

MODEL U-REPEATER III, LIST 3 ISDN 2B1Q REPEATER INSTALLATION AND MAINTENANCE

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1. GENERAL

1.1 This practice provides installation and maintenance procedures for the ADTRAN ISDN U-Repeater III. The circuit pack is shown in **Figure 1**. **Table A** provides the part number and the basic features of the unit. **Table B** provides the part numbers and lists the basic features of the equipment option for the U-Repeater III system.

1.2 This is the first issue of this practice.

1.3 The ADTRAN U-Repeater III is a device for extending the ISDN Basic Rate Interface (BRI). It is capable of operating up to 42 dB loop loss at 40 KHz with 6 dB ANSI Near End Cross Talk (NEXT) Margin. This allows up to 1300 Ω DC resistance on both the network side and customer side loops.

Note: This module is to be used with ADTRAN U-Repeater II Power Module, part number 1212017L1, L2 (T400) or 1102009L1 (D4) only.

1.4 The ADTRAN U-Repeater III provides a means of extending the digital subscriber loop serving range up to 32 kFt of 26-gauge twisted pair wire/cable using a 2600 Ω total loop resistance design with a centrally located repeater. The unit has no manual option settings.

1.5 Power to operate the U-Repeater III is derived from a 43 mA constant sealing current source, independent of line impedance or wire gauge provided by an ADTRAN U-RPM II located in the Central Office (CO). The repeater uses 36 mA of the current and passes 5 mA to 7 mA of sealing current to the customer NT1.

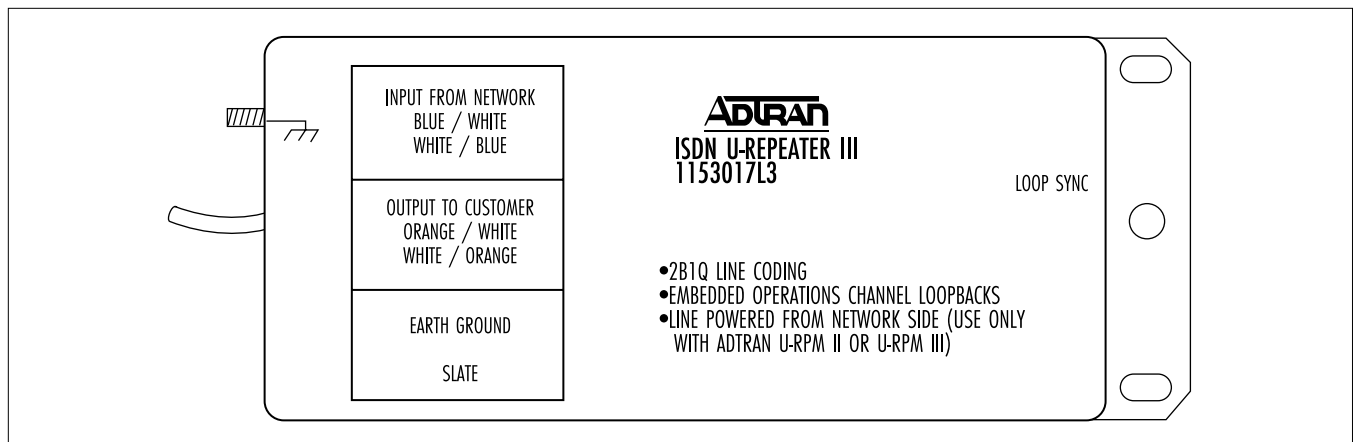


Figure 1. U-Repeater III Circuit Pack

Table A. Basic Features

Unit	Part No.	Features
U-Repeater III List 3	1153017L3	<p>Provides an ISDN U-interface toward the network and toward the customer according to ANSI T1.601-1992.</p> <p>Provides both interim path and segmented performance monitoring, per TR-NWT-000397.</p> <p>Provides eight hours of performance monitoring history per TR-NWT-00829.</p> <p>Responds to the eight ISDN BRA National Standard <i>eoc</i> messages.</p> <p>Provides lightning and power cross protection required by TR-NWT-001089.</p> <p>Derives operating power from the network-side wire pair, requiring 43 mA constant current at 28 V to the repeater, while supplying 5 mA to 7 mA of sealing current toward the customer.</p> <p>Provides termination signal to NT1 when power is applied and a constant sealing current.</p>

1.6 The U-Repeater III operates at line losses up to 42 dB at 40 kHz with 6 dB of ANSI NEXT Margin, in both directions from the repeater and regenerates the 2B1Q signals to meet the transmitted power spectrum of ANSI T1.601-1992.

1.7 This U-Repeater does not require mounting in a repeater apparatus case. Because it is encapsulated in a polyurethane compound, this device is weatherproof and can be mounted on a pole, in a pedestal, in a manhole, or other suitable location.

1.8 The U-Repeater III L3 interchanges with the ADTRAN U-Repeater II (1152017L3), but does not interchange with U-Repeater (1150017L1/L2/L3).

2. INSTALLATION

2.1 Dual Lock Mounting Option

The ISDN U-Repeater III can be mounted using bolts, tie wraps, or ADTRAN-supplied dual lock fasteners. **Figure 2** shows how to mount the ISDN U-Repeater III with dual lock fasteners.

2.2 Remove the repeater circuit pack from the carton and visually ensure that damage has not occurred during shipping or handling. If damage has occurred, file a claim immediately with the carrier, then contact ADTRAN customer service; see **Subsection 6.2**.

Table B. Equipment Options for the U-Repeater III System

Unit	Part Number	CLEI Number	Features
U-Repeater III L3 Circuit Pack (Encapsulated)	1153017L3	DDRPED9_ _ _	Single repeater unit; uses 2B1Q line coding; range up to 16 kFt of 26-gauge wire each direction from repeater; lightning protection; <i>eoc</i> loopback; <i>crc</i> test modes; elastic data buffers for jitter control.
U-Repeater II Powering Module-D4 T400 -48 VDC T400 -72 VDC	1102009L1 1212017L1 1212017L2	DDRPGH6_ _ _ DDRPHH6_ _ _ DDRPHB6_ _ _	Provides constant 43 mA down signal pair to power one repeater, allows for passive customer data flow, monitors the line for excessive resistance or open loop, standard D4 or T400 size plug-in.
U-Repeater Powering Shelf (GPC L3)	1150001L3	D4MEE30_ _ _	Single height shelf accommodates up to 12 D4 U-RPM IIs, fused -48 V alarm output, connectorized input/output.
T400-19 Shelf	1150028L1	NDMMAA0_ _ _	19" Rackmount shelf houses up to 12 U-RPM T400 circuit packs.
NT1 T400-23 Shelf, Rackmount	1150024L1	NDMMBA0_ _ _	23" Rackmount shelf houses up to 12 U-RPM T400 circuit packs.
NT1 T400-23 Enclosed Wallmount Shelf	1150024L2	N/A	23" Wallmount shelf houses up to 12 U-RPM T400 circuit packs.

Required:

- Two Type 400 2-inch plastic strips (dense stem pattern)**
- Two Type 170 plastic strips**
- Clean, dry mounting surface**

1. Remove green protective strips from Type 400 Velcro® strips and press into place, approximately ¼-inch from each end of the housing as shown below.
2. Secure Type 170 strips to Type 400 strips (Velcro-to-Velcro), then remove green protective strip.
3. Carefully align housing into mounting position, press firmly into place, and hold for 30 seconds.

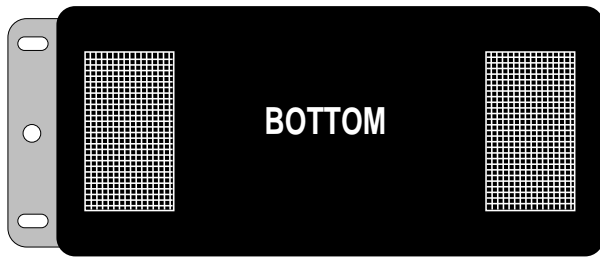


Figure 2. Mounting the U-Repeater III with the Dual Lock Fastener System

2.3 Select a suitable site or pole along the main cable where a loop loss up to 42 dB at 40 kHz is measured from the U-LT to the repeater.

The loop loss from the repeater to the customer site should not exceed 42 dB at 40 kHz, unless a bit error rate (BER) measurement is performed to ensure a maximum BER of less than 1×10^{-7} .

2.4 Make sure that the U-RPM power module is removed while making punch-down connections to the U-Repeater III. Connect the network side of the U-Repeater III by punch-down connection to the blue-white/white-blue pair. Connect the customer side of the repeater by punch-down connection to the orange-white/white-orange pair. Connect the 10-AWG ground wire on the U-Repeater III to a suitable earth ground connection.

OPTIONING THE U-REPEATER III

2.5 The repeater circuit pack has no option settings.

Note: Only one repeater may be used in an ISDN Basic Rate local loop.

3. CIRCUIT TURN UP

3.1 A green LED at the rear of the unit is provided to aid in circuit turn up and diagnostics (see **Figure 3**). The indications provided by this LED are described in **Table C**.

Indication	Meaning
LED <i>Flashes</i> three times after applying power.	Unit receiving power, self test passed.
LED <i>Flashes</i> once per second.	U-interface synchronized to network.
LED <i>On</i> solid.	U-interface synchronized on network and customer sides.

Table C. LED Indication Descriptions

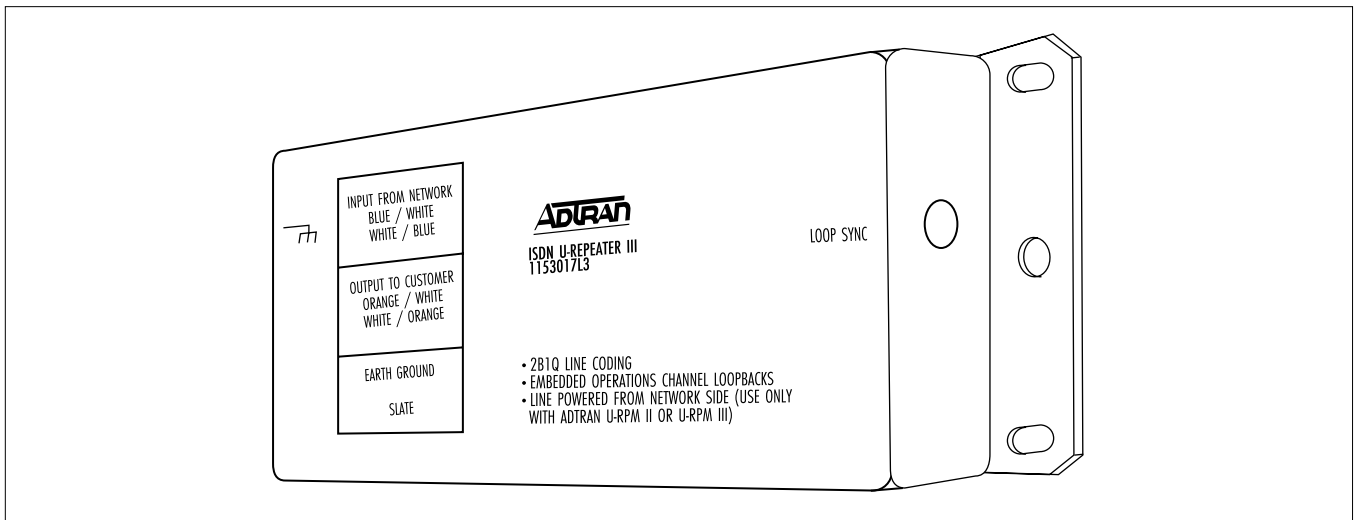


Figure 3. Loop Sync Indicator

Velcro is a registered trademark of Velcro BV.

3.2 The LOOP SYNC indicator at the end away from where the cable enters the unit *Flashes* green three times to indicate when the unit receives power from the U-RPM and passes a power-on self test. Failure of this indication may be due to incorrect or shorted wiring, either at the MDF between the LT and the U-RPM or between the U-RPM and the U-Repeater III. These conditions must be cleared before circuit turn up may proceed.

3.3 After verifying that the unit is receiving power from the U-RPM, the next step is to verify loop synchronization between the LT and the U-Repeater III. Once the network side of the unit has achieved synchronization to the LT, the LOOP SYNC indicator *Flashes* once per second. Failure of the unit to synchronize to the LT may be caused by a bad or incorrect line card, loop loss in excess of 42 dB @ 40 kHz, or excessive noise on the loop. These conditions must be cleared before proceeding.

3.4 After the unit has achieved synchronization to the network, synchronization to the customer may be verified if the customer's NT1 is installed. Once the U-Repeater III synchronizes to the customer NT1, the LOOP SYNC indicator remains *On*. This indicates that a Layer 1 connection between the LT and the customer NT1 has been established. Failure of the unit to synchronize to a properly installed NT1 may indicate excessive loop loss, noise, or faulty wiring.

4. MAINTENANCE

4.1 The U-Repeater III requires no routine maintenance to operate. In case of equipment malfunction, advise the CO to perform an *mp-eoc* loopback test, per TR-NWT-000397. If a malfunction is confirmed, replace the U-Repeater III circuit pack; see **subsection 6.3**.

4.2 The repeater has looping capability (B1,B2, and 2B+D) through the maintenance channel which allows for digital loopback, per TR-NWT-000397 to aid in fault isolation. The looping is accomplished remotely from the CO switch or from the ADTRAN U-BR1TE channel unit. In addition, eight hours of performance history is available to the network as described in TR-NWT-000829. This performance history may be used for troubleshooting and fault isolation purposes.

REPLACEMENT OF CIRCUIT PACKS

4.3 Remove the U-RPM associated with this circuit at the CO.

4.4 Replace the faulty circuit pack.

4.5 Insert the U-RPM and verify loop synchronization of the U-Repeater III.

4.6 Advise the CO to perform an *mp-eoc* loopback test, per TR-NWT-000397.

4.7 ADTRAN recommends that no repairs to the circuit pack be performed in the field. Repair services may be obtained by returning a defective unit to the ADTRAN Repair Department.

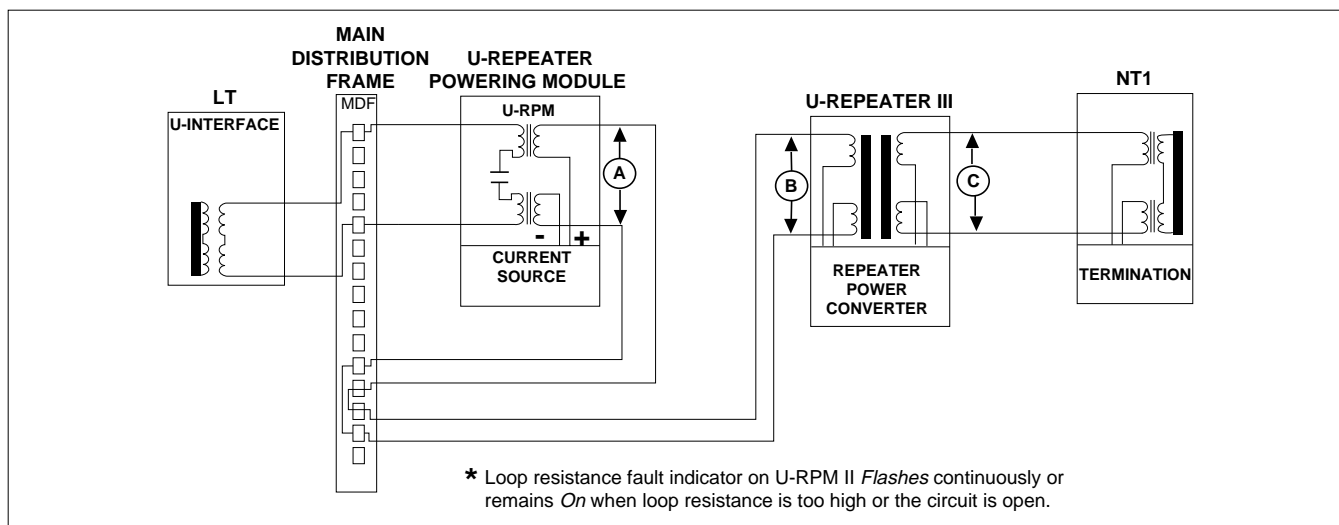


Figure 4. Typical U-Repeater III Circuit Voltage Test Points

TESTING THE REPEATER AT THE CENTRAL OFFICE

4.8 The ADTRAN U-Repeater III performs the standard *mp-eoc* loopbacks described in TR-NWT-000397.

TYPICAL VOLTAGE MEASUREMENTS (NORMAL OPERATING CONDITION)

4.9 **Figure 4** shows a typical loop originating at the LT U-Interface and terminating at the customer NT1. Use a digital multimeter to measure across the loop as demonstrated in the illustration.

The test points (A, B, and C) should contain the following voltage readings under normal operating conditions.

- A.** 28 VDC to 120 VDC. Actual voltage equals 28 V plus the line voltage drop between the U-RPM and the U-Repeater III.
- B.** 28 VDC + -3 V.
- C.**
 1. Not terminated at NT1 = 28 V \pm 3 V.
 2. Terminated at NT1 = 6 to 12 V.

5. DEPLOYMENT GUIDELINES

5.1 See **Figure 5** for information regarding deployment guidelines for ISDN 2B1Q loop transmission.

6. WARRANTY AND CUSTOMER SERVICE

ADTRAN will replace or repair this product within five years from the date of shipment, if the product does not meet its published specifications or if it fails while in service. For detailed warranty, repair, and return information, refer to the ADTRAN Equipment Warranty and Repair and Return Policy Procedure.

6.1 Return Material Authorization (RMA) is required prior to returning equipment to ADTRAN.

6.2 For service, RMA requests, or further information, contact one of the following numbers.

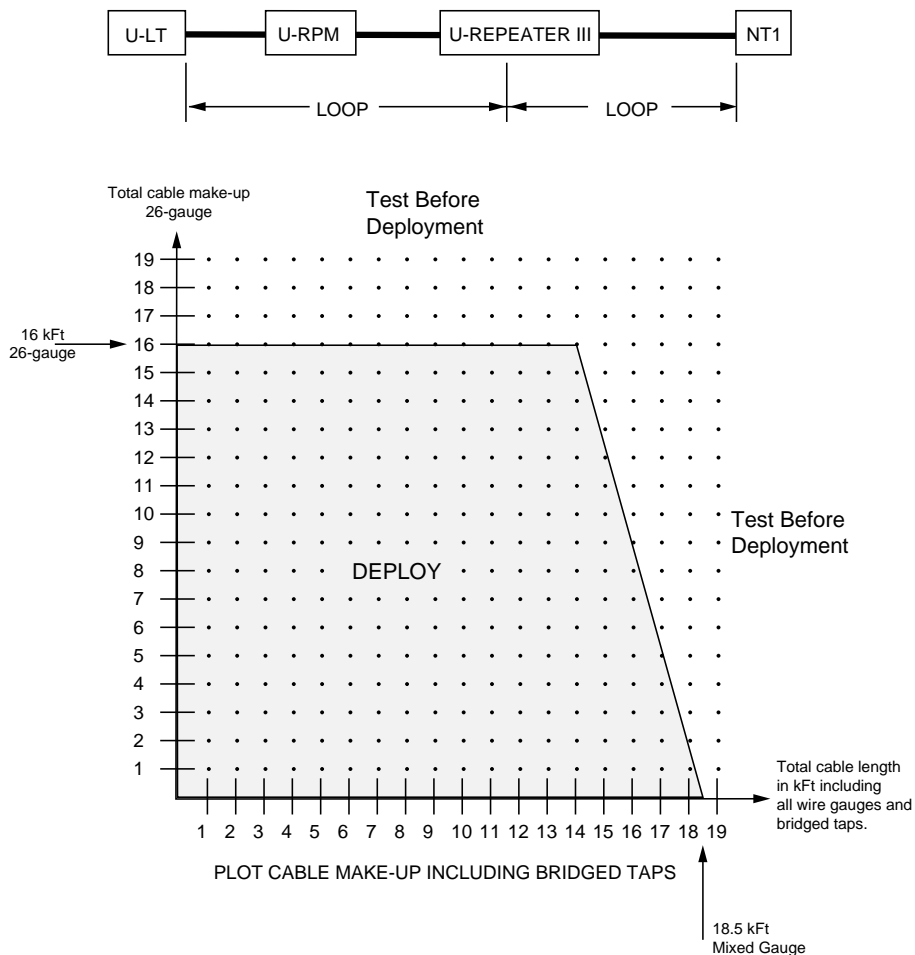
ADTRAN Customer Service:

RMA	(205) 971-8722
Technical Support	(800) 726-8663
Applications Engineering	(800) 615-1176
Sales	(800) 827-0807

Repair and Return Address:

ADTRAN, Inc.
Customer Service Department
901 Explorer Boulevard
Huntsville, Alabama 35806-2807





How to use this guideline:

1. Calculate the total length of 26-gauge wire, then plot on vertical axis.
2. Calculate the total length of wire in the cable make-up including 26-gauge and all bridged taps. Plot this total length on the horizontal axis.

If the plotted point falls within the solid line boundaries, the U-Repeater III can generally be deployed without testing.

If the plotted point is outside the solid line boundary, long term performance of the U-Repeater III can not be guaranteed. If deployment is desired, the circuit must be measured for all line qualification requirements and must be tested for performance. If these requirements are not met or performance does not pass, the circuit must be reengineered.

Line Qualification Requirements	
Maximum single bridged tap:	1.5 kFt (0.45 km)
Maximum total bridged tap:	4.5 kFt (1.37 km)
Maximum bridged taps:	3
Maximum resistance:	1300 Ω
(each side)	
Maximum loss at 40 KHz:	42 dB
Maximum Noise:	-57 dBm
(135 Ω termination, 50 kB filter)	
Maximum impulse noise threshold:	-40 dBm
(135 Ω input, 50 kB filter, seven or less counts in 15 minutes)	

Figure 5. ISDN U-Repeater III (Third Generation) Mixed Gauge Deployment Chart