PAIRGAIN TECHNOLOGIES HIGAIN™ REMOTE ENCLOSURE MODEL HRE-450

List 2, PairGain #150-1121-02 CLEI: T1RHCAS4RA
List 3, PairGain #150-1121-03 CLEI: T1RHCAS4RB
List 4, PairGain #150-1121-04 CLEI: T1RHCAS4RC

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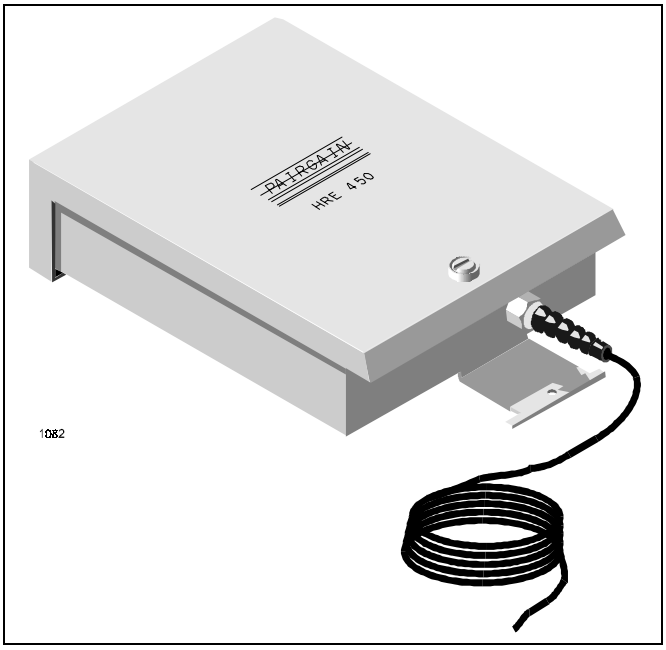

Figure 1. HRE-450. The PairGain HiGain Remote Enclosure Model HRE-450 is designed to house either one HiGain Doubler Unit or one HiGain Remote Unit to protect against environmental hazards.

A. PRODUCT OVERVIEW

1. DESCRIPTION AND FEATURES

1.01 This Technical Practice describes the HiGain Remote Enclosure Model HRE-450. The HRE-450 is a weatherproof enclosure (Figure 1) which can house one single-width 400-series mechanical configuration module: either one HiGain Doubler Unit (HDU), or one HiGain single slot Remote Unit (HRU). The international equivalent EDU and ERU models can also be housed in the HRE-450. The HRE-450 is part of the HiGain system. The three list numbers define the following features:

- List 2: Single, gel-filled, 20 foot stub
- List 3: Single, air-filled, 20 foot stub
- List 4: No stub

Note: These units replace the original List 1 unit which had four I/O ports and no stubs.

1.02 Revision History of this practice.

Revision 02—May 31, 1996

a) Re-designed to half-page format.

b) Added breather cap.

1.03 The HRE-450 white-rectangular enclosure is weather-resistant, non-pressurized, and has with a removable front lid. Its major components are shown in Figure 2.

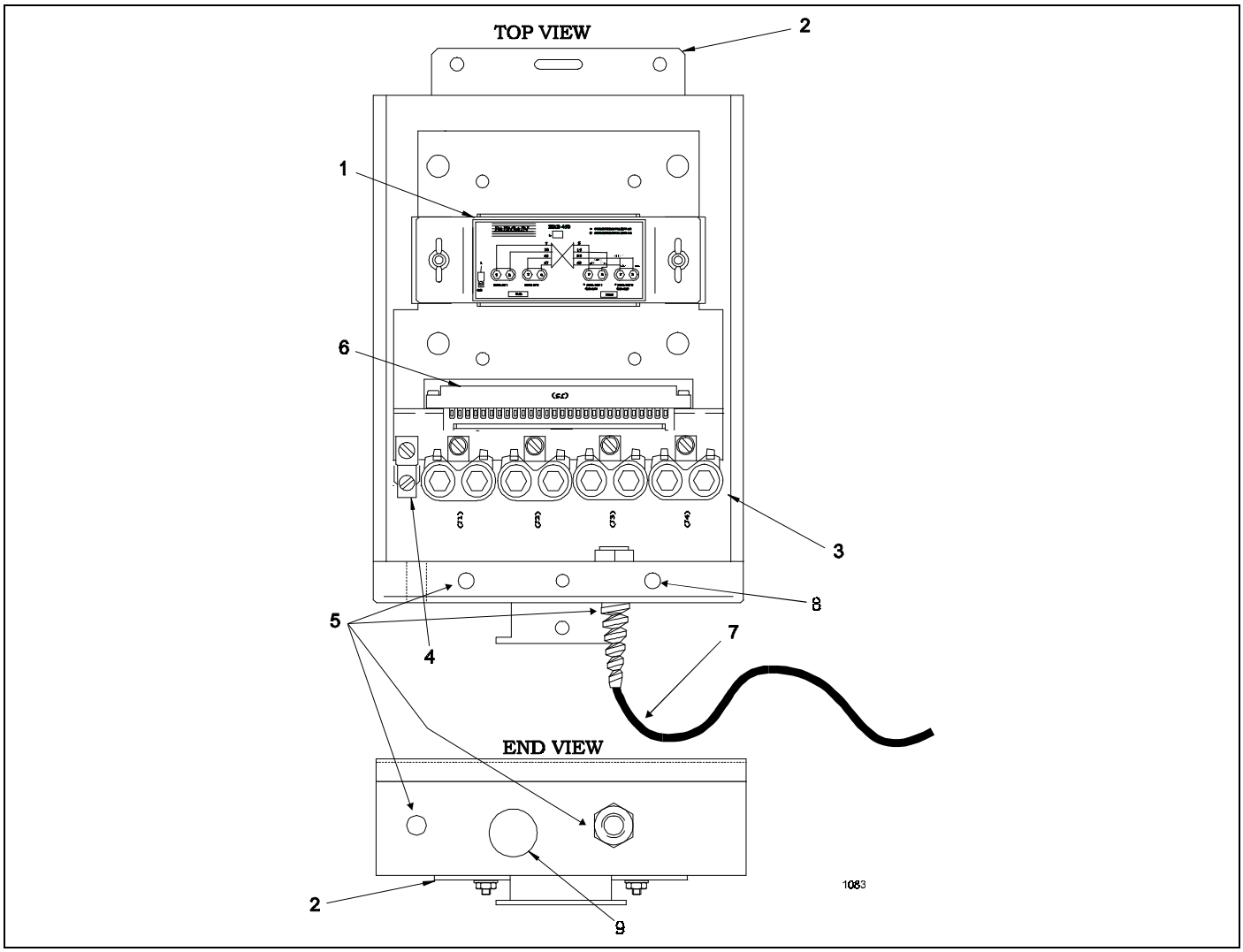

Figure 2. PairGain HRE-450 Major Components.

1 Mounting plate with a screw-on metal strap to hold doubler or remote unit.

2 Mounting bracket for enclosure.

3 Four Quiet-Front Connector Modules with integrated gas-tube surge protectors, to which signal cables attach in four places.

4 Ground wire connector.

5 Two sealing cable riftings mounted in bottom plate sized for signal cable and ground wire.

6 One 56-pin card-edge connector for mechanical and electrical connections.

7 20-foot gel or air-filled stub or no stub.

8 Two 3/8” padlock shackle holes in lid (not shown).

9 Air vent/Breather cap assembly.

1.04 The HRE-450 Quiet Front Connector Modules (QFCM) protect the enclosed module from lightning and over-voltage spikes (Figure 3).

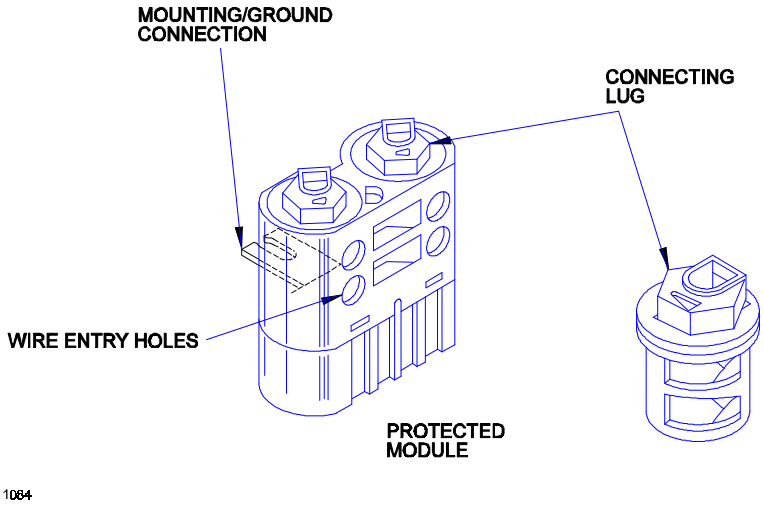

Figure 3. Quiet-Front Connector Module.

Each QFCM has:

- One AMP (part #755254-1)
- One PairGain (part #655-1010-06)
- One three-element gas-discharge tube surge protector, which has a 265 to 600 VDC breakdown voltage for voltage ramps up to 2000 Volts/Second.
- Wire entry holes for terminating each conductor of the connecting cable pair. The cable stubs in List 2 and 3 are terminated on the QFCM. List 4 has no stub. The user must provide the interface cable and terminate it on the QFCM.
- Two rotating quarter-turn lugs. Each lug controls two wire entry holes, and each wire entry hole has two insulation-displacement knives inside it. The two knives allow for slicing through the insulation and make positive electrical and mechanical contact with wires of different diameters.

2. BENEFITS

- Compact dimensions.
- Eliminates need for expensive Controlled Environmental Vaults.
- Unaffected by dust, wind, rain, sleet, ice, and snow.
- Easily mounted with two or three screws on a wall or pole.
- Weather-sealing cable fittings that protect connections and provide strain relief.
- Easy-open front cover, secured by one captive screw, that enables quick inspection or service of enclosed modules.
- Quiet Front Connector Modules provide electrical surge protection and corrosion-resistant wire connections.
- Air vent allows the enclosure to breath and keeps the internal atmosphere free of harmful contaminants.

3. APPLICATIONS

3.01 Physical application. The HRE-450 is an outdoor enclosure that can house any 400-series HiGain unit. The HRE-450 is designed to be mounted outdoors on any suitable above-ground and above-water surface, such as wood, concrete walls, or telephone poles. It can not be pressurized so it must not be located underground.

3.02 System application. The HRE-450 encloses and connects doublers and remote units as a single remote unit, a single doubler system, or as a two doubler system (Figure 4).

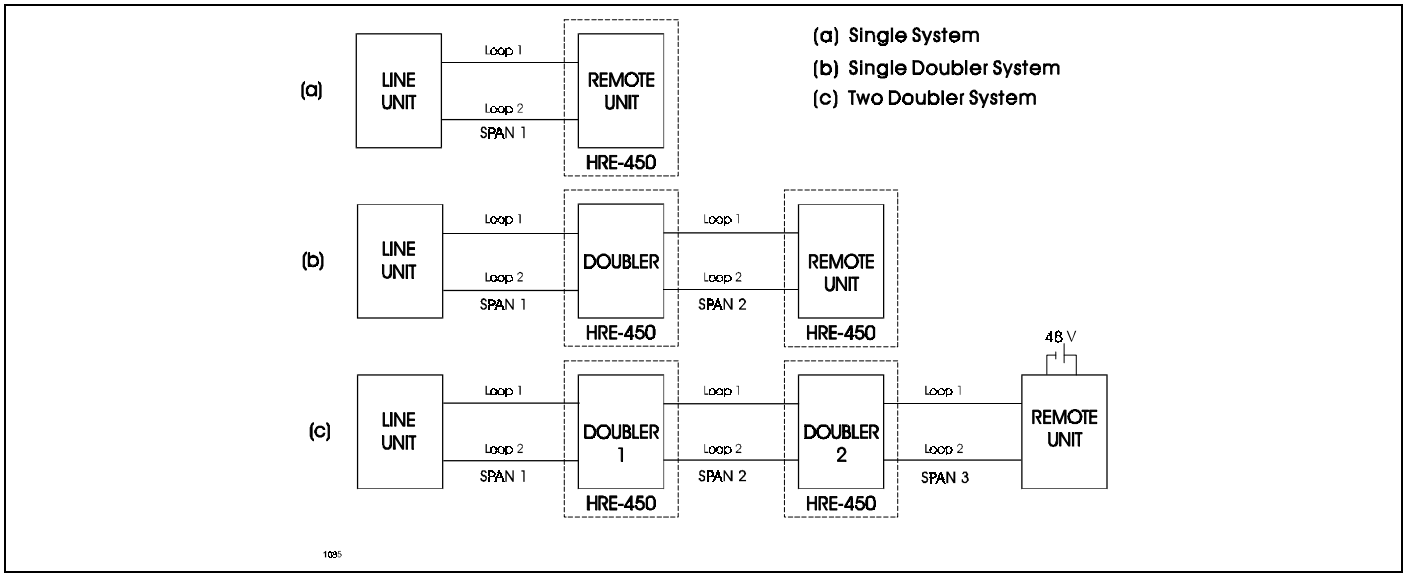

Figure 4. HRE-450 Use in HiGain 400-Series System Configurations.

Note:	The HRE-450 is not designed to provide local 48V power to its enclosed remote module as required in configuration (c) in Figure 4. It is therefore not recommended that the HRE-450 be used for housing a locally-powered remote as shown in example (c).

4. SPECIFICATIONS

4.01 The HRE-450 has the following specifications:

Enclosure Box

Length:	9.31 in. (23.65 cm)
Width:	7.31 in. (18.57 cm)
Depth:	2.31 in. (5.87 cm)

Enclosure Lid

Length:	10.25 in. (26. cm)
Width:	7.50 in. (1 90 cm)
Depth:	2.69 in. (6.83 cm)

Complete Unit

Weight:	3 lbs. (1.36 kg)

Quiet Front Connector Modules (QFCM)

Each QFCM contains a 60-amp, 3-element, gas-tube surge protector, which has a 265 - 600 VDC breakdown voltage at a breakdown rate of 2000 V/second. This element complies with the following specifications:

- PB 80, heavy duty
- Bellcore TP-TS-1 -000073

- GTS 8376
- UL497

5. CERTIFICATION

5.01 FCC, UL and CSA certifications are not applicable.

6. WARRANTY

6.01 PairGain Technologies warrants this product to be free of defects and to be fully functional for a period of 36 months from the date of original shipment, given proper installation. PairGain will repair or replace any unit without cost during this period if the unit is found to be defective for any reason other than abuse or improper use or installation.

6.02 This module should not be field repaired. If it fails, replace it with another unit. Return the faulty unit to PairGain for repair. Modifications made to an HRE-450 by anyone other than an authorized PairGain representative voids the warranty.

6.03 If a unit needs repair, call PairGain for a Return Material Authorization (RMA) number and return the defective unit, freight prepaid, along with a brief description of the problem, to:

PairGain Technologies, Inc.
14402 Franklin Avenue
Tustin, CA 92680
ATTN: Repair and Return Dept.
(800) 638-0031

7. TECHNICAL ASSISTANCE

7.01 PairGain Technical Assistance is available 24-hours-a-day, 7-days-a-week by contracting PairGain's Customer Service Engineering group at one of the following numbers:

Telephone:	**(800) 638-0031**
	(714) 832-9922
Fax:	**(714) 832-9924**

During normal business hours (8:00 AM to 5:00 PM, Pacific Time, Monday - Friday, excluding holidays), technical assistance calls are answered directly by a Customer Service Engineer. At other times, a request for technical assistance is handled by an on-duty Customer Service Engineer through a callback process. This process results in a callback within 30 minutes of initiating the request.

In addition, PairGain maintains a computer bulletin board system for obtaining current information on PairGain products, product troubleshooting tips and aids, accessing helpful utilities, and for posting requests or questions. This system is available 24-hours-a-day by calling (714) 730-3299. Transmission speeds up to 28.8 kbps are supported with a character format of 8-N-1.

B. MOUNTING

8. PARTS AND MATERIALS LIST

8.01 The HRE-450 installation kit components are listed in Table 1.

TABLE 1. PARTS AND MATERIALS FOR P.N. 131-1029-01,INSTALLATION KIT

Qty (ea)	Part Number	Description
1	100-450-102-02	Technical Practice
3	670-1018-24	Screw, #10 x 1.5 in., Wood
3	671-1002-04	Nut, #10 x 1 in., Anchor
3	672-1001-04	Washer, Flat, #10 CPS/ZPS
1	674-1012-01	Tie, Cable, 5.5 in. length, 0.15 in. width

9. MOUNTING

9.01 The HRE-450 is designed to be mount onto a wall or telephone pole with the screws in the Installation Kit as described in Table 2.

TABLE 2. HRE-450 MOUNTING PROCEDURE

Step	Procedure
1	Loosen the screw on the HRE-450 cover, then remove the cover.
2	Ensure that each of the two cable fittings is secure. If necessary, hand-tighten the cable fitting.
3	Select a location for mounting the HRE-450 that allows access to wiring and grounding connections through the cable fittings on the HRE-450's bottom. **NOTE:** The HRE-450 must be located above ground to avoid being submerged in water.
4	Place the HRE-450 in the chosen mounting location, level the HRE-450, then mark its pilot hole locations with a pencil.
5	Do one of the following: • If the mounting location is wood, use a drill with a wood/metal drill bit, and drill the pilot holes into the wooden surface. • If the mounting location is concrete, use a drill with a concrete drill bit (with a size slightly smaller than the diameter of the anchor), drill the pilot holes into the concrete surface, then insert the anchors into the pilot holes and tap the anchors into place with a hammer.
6	Using a #2 slotted screwdriver, fasten the HRE-450 onto the mounting location with the three screws and washers from the Installation Kit.

C. WIRING

10. LIST 2 AND 3

10.01 The List 2 HRE-450 has a 20 foot gel-filled stub. This six pair, 24 AWG cable is made by Superior Cable, part # TEL U FPA WT FS. It has a foam skin insulation with a single filled jacket intended for aerial (above ground) applications. Each conductor has a dual insulation consisting of an inner coating of natural, insulating-grade high-density cellular polyethylene covered by an outer skin of color-coded, high-density solid polyethylene. Standard color codes are used for pair identification with color compounds chosen for electrical balance and permanency. The entire assembly is completely flooded with an ETPR compound, filling the air space between the insulated conductors. A non-hygroscopic core wrap protects the core and provides improved mechanical and electrical characteristics. The inner surface of the core wrap is coated with the ETPR filling compound. The outer surface is coated with an amorphous polypropylene compound. The cable core shield is a corrugated copolymer coated 8 mil aluminum tape. The outer jacket consists of a black, low-density polyethylene material that provides a flexible 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-84-608-1988 and REA PE-89. The outside diameter of the cable is 0.38 inches (10 mm).

10.02 The List 3 HRE-450 has a 20 foot Air filled stub. This six pair, 24 AWG cable is made by Superior Cable, part # TEL U FPA. It is a plastic-insulated single-jacketed air core cable intended for aerial (above ground) applications. Conductors are insulated with solid high-density polyethylene. Standard color codes are used for pair identification with color compounds chosen for electrical balance and permanency. A non-hygroscopic core wrap protects the core and provides improved mechanical and electrical characteristics. The cable core shield is a corrugated copolymer coated 8 mil aluminum tape. The outer jacket consists of a black, low-density polyethylene material that provides a flexible 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-85-625-1989 and REA PE-22. The outside diameter of the cable is 0.36 inches (9 mm).

10.03 Since the HRE-450 can not be pressurized it is limited to above ground applications. Thus the choice of stub type, Gel or Air, is one of user preference.

10.04 Figure 5 shows the identity of the four ports to which each cable stub provides access. The CO ports are restricted to the CO HDSL cable pair connections for either the doubler or the remote unit. The FIELD pairs connect to the FIELD HDSL pairs for doubler applications or to the DS1 or G.703 interfaces for remote unit applications. The pair assignment was chosen to minimize the crosstalk between the DS1 or G.703 ports. PairGain does not recommend grounding the two unused pairs. This practice exposes the other pairs to ground, and as such increases their tendency to breakdown when high voltage transients enter the cable.

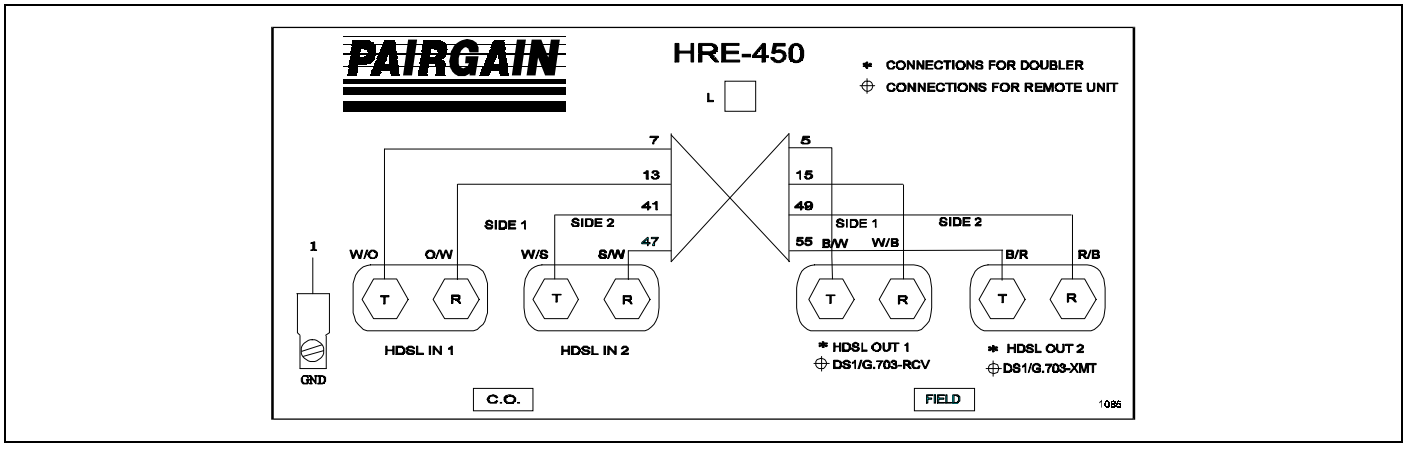

Figure 5. HRE-450 Wiring Diagram.

11. LIST 4

11.01 The List 4 HRE-450 has no cable stud. It is intended for CPE applications that requires user supplied drop wire for the interface connections.

11.02 Connect the HRE-450 to Signal Cables and Ground Wire as shown in Table 3.

TABLE 3. LIST 4 HRE-450 WIRING PROCEDURE

Step	Procedure
1	Loosen the nuts on two cable riftings on the bottom of the HRE-450 by doing one of the following: • Hand-turn the compression-connector nuts counterclockwise. • If compression-connector nuts are too tight for hand-loosening, use groove-joint pliers to hold each cable fitting center locknut, then use groove-joint pliers to turn each compression nut counterclockwise.
2	Position solid ground wire, up to #6 AWG, through the HRE-450 GND cable fitting.
3	Strip approximately 1/2 in. of insulation from the end of the wire.
4	Insert the stripped wire into the grounding lug hole, then tighten the grounding-lug screw.
5	Finger-tighten the ground cable fitting compression nut.
6	Remove the pig tail compression nut from the main fitting hub.
7	Insert approximately 6 in. of interface telephone cable through the exposed cable fitting hub. (The main cable fitting hub's inside diameter ranges from 0.231 inches to .0391 inches.)
8	Slit the ends of the leads of each drop-wire pair and bend as shown in Figure 6 (on next page). **NOTE:** Do NOT strip insulation.
9	Use a Type 216C (7/16 in.) wrench to rotate each QFCM lug 1/4-turn counter-clockwise to open the connector. **CAUTION:** Terminal lug rotation limit is 1/4 turn. Do not attempt to turn terminal lug past stop.
10	Insert the first pair's tip and ring wires into the holes in the first QFCM until the wires touch the ends of the transparent plastic caps.
11	Use your fingers to hold the tip and ring wires in place.
12	Use a Type 216C (7/16 in.) wrench to rotate each QFCM lug 1/4 turn clockwise. **CAUTION:** Terminal lug rotation limit is 1/4 turn. Do not attempt to turn terminal lug past stop.
13	Finger tighten (do not use pliers or wrench) the cable rifting compression nut. If necessary, use groove-joint pliers to hold each cable rifting center locknut while finger-tightening each compression nut.
14	Use cable ties to dress the wires entering the enclosure box that connect to the QFCM terminals per local practice.
15	Position and secure the ground wire along the it installation surface and connect to a nearby ground per local practice.

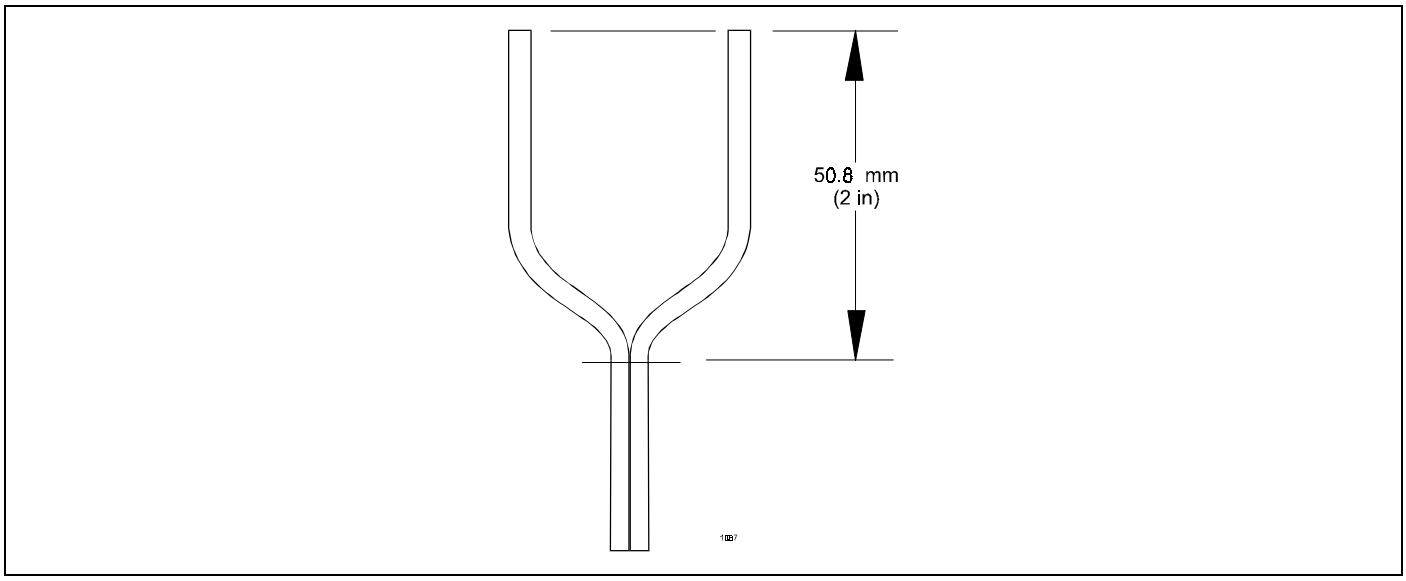

Figure 6. Wire preparation for insertion into Quiet-Front Connector Modules. Before insertion into Quiet-Front Connector Modules, wire pairs must be slit and arranged as shown above (see step 8 in Table 3).

D. GENERAL CIRCUIT CARD PRE-INSTALLATION PROCEDURES

12. PRE-INSTALLATION TEST

12.01 A multimeter (MM), including test leads and clips, is required to perform a pre-installation test.

12.02 Before installing a circuit card into the slot in the HRE-450, verify that the circuit is correctly configured by performing the appropriate test(s) for your configuration, as described in sections 12.03 through 12.07.

12.03 Enclosed HRU in a Single System. If the HRE-450 is enclosing a remote unit connected directly to a line unit (Figure 7), perform the test steps in Table 4.

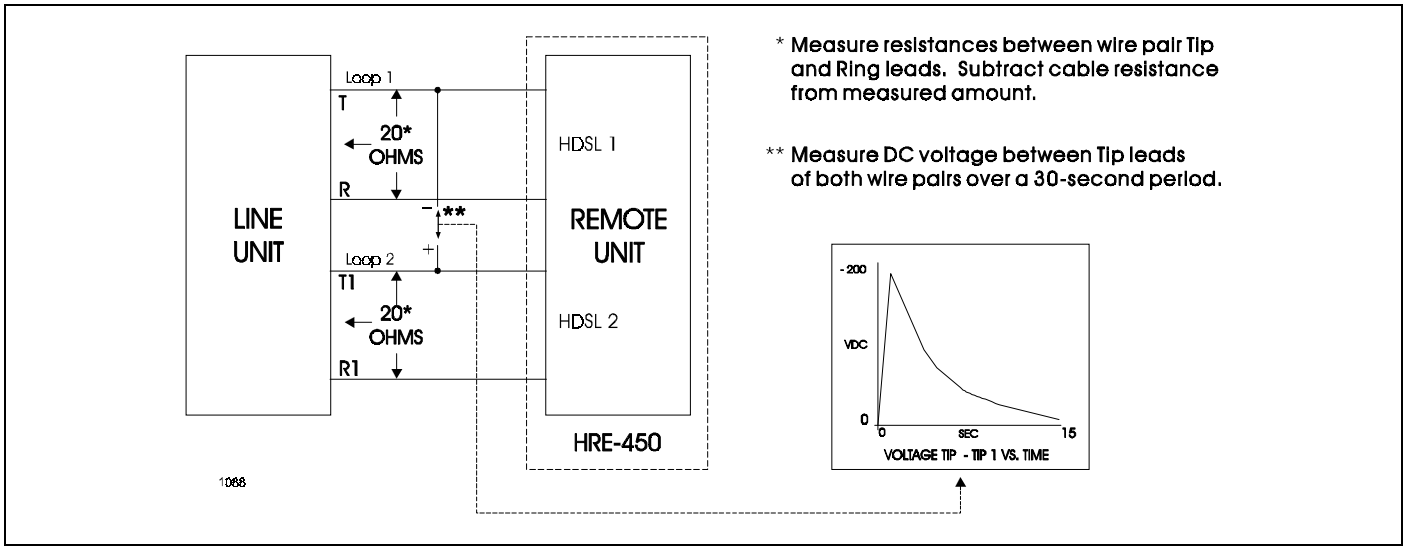

Figure 7. Test Configuration for an Enclosed HRU in a Single System. This test verifies: (a) resistances when looking upstream towards the line unit, and (b) the presence of an approximately 200 VDC pulse with a fast rise time and slow decay time over a time interval of approximately 30 seconds.

TABLE 4. TEST STEPS FOR ENCLOSED REMOTE UNIT IN A SINGLE SYSTEM

Step	Procedure for Testing Upstream Toward CO (Line Unit)
1	Set MM to "OHMS," then connect test leads across the Tip and Ring leads of HDSL Loop I pair from the line unit.
2	Measure the resistance. Note: Measuring the resistance of the HDSL pair tests continuity from the remote unit HDSL "input" through the cable pair to the line unit.
3	Verify that resistance = cable resistance (<750 Ω) + approximately 20 Ω. If not, go to Step 10.
4	Set MM to "OHMS," then connect test leads across the Tip and Ring leads of HDSL Loop 2 pair to the remote unit.
5	Measure the resistance.
6	Verify that the resistance = cable resistance (<750 Ω) + approximately 20 Ω. If not, go to Step 10.
7	Set MM to "VDC," then connect test leads between the Tip leads of HDSL Loop 1 and HDSL Loop 2 pairs.
8	Wait for a maximum of 30 seconds.
9	Verify that the voltage displayed on MM rises to less than approximately 200 VDC and slowly decreases, assuring DC power availability. If not, go to Step 11.
10	If measured resistance is "open, " then a HLU is not installed or a cable pair between the line unit and this location is open.
11	If resistance tests (Steps 2, 5) are OK but no voltage is present, then the line unit in the CO is not receiving power or is defective.

12.04 Enclosed Doubler in a System with a Single Doubler. If an HRE-450 is enclosing a doubler in a single-doubler system (see Figure 8), perform steps in Tables 5 and 6.

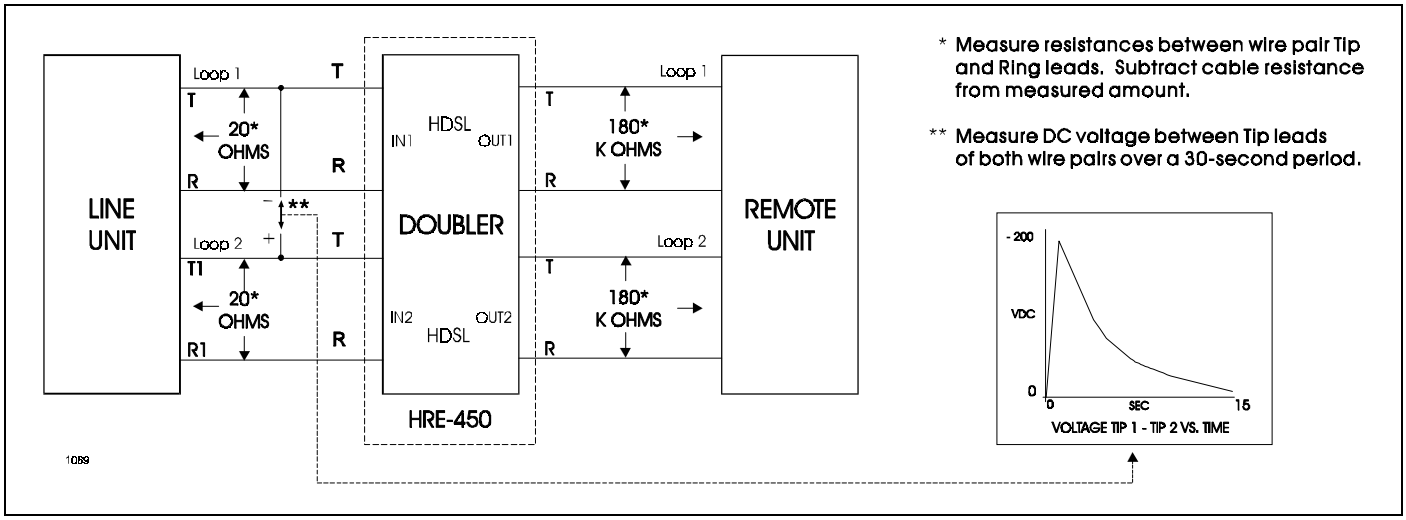

Figure 8. Test Configuration for an Enclosed Doubler (HDU) in a System with a Single Doubler. This test verifies: (a) resistances upstream towards the line unit and downstream towards the remote unit, and (b) the presence of an approximately 200 VDC pulse with a fast rise time and slow decay time over a time interval of approximately 30 seconds.

TABLE 5. TEST STEPS FOR ENCLOSED HDU IN A SYSTEM WITH A SINGLE HDU.

Step	Procedure for Testing Upstream Wires Towards CO (Line Unit)
1	Set MM to "OHMS," then connect test leads across Tip and Ring leads of HDSL IN1 pair from CO side.
2	Measure the resistance.
3	Verify that measured resistance = cable resistance (<750 Ω) + approximately 20 Ω. If not, go to Step 10.
4	Connect test leads across Tip and Ring leads of HDSL IN2 pair from CO side.
5	Measure the resistance.
6	Verify that measured resistance = cable resistance (<750 Ω) + approximately 20 Ω. If not, go to Step 10.
7	Set MM to “VDC,” then connect test leads between the Tip leads of Loop 1 and Loop 2 HDSL pairs.
8	Wait for a maximum of 30 seconds.
9	Verify that voltage displayed on MM quickly rises to less than approximately 200 VDC and slowly decreases. If not, go to Step 11.
10	If resistance is "open", line unit is not installed in CO or cable pair between doubler and line unit is open.
11	If no voltage is seen, but resistance tests indicate that a line unit is connected to HDSL pairs, then line unit in CO is not receiving power or is defective.

TABLE 6. TEST STEPS FOR ENCLOSED DOUBLER IN A SINGLE DOUBLER SYSTEM

Step	Procedure for Testing Downstream Wires Toward a Remote Unit
1	Set MM to "OHMS," then connect test leads across the Tip and Ring leads of the HDSL OUT1 wire pair to remote unit.
2	Measure the resistance.
3	Verify that the measured resistance = 157 KΩ to 183 KΩ. If not, go to Step 7.
4	Set MM to "OHMS," then connect the test leads across the Tip and Ring leads of the HDSL OUT2 pair to remote unit.
5	Measure the resistance.
6	Verify that measured resistance = 157 KΩ to 183 KΩ. If not, go to Step 7.
7	If resistance is "open," the remote unit is not installed in an enclosure or the cable pair from the doubler to remote unit is open.

12.05 Enclosed Remote Unit in a System with a Single Doubler. If the HRE-450 is enclosing a remote unit in a single-doubler system (see Figure 9), perform the test steps in Table 7.

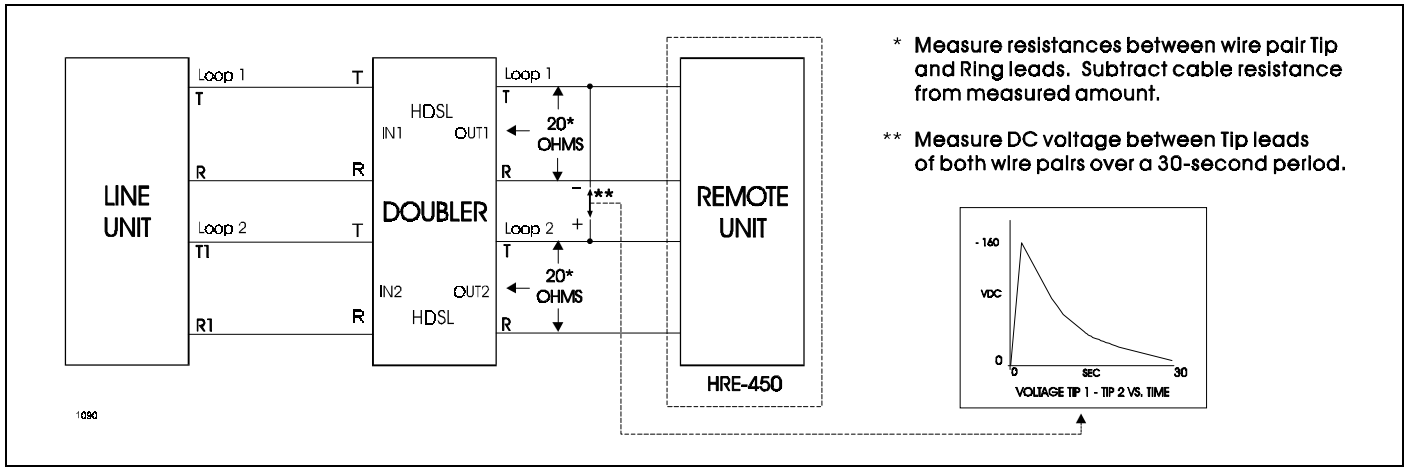

Figure 9. Test Configuration for an Enclosed Remote Unit in a System with a Single Doubler. This test configuration verifies: (a) resistances when looking upstream towards the doubler, and (b) the presence of an approximately 160 VDC pulse with a fast rise time and slow decay time over a time interval of approximately 30 seconds.

TABLE 7. TEST STEPS FOR AN ENCLOSED REMOTE UNIT IN A SYSTEM WITH A SINGLE DOUBLER

Step	Procedure for Testing Upstream Wires Toward an HDU
1	Set MM to "OHMS," then connect test leads across the Tip and Ring leads of the pair from the doubler.
2	Measure the resistance.
3	Verify that the resistance = cable resistance (<750 Ω) + approximately 20 Ω. If not, go to Step 10.
4	Set MM to "OHMS," then connect the test leads across the Tip and Ring leads of the second HDSL pair from doubler.
5	Measure the resistance.
6	Verify that the resistance = cable resistance (<750 Ω) + approximately 20 Ω. If not, go to Step 10.
7	Set MM to “VDC,” then connect test leads between the Tip leads of Loop 1 and Loop 2 pairs towards the doubler.
8	Wait for a maximum of 30 seconds.
9	Verify that the voltage displayed on MM rises to less than approximately 160 VDC and slowly decreases. If not, go to Step 11.
10	If measured resistance is "open," then a doubler is not installed or the cable pair between the doubler and remote unit is open.
11	If resistance tests (Steps 2 through 5) are OK but no voltage is present, then the line unit in the CO is not receiving power or is defective, or the doubler is defective.

12.06 Enclosed First Doubler in a System with Two Doublers. If an HRE-450 is enclosing the first doubler in a two-doubler system (see Figure 10), perform the test steps in Tables 8 and Table 9.

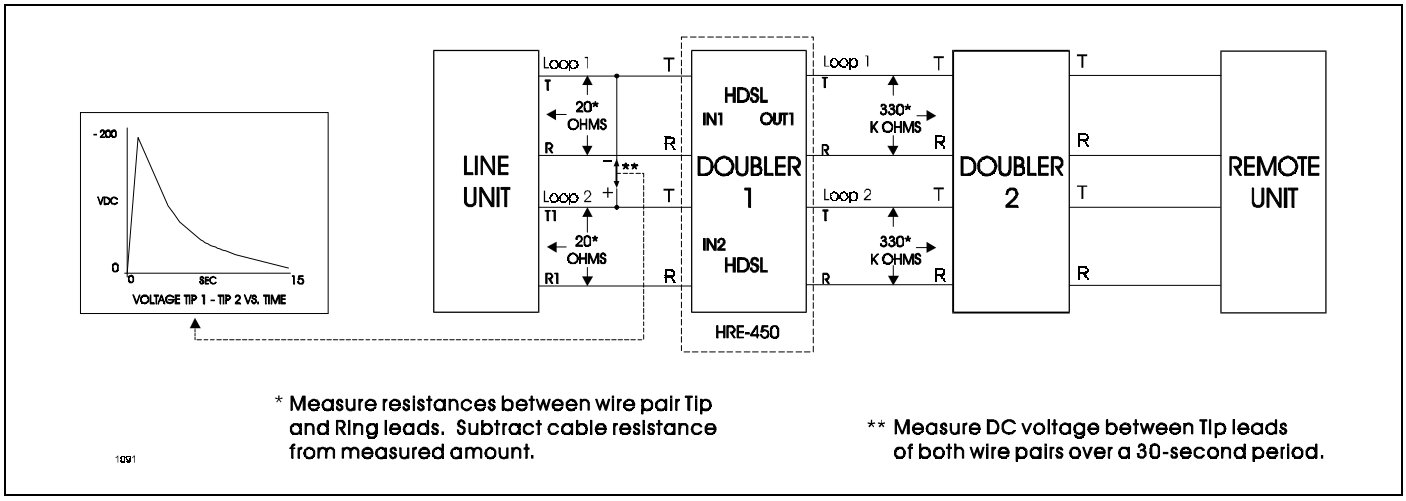

Figure 10. Test Configuration for Enclosed Doubler #1 in a System with Two Doublers. This test configuration verifies: (a) resistances when looking both upstream towards the line unit and downstream towards Doubler #2, and (b) the presence of an approximately 200 VDC pulse with a fast rise time and slow decay time over a time interval of approximately 30 seconds.

TABLE 8. TEST STEPS FOR ENCLOSED DOUBLER #1 IN A SYSTEM WITH TWO DOUBLERS

Step	Procedure for Testing Upstream Wires Towards CO (HLU)
1	Set MM to “OHMS,” then connect test leads across the Tip and Ring leads of HDSL IN1 pair from CO side.
2	Measure the resistance.
3	Verify that the measured resistance = cable resistance (<750 Ω) + approximately 20 Ω. If not, go to Step 10.
4	Connect test leads across the Tip and Ring leads of the HDSL IN2 pair from the CO side.
5	Measure the resistance.
6	Verify that the measured resistance = cable resistance (<750 Ω) + approximately 20 Ω. If not, go to Step 10.
7	Set MM to “VDC,” then connect test leads between the Tip leads of the IN1 and IN2 HDSL wire pairs.
8	Wait for a maximum of 30 seconds.
9	Verify that the voltage displayed on MM rises to less than approximately 200 VDC and slowly decreases. If not, go to step 11.
10	If resistance is "open," the line unit is not installed in the CO or the cable pair between the doubler and the line unit is open.
11	If no voltage is seen, but resistance tests indicate that a line unit is connected to HDSL pairs, then the line unit in the CO is not receiving power or is defective.

TABLE 9. TEST STEPS FOR ENCLOSED DOUBLER #1 IN A SYSTEM WITH TWO DOUBLERS

Step	Procedure for Testing Downstream Wires Toward DOUBLER #2
1	Set MM to "OHMS," then connect test leads across the Tip and Ring leads of HDSL OUT1 wire pair to Doubler #2.
2	Measure the resistance.
3	Verify that the measured resistance = approximately 330 KΩ. If not, go to Step 7.
4	Set MM to "OHMS," then connect test leads across the Tip and Ring leads of HDSL OUT2 pair to Doubler #2.
5	Measure the resistance.
6	Verify that the measured resistance = approximately 330 KΩ. If not, go to Step 7.
7	If resistance is "open," HDU #2 is not installed or the cable pair from Doubler #1 to Doubler #2 is open. If the resistance is <750Ω, a short circuit exists.

12.07 Enclosed Second Doubler in a System with Two Doublers. If an HRE-450 is enclosing the second doubler in a two-doubler system (see Figure 11), perform the test steps in Tables 10 and Table 11.

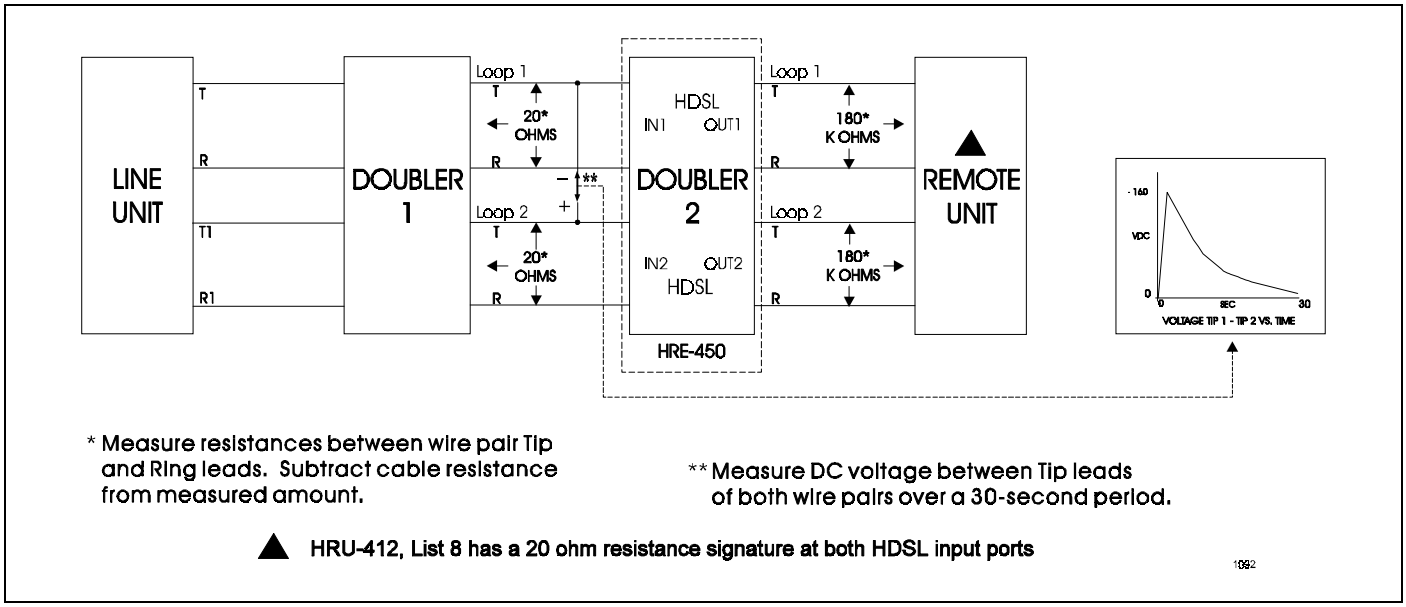

Figure 11. Test Configuration for Enclosed Doubler #2 in a System with Two Doublers. This test configuration verifies: (a) resistances when looking both upstream towards the Doubler #1 and downstream towards the remote unit, and (b) the presence of an approximately 160 VDC pulse with a fast rise time and slow decay time over a time interval of approximately 30 seconds.

TABLE 10. TEST STEPS FOR ENCLOSED DOUBLER #2 IN A SYSTEM WITH TWO DOUBLERS

Step	Procedure for Testing Upstream Wires Toward Doubler #1
1	Set MM to “OHMS,” then connect test leads across the Tip and Ring leads of the HDSL IN1 pair from Doubler #1.
2	Measure the resistance. NOTE: Measuring resistance of the HDSL pair tests continuity from Doubler #1 to Doubler #2.
3	Verify that the measured resistance = cable resistance (<750 Ω) + approximately 20Ω. If not, go to Step 10.
4	With MM set to "OHMS", connect test leads across Tip and Ring leads of HDSL IN2 pair from Doubler #1.
5	Measure the resistance.
6	Verify that measured resistance = cable resistance (<750 Ω)+ approximately 20 Ω. If not, go to Step 10.
7	Set MM to “VDC,” then connect test leads between the Tip leads of the HDSL IN1 wire pair and the HDSL IN2 wire pair.
8	Wait for a maximum of 30 seconds.
9	Verify that the voltage displayed on MM quickly rises to less than 160 VDC then slowly decreases, assuring DC power availability from Doubler #1 downstream to Doubler #2 (position under test). If not, go to Step 11.
10	If the measured resistance is approximately 180 KΩ, IN and OUT pairs are reversed. If resistance is "open," Doubler #1 is not installed or the cable pair from Doubler #1 to Doubler #2 is open.
11	If no voltage is seen, but resistance tests indicate that Doubler #1 is connected to HDSL pairs, then the line unit in the CO is not receiving power or is defective, or Doubler #1 is defective.

TABLE 11. TEST STEPS FOR ENCLOSED DOUBLER #2 IN A SYSTEM WITH TWO DOUBLERS

Step	Procedure for Testing Downstream Wires Toward a Remote Unit
1	With MM set to "OHMS", connect test leads across Tip and Ring leads of the HDSL OUT1 wire pair to remote unit.
2	Measure the resistance.
3	Verify that the measured resistance = 157 KΩ to 183 KΩ. If not, go to Step 7.
4	With MM set to "OHMS", connect test leads across Tip and Ring leads of the HDSL OUT2 pair to remote unit.
5	Measure the resistance.
6	Verify that the measured resistance = 157 KΩ to 183 KΩ. If not, go to Step 7.
7	If resistance is "open," the remote unit is not installed or the cable pair from Doubler #2 to the remote unit is open.

E. UNIT CARD INSTALLATION AND POWER ON

13. UNIT CARD INSTALLATION AND POWER ON

13.01 Installation and Initial Power On Procedure. Perform test steps in Table 12 to install doubler or remote unit and verify correct operation.

TABLE 12. TEST STEPS FOR DOUBLER OR REMOTE UNIT INSTALLATION AND INITIAL OPERATION

Step	Procedure
1	Loosen the wingnuts on the strap, then pull the strap away from the mounting plate.
2	Slide the doubler or remote unit into the slot until firmly seated. If DC Voltage pulse was present on MM in tests listed above, the doubler or remote unit should begin initial power-on cycle within 30 seconds.
3	If the installed unit is a doubler, and a remote unit is not yet installed, verify that the doubler completes its initial power-on cycle and two "HDSL IN" LEDs emit green light.
4	If the installed unit is a doubler, and a remote unit was installed, verify that the doubler completes its initial power-on cycle and all four (two "HDSL IN", two "HDSL OUT') LEDs emit green light.
5	If the installed unit is an HRU, verify that the unit completes its initial power-on cycle and that both front-panel "HDSL" LEDs emit green light.
6	Tighten the wingnuts on the strap.
7	Install the HRE-450 cover and tighten the screw to approximately 6 to 8 in-lbs. (maximum) torque to secure.