If you are using blocking capacitors, signaling and dialing capability on the order wire pair will be directional. When splicing the order wire pair, take care to maintain the direction of signaling your application requires.

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 16 on page 36.

2 Repeat Step 1, wrapping the pairs on the other side of the screen of the 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 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 (1.9 cm) 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 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.

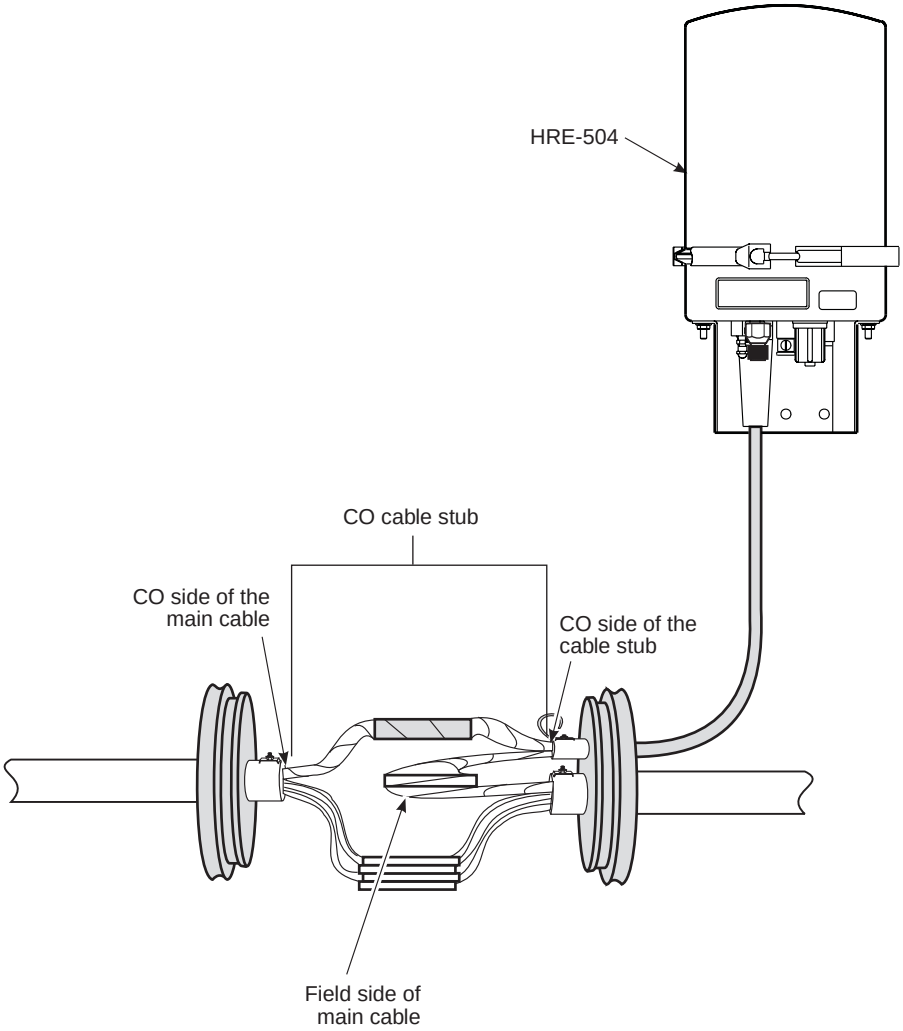


Figure 16. *Post-Splicing Procedure*

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. See Figure 17 on page 37.

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.

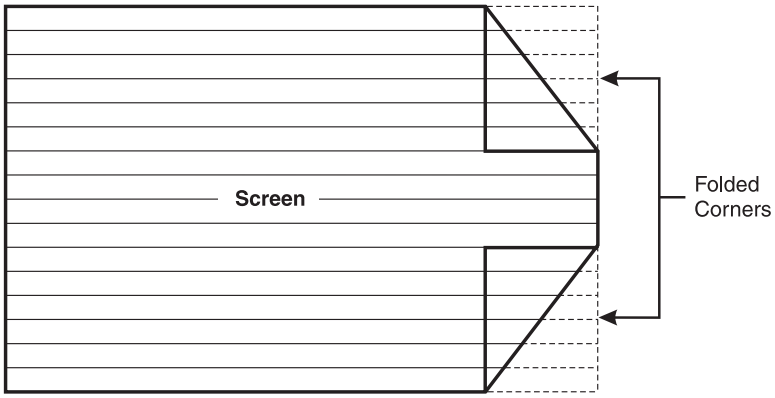


Figure 17. *Screen Folding Diagram*

REPLACEMENT PARTS

The HRE-504 contains LPU surge arrestors that may be replaced in the field, if needed. See the following for instructions on replacing the LPU surge arrestors and see Table 5 on page 38 for replacement part numbers. Additionally, ADC recommends that the O-ring be closely examined whenever the housing is opened for maintenance. If the O-ring is damaged, replace it.

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.

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 as described in "Opening the Enclosure" on page 18.

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 the O-ring if it is damaged.

7 Place the cover and clamp, and then repressurize housing if required per "Closing the Enclosure" on page 19.

Table 5. *Replacement Part Kits*

Number	Quantity	Part
132-1032-01		**Cover, Metal Locking Clamp, O-Ring, Desiccant**
	1	Dome Cover
	1	Dome Cover O-Ring
	1	V-Band Locking Clamp
	2	Desiccant (two-unit) Bag
132-1033-01		**O-Ring, Desiccant**
	1	Dome Cover O-Ring
	2	Desiccant (two-unit) Bag
132-1034-01		**LPU Surge Arrestor, Desiccant**
	1	Single Slot, 4 Port, Protection LPU Board
	2	Desiccant (two-unit) Bag
132-1035-01		**Metal Locking Clamp, O-Ring, Desiccant**
	1	Dome Cover O-Ring
	1	V-Band Locking Clamp
	2	Desiccant (two-unit) Bag
132-1038-01		**Valve Kit**
	2	Pressure Relief Valve
	2	Breather Vent Valves
	2	Air Stem Valves
	2	Air Pressure Cutoff Valve
	2	Air-intake T-valve Caps
	2	Desiccant (two-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 lug bolts
132-1030-01	25	Protector Tube Kit: 47BT Gas Tube Protectors

VALVE REPLACEMENT PROCEDURES

All four of the metal valves shown in Figure 2 on page 3 can be replaced if needed. Order the valve replacement kit #132-xxxx-01 listed in Table 5 to obtain new valves. Use the following procedures when replacing any of the four valves.

Pressure Relief Valve

The pressure relief valve (PRV) is part of an all metal, nickel-plated brass assembly as shown in Figure 2 on page 3. The valve acts as a guard against overpressurizing the enclosure and releases the internal pressure when it exceeds a nominal level of 15 PSI.

The assembly consists of an adapter that tightens into a brass fitting (located on the bottom of the baseplate), and the PRV valve which tightens into this adapter. The adapter has two O rings 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:

1 Grip the adapter nut with a $^{3}/_{4}$-inch (1.9 cm) wrench and the PRV with a $^{1}/_{2}$-inch (1.3 cm) wrench.

2 While holding the adapter nut steady, loosen and remove the PRV by turning it counterclockwise. If the adapter nut becomes loose, tighten it to 60 inch-pounds.

3 Verify that the O ring in the adaptor'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 the $^{3}/_{4}$-inch (1.9 cm) wrench and the PRV with a $^{1}/_{2}$-inch (1.3 cm) wrench and torque the latter to 120 inch-pounds. Do not overtighten. Excessive torque does not improve the seal and may damage the PRV.

6 Pressurize the chamber and check entire assembly for leaks.

Breather Vent Valve

The breather vent valve (BVV) is an all metal, nickel-plated brass unit shown in Figure 2 on page 3. The valve allows air to circulate into the enclosure so it can breath and avoid the build up of excessive moisture and other contaminants.

It has a hollow threaded stem that tightens into a brass fitting (located on the bottom of the baseplate). 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 entering the enclosure.

To remove and replace the BVV:

1 Grip the BVV with a $^{3}/_{4}$-inch (1.9 cm) wrench, and turn it counterclockwise to remove.

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

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

4 Grip the BVV with a $^{3}/_{4}$-inch (1.9 cm) wrench and torque to 60 inch-pounds. Do not overtighten. Excessive torque does not improve the seal and may damage the valve.

Air Stem Valve

The air stem valve (ASV) is part of an all metal, nickel-plated brass assembly as shown in Figure 2 on page 3. The valve is used to pressurize the enclosure from an external air supply.

The assembly consists of an adapter that tightens into a brass fitting (located on the bottom of the base), the ASV which tightens into this adapter, and a cap that screws on the top of the ASV. The adapter has two O rings that are required to create an airtight seal. One is located on the 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:

1 Grip the adapter nut with a $^{3}/_{4}$-inch (1.9 cm) wrench, and the ASV with a 7/16-inch (1.1 cm) wrench.

2 While holding the adapter nut steady, remove the ASV by turning it counterclockwise. If the adapter nut becomes loose, torque it to 60 inch-pounds.

3 Verify that the O ring in the adaptor's 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 (1.9 cm) wrench and the PRV with a 7/16-inch (1.1 cm) wrench and torque the valve to 120 inch-pounds. Do not overtighten. Excessive torque does not improve the seal and may damage the ASV.

6 Pressurize the chamber and check entire assembly for leaks.

Air Pressure Cutoff Valve

The air pressure cutoff valve (PCV) is part of an all metal, nickel-plated brass assembly as shown in Figure 2 on page 3. The valve controls the flow of air from the air-core stub into the enclosure.

The assembly consists of an adjusting knob and stem that is interlocked to a limiting nut. The outer limiting nut tightens into the outer threads of the body housing connected to the enclosure's baseplate. The stem tightens 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. When the adjusting nut is fully clockwise, the airflow is OFF. When it is rotated one turn clockwise, the air flow is ON. The body housing also has an O ring on its threads 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 a half turn counterclockwise.

2 Since the valve stem is internally threaded to the body housing, both the limiting nut and adjustment knob must 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 is attached to the threaded tip of the body housing.

5 The replacement PCV assembly 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. Insert it as far as it will go. Some resistance will occur as the O rings contact the inner housing threads.

6 Rotate the limiting nut clockwise a half turn.

7 Tighten the adjusting nut to the O ring by grasping both the limiting nut and the adjustment knob and tightening this subassembly into the 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 Verify that the adjusting knob has at least 11/2 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. Then 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 back ON when backed off 1 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 (4,300 m)
Mounting:	Dual or Single 239 T1 or DDS/ISDN Repeater Mechanics

Dimensions

Height:	18 in (45.7 cm)
Diameter:	9 in (22.8 cm)
Depth:	12 in (30.5 cm)
Volume:	0.21 ft^3 (.00567 m^3)
Weight:	HRE-504 List 1 (gel-filled): 23 lb (10.4 kg)
	HRE-504 List 2 (air-filled): 21 lb (9.5 kg)

Stub Diameters

Gel:	1 in (25.4 mm) max.
Air:	0.8 in (20 mm) max.

Figure 18 provides specifications for 28-pair, T-screen cable.

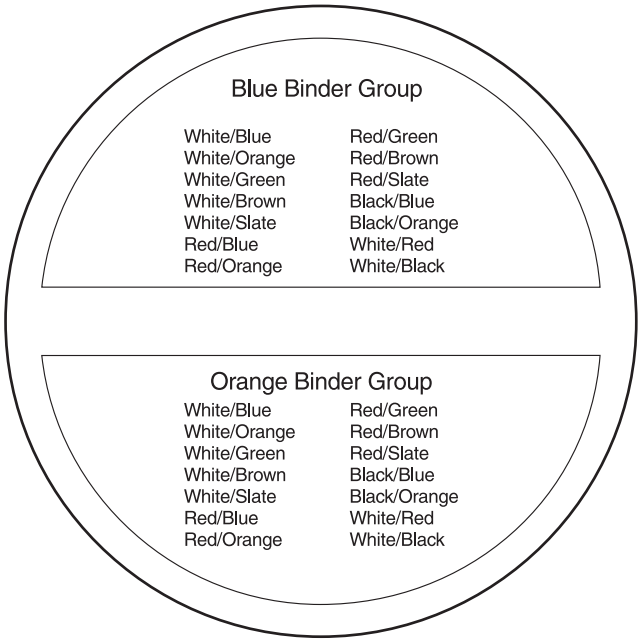


Figure 18. *T-Screen Color Code Specifications (28-Pair Cable)*

APPENDIX C - PRODUCT SUPPORT

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

TECHNICAL SUPPORT

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

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
ADC Technical Assistance Center 800.638.0031 714.730.3222 Fax: 714.730.2400 Email: wsd_support@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 telephone numbers with an 800 prefix 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

E

ECI: Equipment Catalog Item

H

HDU: HiGain Doubler Unit

I

ICEA: Insulated Cable Engineers Association

L

LPU: Lightning Protection Unit

P

PCV: Air-pressure Cutoff Valve
PRV: Pressure-relief Valve
PSI: Pounds Per Square Inch

CERTIFICATION AND WARRANTY

FCC COMPLIANCE

The HRE-504 List 1, List 1B, and List 2 do 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 twelve (12) 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.

MODIFICATIONS

Any changes or modifications made to this device that are not expressly approved by ADC Telecommunications, Inc., may void 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

The HRE 504 has been tested and verified to comply with the applicable sections of the following standards:

- TR-TSY-000056
- GR 950-CORE Section 6.5.4 and 6.5.6
- T4.1E-IEC 68-2

For technical assistance, refer to "Appendix C Product Support."

ADC DSL Systems, Inc.
14402 Franklin Avenue
Tustin, CA 92780-7013
Tel: 714.832.9922
Fax: 714.832.9924

Technical Assistance

Tel: 800.638.0031
Tel: 714.730.3222
Fax: 714.730.2400

DOCUMENT: 150-504-100-03
1240598