

Installation and Operation

Metroplex™ 6000

Platform Card
Model MP 6001

Manual Revision History

Shown below is a chronological listing of revisions to this manual. The issue number, date, and synopsis of revised materials are included to provide the reader with a comprehensive manual history.

Note

In keeping with the policy of continuing development carried out by General DataComm Inc., the information in this manual is subject to revision without notice.

Issue	Date	Description
1	Jun/96	First issue.
2	Apr/97	Updates and additional information on the Ethernet option card, and support for SNMP.
3	Oct/97	Adds information on DSX-1 LIU and E1 LIU option card, Dial out on alarm and general updates.
4	Mar/'98	Added HDSL features

Compatibility

Check that you have the required revision of Platform Card firmware to support the cards in your system. Refer to Compatibility on page 7.

Platform Card

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Platform Card

The Platform Card is the common card for the Metroplex™ 6000. It provides configuration and diagnostic management of the other Metroplex™ 6000 cards through its supervisory ports. It also provides one or two Line Interface Units (LIUs) for connection to the network. You can use the supervisory ports to perform configuration, diagnostic, control, and maintenance functions, and to monitor alarms and status conditions.

The Platform Card is available in four versions; the 086P020-001, -002, -003, and -004. The -001 is populated with an integral CSU T1 interface on the card for LIU A. You can add a second T1 interface for LIU B by adding a CSU T1 option card or a DSX-1 LIU option card.

The -002 has no CSU T1 interface on the basecard. This allows you to add the LIUs you desire. Add one or two CSU T1 option cards (for DS-1 interfaces), one or two DSX-1 LIU option cards (for DSX-1 interfaces), one or two E1 LIU option cards (for E1 interfaces), one or two HDSL (High bit rate Digital Subscriber Line) E1 LIU option cards.

The -003 is the same as the -001, except that it adds SNMP (Simple Network Management Protocol) management.

The -004 is the same as the -002, except that it adds SNMP management.

You may use one CSU T1 and one DSX-1 LIU on the same basecard but you may not mix T1 and E1 LIUs.

The E1 LIU and the HDSL E1 LIU can only be used on the -002 or -004 Platform Card.

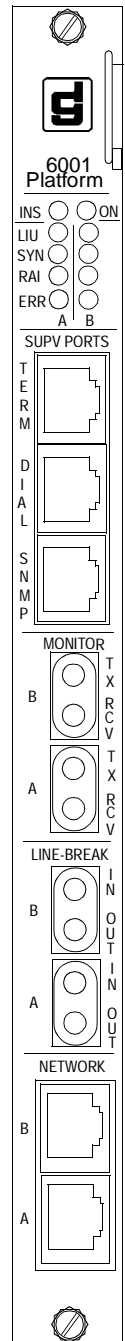
Important *Due to power limitations, we recommend that you populate only one HDSL card if you are also using an Ethernet card. If you are not using an Ethernet card, you may populate two HDSL cards. The CSU T1, DSX-1 and E1 LIUs do not have a power limitation.*

Management Features

- Supervisory terminal provides software control of configuration, diagnostics, and maintenance.
- Dial port that supports dial-in from a remote supervisory terminal, supports dial-in PPP connections for TELNET and SNMP or supports dial-out on alarm in SNMP TRAPs or ASCII strings.
- Ethernet port for direct LAN attachment.
- Acts as an SNMP agent (-003 and -004 version only) for all cards in the enclosure.

LIU Features

- Supports one or two independent network connections.
- Supports full Drop and Insert.
- Supports diversity, which allows two network connections at the same time with one connection acting as a spare to carry the data traffic of the other connection during line failure.
- Configurable for transmit timing from an internal clock or recovered from the network data except the HDSL E1 LIU which adapts timing from either the PCM Interface or an internally provided clock.



- Configurable for backup transmit timing from an internal clock or recovered from the network data except the HDSL E1 LIU which adapts timing from either the PCM Interface or an internally provided clock.
- Automatic backup transmit timing.
- Supports the following LIUs: CSU T1, DSX-1, E1, HDSL E1.

Note

Transmit timing for LIU A and for LIU B is always derived from the same source. Transmit timing is usually derived from the receive signal on the NETWORK A port. It may also be derived from an internal timing source.

Backup transmit timing may be derived from either the receive signal on the NETWORK B port (if LIU B is in use) or from the internal timing source.

Front Panel Indicators and Connections

Table 1 describes the front panel indicators and electrical connectors and *Figure 6* shows the functions of the MONITOR and LINE-BREAK jacks.

Table 1 Front Panel Indicators

Indicators	
LED	Use
ON	Power on. Off = The card has not received power. Green = Card installed, has power, and has passed self-test. Red = Card has power but failed self-test.
INS	In Service. On = Green - Card is in service.
LIU A, B	LIU Mode. Off = LIU not in use, or has not been installed. Green = Timeslots assigned. LIU is in use. Green Flashing = HDSL startup sequence in progress. Red = LIU is in test mode.
SYN A,B	In Sync. Off = LIU is not installed. Green = LIU is in sync and out of Red Alarm. Red = LIU has lost frame sync or Both HDSL loops out of sync. Red Flashing = Flashes 250 msec with each frame slip or if one HDSL loop out of sync.
RAI A,B	Remote Alarm Indication. Off = Normal. Red = Remote Alarm Indication received. Note: Both SYN and RAI On (Red) indicates receipt of AIS Alarm Indication Signal)
ERR A,B	Error Detected. Off = Normal. Red Flashing = Flashes for 250 msec for BPVs or CRC errors in ESF mode, or framing bit errors in D4 mode. Red = LIU has lost the receive signal. Note: Both SYN and ERR On (Red) indicate LOS (Loss Of Signal)
Note: If LIU B is installed but does not have any timeslots assigned to it and the LIU Interface Mode is set to Network Link, the SYN, RAI, and ERR LEDs for LIU B will remain off.	

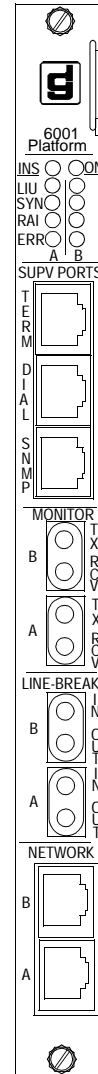


Table 2 through *Table 6* describes the three supervisory ports labelled: TERM (Terminal), DIAL (Dial-In or Dial-out), and SNMP (SNMP Management) and the NETWORK ports. All five are 8-position modular jacks.

TERM - Pinout follows EIA/TIA-561. The electrical interface is EIA/TIA-232-E. The physical layer transport supports the following:

- Connects to a DTE (terminal).
- VT-100 craft interface.
- Async data rate of 9.6 kbps.

- Format of 8N1.

DIAL - Pinout follows EIA/TIA-561. The electrical interface is EIA/TIA-232-E. The physical layer transport supports the following:

- Connects to a DCE (modem).
- VT-100 craft interface for dial-in, ASCII text for dial-out.
- Also supports PPP session (-003 and -004 versions only).
- Async data rate of 9.6 kbps.
- Format of 8N1.

SNMP - This port is configurable via an on-board jumper for either PPP (using EIA/TIA-232-E circuitry on the basecard) or IEEE 802.3 10Base-T (using the Ethernet option card).

The Ethernet physical layer transport is IEEE802.3 10Base-T (10 Mbps). The PPP pinout follows EIA/TIA-561. The electrical interface is EIA/TIA-232-E. The physical layer transport supports the following:

- Connects to a DTE (terminal).
- PPP protocol.
- Async data rate of 9.6 kbps.
- Format of 8N1.

Table 2 TERM Port Front Panel Connector

TERM (Terminal) Port			
Pin No.	Signal	Direction	Description
1	No Connection		
2	DCD	From Platform Card	Data Carrier Detect - Always On.
3	DTR	To Platform Card	Data Terminal Ready- Not Used.
4	Signal Ground		Signal Ground
5	RXD	From Platform Card	Receive Data - Supervisory data to the terminal
6	TXD	To Platform Card	Transmit Data - Supervisory data from the terminal
7	CTS	From Platform Card	Clear To Send - Always On.
8	RTS	To Platform Card	Not Used

Table 3 DIAL Port Front Panel Connector

DIAL Port			
Pin No.	Signal	Direction	Description
1	No Connection		
2	DCD	To Platform Card	Data Carrier Detect - Used to detect an incoming call.
3	DTR	From Platform Card	Data Terminal Ready - Always On.
4	Signal Ground		Signal Ground
5	RXD	To Platform Card	Receive Data - Supervisory data to the Platform Card
6	TXD	From Platform Card	Transmit Data - Supervisory data from the Platform Card
7	CTS	To Platform Card	Clear To Send - Not Used
8	RTS	From Platform Card	Request To Send - Always On.

Table 4 SNMP (PPP) Front Panel Connector

SNMP Port (Configured for PPP)			
Pin No.	Signal	Direction	Description
1	No Connection		
2	DCD	From Platform Card	Data Carrier Detect - Always On.
3	DTR	To Platform Card	Data Terminal Ready - Not Used.
4	Signal Ground		Signal Ground
5	RXD	From Platform Card	Receive Data - Supervisory data from Platform Card.
6	TXD	To Platform Card	Transmit Data - Supervisory data to Platform Card.
7	CTS	From Platform Card	Clear To Send - Always On.
8	RTS	To Platform Card	Not Used.

Table 5 SNMP (Ethernet) Front Panel Connector

SNMP Port (Configured for Ethernet)			
Pin No.	Signal	Direction	Description
1	Tx+	From Platform Card	Transmit Data
2	Tx-	From Platform Card	Transmit Data
3	Rx+	To Platform Card	Receive Data
4			
5			
6	Rx-	To Platform Card	Receive Data
7	No Connection		
8	No Connection		

Table 6 NETWORK (A and B) Front Panel Connector

T1/E1 CSU			
Pin No.	Signal	Direction	Description
1	Rx Ring	To Platform Card	Receive Data (Ring)
2	Rx Tip	To Platform Card	Receive Data (Tip)
3	No Connection		
4	Tx Ring	From Platform Card	Transmit Data (Ring)
5	Tx Tip	From Platform Card	Transmit Data (Tip)
6	No Connection		
7	No Connection		
8	No Connection		

Table 7 NETWORK (A and B) Front Panel Connector

HDSL E1			
Pin No.	Signal	Direction	Description
1	Ring	Bidirectional	Loop 2 HDSL Transceiver
2	Tip	Bidirectional	Loop 2 HDSL Transceiver
3	No Connection		
4	Ring	Bidirectional	Loop 1 HDSL Transceiver
5	Tip	Bidirectional	Loop 1 HDSL Transceiver
6	No Connection		
7	No Connection		
8	No Connection		

Compatibility

You need a certain revision level of Platform Card firmware in order to support the various option cards on the Platform Card, and also the various basecards and their option cards.

To check the Platform Card firmware revision level, go to the System Utilities Screen on the Local Manager. Select **Card Revisions**. The firmware revision level is under the **F/W** column. The revision level starts at -- and proceeds in the order A-, B-, C-, etc.

If a basecard is not in a slot, or an option card is not populated on a basecard, the card name will appear as **None** in the **Card Type** or **OptCrđ** headings on the **Card Revisions** screen. If a basecard or option card is populated, but not supported by your Platform Card firmware, the card name will appear as **Unknown**.

Installation

Install option cards on the Platform Card - *Figure 1* shows the 086P020-002 or -004 Platform Card and the location of the option cards. The 086P020-001 or -003 card is identical except that you cannot plug an option card into the LIU A position, since LIU A is already built into the basecard.

Option cards plug onto the basecard using one or more connectors. The basecard connectors have socket (female) contacts and the option card connectors have pin (male) contacts. The connector housing has a small key located at pin 1 to prevent incorrect mating. These surface-mount, high-density connectors have fragile pins, so they must be handled carefully. Each option card also has four plastic snap-in standoffs which secure the card mechanically to the basecard. The standoffs have a locking end which remains in the option card, and a non-locking end which allows removal of the option card from the basecard. You must make sure that the option card is oriented and located correctly before attempting installation. One corner of each option card is notched to help in orientation, and also one standoff is offset to prevent incorrect installation.

Before handling a card, make sure that you are grounded with an ESD wriststrap, to prevent ESD damage to the card.

Orient the LIU option card so that the notched corner is at the bottom right as shown in *Figure 1*. Orient the Ethernet option card so that the notched corner is at the top right as shown in *Figure 1*.

The basecard silkscreen has a notched outline of the option card to help in location and orientation. Place the option card over the basecard, locating the four standoffs over the corresponding holes in the basecard. Press the four corners of the option card firmly into place until the four standoffs snap into the holes.

To remove an option card, turn the basecard over and press down on each of the option cards' standoffs to push the standoffs through the basecard holes. You can use a blunt object such as the end of a plastic screwdriver handle. Never use a sharp or metallic object to do this, in order to avoid damage to circuit traces or components. When all four standoffs are free, the connectors will be unmated, allowing the option card to be lifted off easily.

Switches and Jumpers

Set Switch S1 and jumper X15 as shown in *Figure 1*. The defaults are OFF (down) for S1, and the jumpers placed at PPP.

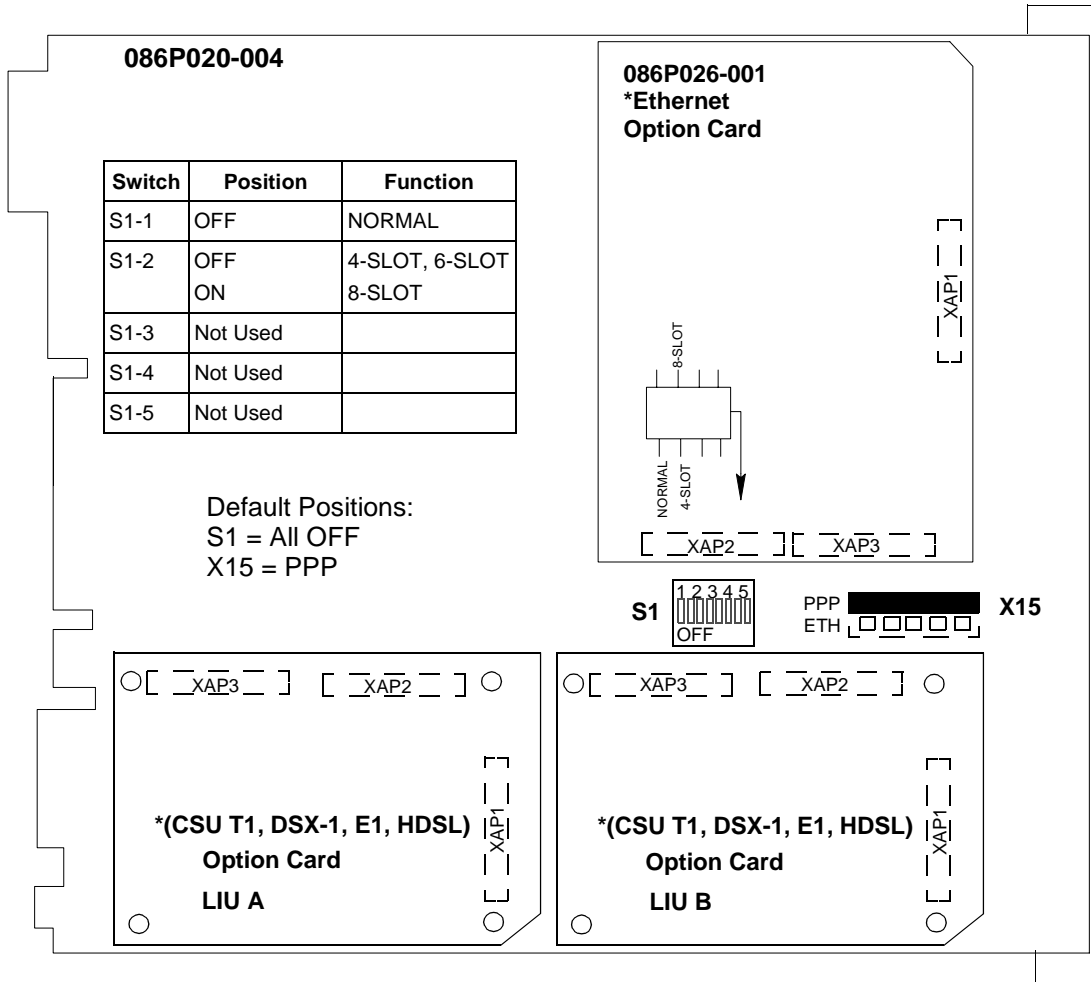
Note *The jumper on some Platform Cards is labelled SNMP instead of ETH.*

Set switch S1-2 to the OFF position labelled 4-SLOT if you are using a 4-slot Metroplex™ 6000 backplane in a USS (Universal System Shelf). Set S1-2 to 8-SLOT if you are using an 8-slot Metroplex™ 6000 backplane in a USS. The 8-slot backplane consists of two 4-slot backplanes

connected together with a ribbon cable. If you are using a 6-slot Wallmount Enclosure, set S1-2 to OFF.

To use the front panel SNMP port for PPP, you must set jumpers X15 to PPP and you must configure the Platform Card with an IP address. Refer to *Local Management - 6, System Utilities* section for more details. You do not need an Ethernet option card, since the PPP function is on the basecard. You must have either a -003 or a -004 version of the Platform Card.

To use the SNMP port for Ethernet, you must have an Ethernet option card installed. Set the jumpers X15 to the ETH (this may be labelled SNMP) and configure the Platform Card with an IP address. Refer to *Local Management - 6, System Utilities* section for more details.



Important * Due to power limitations, we recommend that you populate only one HDSL card if you are also using an Ethernet card. If you are not using an Ethernet card, you may populate two HDSL cards. The CSU T1, DSX-1 and E1 LIUs do not have a power limitation.

Figure 1 Platform Card (-004) With *Two Option Cards and an Ethernet Option Card

Insert the Platform Card into the housing. The Platform Card should always be in slot 1, (the leftmost slot when looking from the front). Insert the card into the card guides, pushing on the front panel until the backplane connector mates. Tighten the two captive screws at the top and bottom of the front panel.

To remove the Platform Card, loosen the top and bottom captive screws and pull the ring located near the top of the front panel.

Once the Platform Card is installed in a powered system (or when the system is powered up), it automatically performs a card self-test. If the self-test passes, the front panel ON led turns green; if the test fails, it remains red. The status is also reported in the `Status` column of the Manager's Monitor, Diagnostic, and Configuration Slot Selection screens.

Connect cables to the front panel connectors as follows. See [Figure 2](#) for a typical cabling arrangement. To connect a VT-100 terminal to the TERM port, use the 029H210-001 DB25 to 8-position modular adapter with the 830-128-807 modular-to-modular cable. If you are running a VT-100 terminal emulator on a pc with a 15-pin serial port, use the 029H211-001 DB15 to 8-position modular adapter instead.

To connect a modem to the DIAL port, use the 830-128-807 modular-to-modular cable with the 029H210-001 DB25 to 8-position modular adapter. For details on setting up the modem for dial-in or dial-out applications, refer to the Local Management Installation and Operation Manual, GDC Part No. 086R605-001.

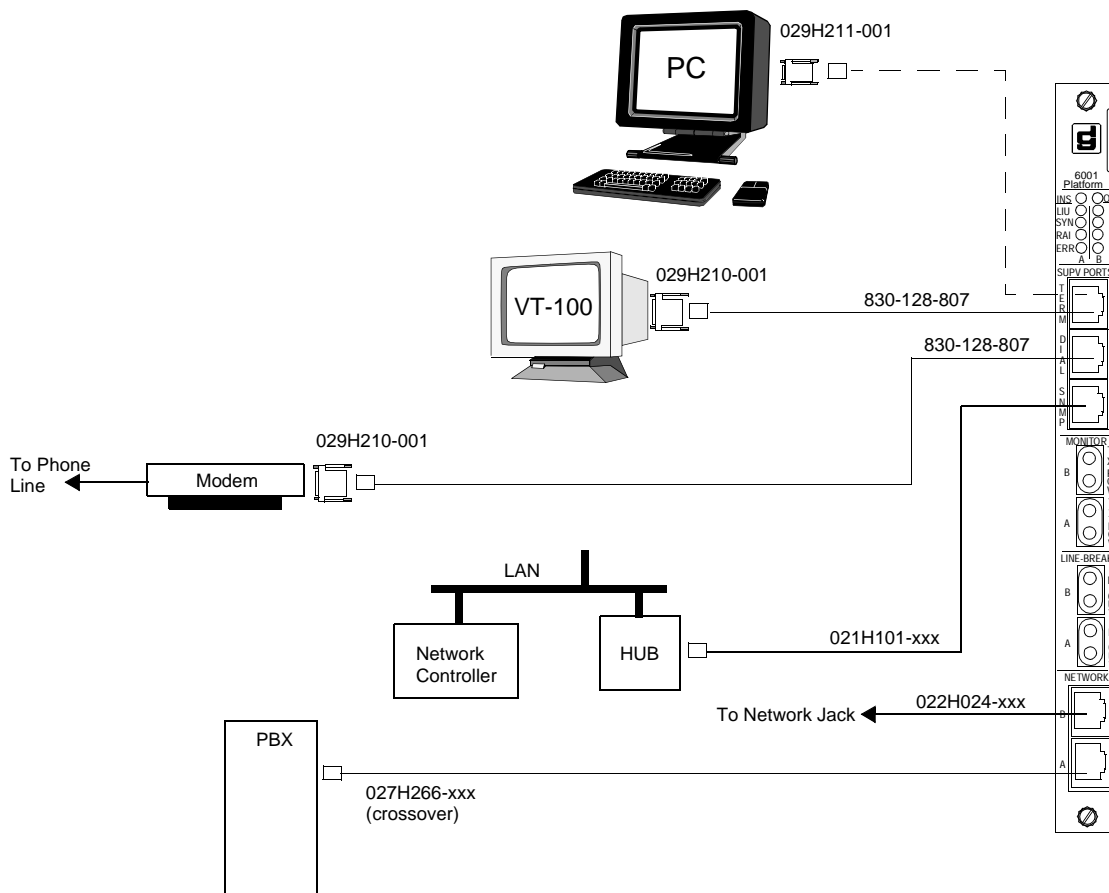


Figure 2 Typical Cabling

Application Information

LIU Timing

The Metroplex™ 6000 can be timed from the network receive signal, or from an internal source. This system (backplane) timing is used on each LIU to transmit the signal to the network and is also used for the channels' clocks. You can configure a primary timing source, and also a secondary or backup timing source, for use if the primary timing source fails.

In most cases, the network provides timing, and you should configure the Metroplex™ 6000 to recover timing from the received signal. Each LIU on a Platform Card can recover timing from its own network received signal.

When you are using only one LIU, it must be LIU A. On the Local Manager's Platform Card Configuration screen, select `Transmit Timing: Network A`. In this case, the only choice for `Backup Transmit Timing` is `Internal`.

When you are using both LIU A and LIU B to connect to the public network, use LIU A to connect to the more stable and reliable source of timing. Select `Transmit Timing: Network A`, and `Backup Transmit Timing: Network B`. You cannot select `Network B` as a primary timing source, but it may be used as a backup timing source.

When connecting to a line that does not provide a source of timing, for example in a point-to-point application, set one Metroplex™ 6000 to `Transmit Timing: Internal`, and the other Metroplex™ 6000 to `Transmit Timing: Network A`.

LIU Interface Mode

The Platform Card may be equipped with one or two LIUs. Remember that the 086P020-001 Platform Card has a built-in CSU T1 on the basecard, and a second LIU may be added by plugging in an LIU option card. The 086P020-002 Platform Card accepts one or two LIU option cards. The two LIUs may be configured to suit a variety of applications. You may not mix T1 and E1 LIUs on the same Platform Card.

On the Local Manager's Platform Card Configuration screen, select `LIU Interface Mode: Network Link` if you want to connect both LIUs to the network. Channels may be configured to use any timeslot on either LIU. Note that a DSX-1 channel on the Frac-Data Card is always treated as a single channel, and so it must use a contiguous group of timeslots on either LIU A or LIU B.

To configure LIU B as a backup to LIU A, select `LIU Interface Mode: Diverse Link`. You must first de-assign any channels that are assigned to timeslots on LIU B. No timeslots can be assigned on LIU B, since it is used to provide a backup link in case LIU A or its network line fails. When `Diverse Link` is selected, all of the LIU A transmit data is also transmitted on LIU B, but the receive data comes from LIU A only. Detection of an alarm condition on LIU A causes the Metroplex™ 6000 to switch to receiving on LIU B only. The alarm conditions are: `Out Of Frame` or `Loss Of Signal`. When the alarm condition on LIU A clears, traffic is not restored automatically to LIU A. To perform a manual restoral to LIU A, go to the System Utilities -> Diversity screen and select `Restore Primary LIU`. The LIU Status field changes from `Diversity` to `Normal` to indicate that the restoral was successful. Note that switchover to LIU B will not occur if an alarm condition exists on LIU B. Similarly, you cannot restore to LIU A if it has an alarm condition.

When LIU A is used to connect to the network, and LIU B is used to connect to another device such as a digital PBX, or a second Metroplex™ 6000, select `LIU Interface Mode: Drop and Insert`. This routes a contiguous group of timeslots from LIU A to the same group of timeslots on LIU B. Specify the start timeslot and the stop timeslot of this group on the Platform Card Configuration screen. All other timeslots on LIU A are available for assignment to channels. Similarly, all other timeslots on LIU B are also available for assignment to channels. A typical

application would be to route, say, 12 network voice circuits through the Metroplex™ 6000 to a PBX, and to route four timeslots, representing a 256 kbps high-speed data circuit, to a Frac-Data Card. Note that in this case, you could additionally route voice circuits from the PBX to the Flexi-Voice Plus Card.

When you route T1 voice circuits between LIU A and LIU B, select `Signaling Channel` for each of the timeslots in the Drop and Insert Timeslot Configuration screen. This causes each LIU to extract the robbed-bit signaling from its incoming line and to insert the signaling from the other LIU in the correct multiframe of its outgoing line. Note that there is no multiframe alignment between LIU A and LIU B. For all other circuit types, select `Clear Channel`, which is the default. This passes all eight bits of the timeslot from LIU A to LIU B, and does not re-insert signaling.

When you route E1 voice circuits between LIU A and LIU B, both LIUs must be configured for CAS (Channel Associated Signaling). In the E1 LIU Configuration screen, select `CAS:ON`. Select `Signaling Channel` for each of the timeslots in the Drop and Insert Timeslot Configuration screen. This allows each LIU to extract the signaling from timeslot 16 from its incoming line and to insert the signaling from the other LIU into its outgoing line.

Diagnostics

Diagnostics consists of a self-test, manager-initiated loopbacks and network-initiated (Telco) loopbacks.

Self-Test

This test is run on power-up or a command from the Local Manager’s Platform/LIU Diagnostic screen. If the self-test fails, the front panel ON LED is lit red, otherwise the ON LED turns green.

Manager-Initiated Loopbacks

ToChan Loopback - The ToChan (to channel) loopback (see *Figure 3*) loops all of a LIUs timeslots back towards the channels.

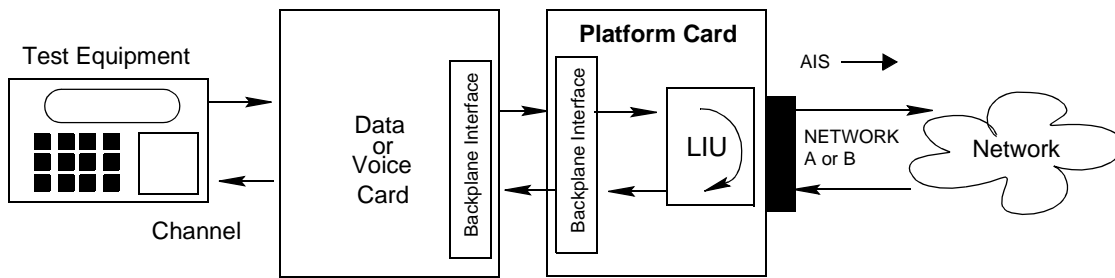


Figure 3 ToChan Loopback

An Alarm Indication Signal (AIS) is transmitted towards the network. External test equipment on the channels may be used to generate and check a test signal. This test signal verifies all of the channel card circuitry, the Metroplex™ 6000 backplane and all of the Platform Card circuitry up to the LIU.

Payload Loopback - The Payload Loopback (see *Figure 4*) loops all 24 (T1) or 30/31(E1) timeslots received from the network back to the network. Receive data continues to be sent to the channels, i.e. it is a transparent loopback.

The HDSL E1 LIU also loops back timeslot 0 in a Payload Loopback.

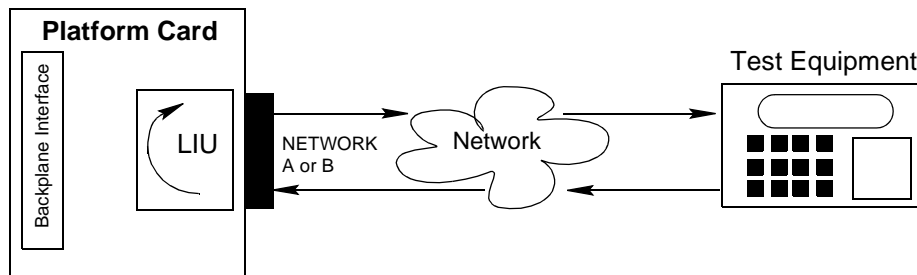


Figure 4 Payload Loopback

Network - Initiated Loopbacks

Refer to the section on each individual option card for a description of the network-initiated loopbacks that it supports.

CSU T1 Option Card

Compatibility - This option card works with all versions of the Platform Card firmware.

The CSU T1 option card (see [Figure 5](#)) provides the 1.544 Mbps interface required to connect to a T1 line. This card meets the ANSI T1.403-1995 requirements, and is supported, and fully configured by the Platform Card through network management.

Features

- Supports both Alternate Mark Inversion (AMI) and Bipolar with 8 Zero Substitution (B8ZS) line codes.
- Supports both Extended Superframe (ESF) and D4 framing formats.
- Provides network interfacing and protection.
- Supports LINE-BREAK jacks (see [Figure 6](#)) on the Platform Card front panel to allow connection of test equipment to the T1 line.
- Supports MONITOR jacks on the Platform Card front panel to allow connection of test equipment to monitor Tx and Rx data on the T1 line.
- Regenerates DS-1 received signal to a full DSX-1 level for the RX MONITOR jack.
- FCC Part 68 registered.
- UL 1459 compliant.
- Selectable line build out of 0, -7.5 or -15 dB at 772 kHz.
- Indicates/detects OOF (Out Of Frame), LOS (Loss Of Signal), RAI (Remote Alarm Indication), AIS (Alarm Indication Signal) and excessive error rate (ESF mode only).
- Supports both manager and carrier initiated loopbacks.
- Supports Technical Reference 54016 ESF User and Network Performance.
- Supports ANSI T1.403 ESF Performance.

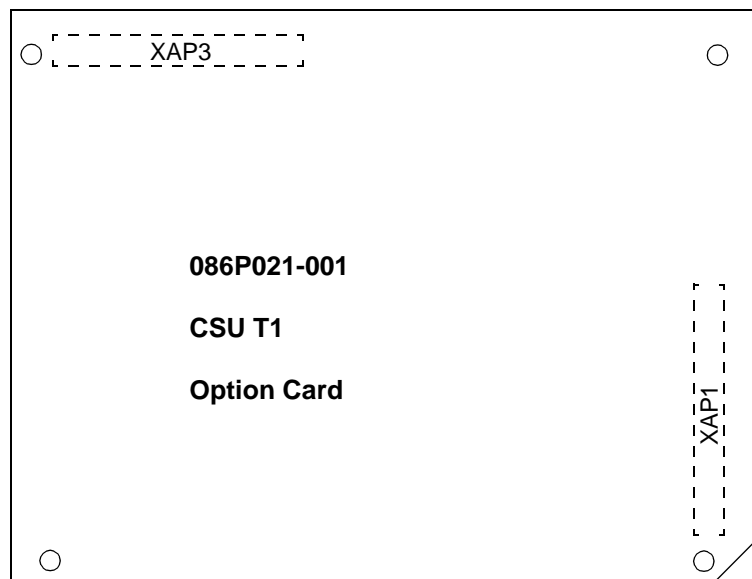
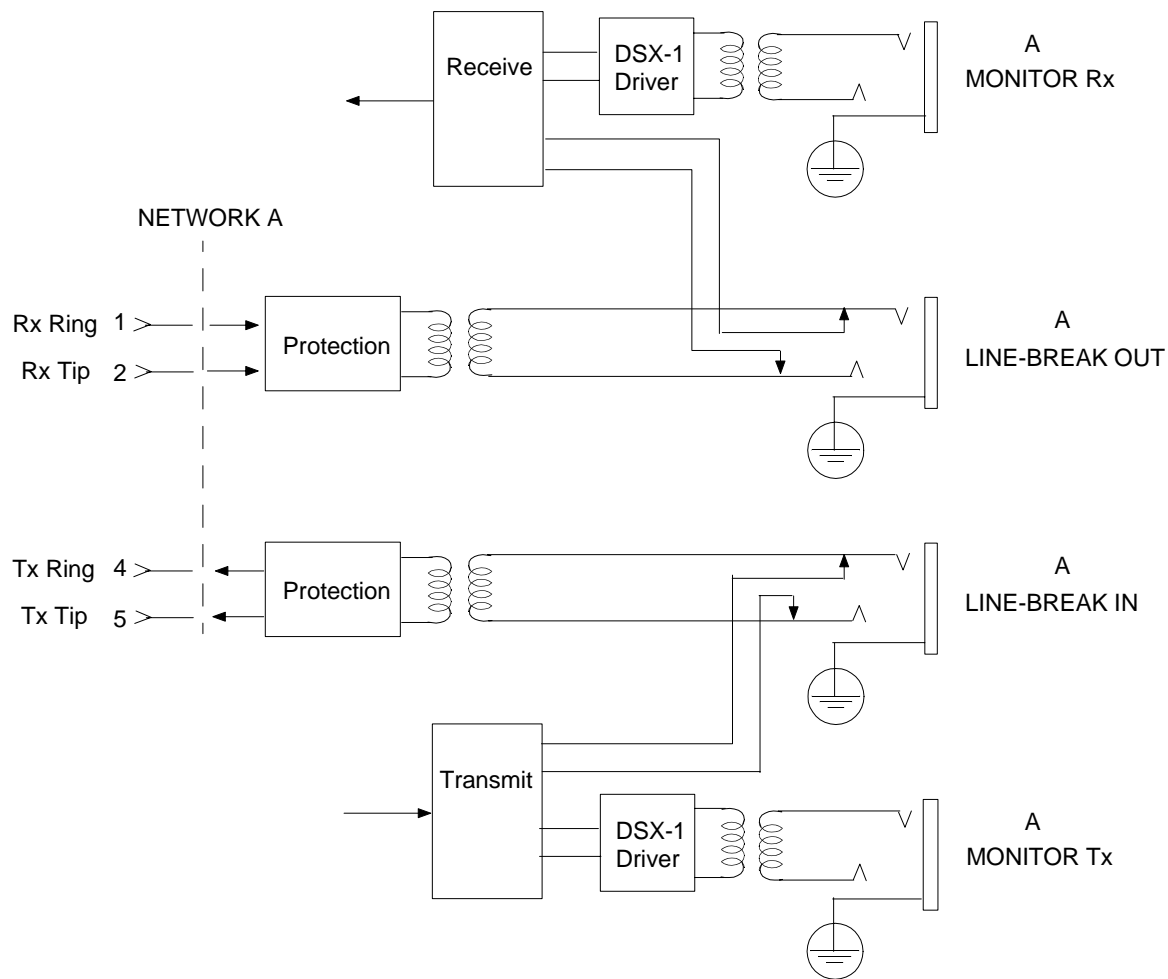


Figure 5 CSU T1 Option Card



NOTE: The received DS-1 signal is regenerated to a DSX-1 level for the Rx MONITOR jack

Figure 6 Line-Break and Monitor Jack Functions for LIU A (LIU B is similar)

ESF Performance Parameters

On the T1 LIU Configuration screen, you can select how the Platform Card responds to ESF (Extended Super Frame) Performance Parameters requests from the network over the ESF data link. Performance parameters include such things as errored seconds, loss of frame count, etc. Two standards are available, TR54016 and ANSI T1-403. The Platform Card is fully compatible with these standards. You can also select None to disable any responses. This may be useful if there is another CSU between the Metroplex™ 6000 and the network. The Platform Card maintains two sets of performance parameter registers for each LIU. Each set of registers accumulates the same performance parameters. One set can be read and cleared by the network, the other set can be read and cleared by the Local Manager. Whether you select TR54016, ANSI or None on the T1 LIU Configuration screen, you can still view both TR54016 and ANSI parameters on the Monitor -> TR54015 Performance or Monitor -> ANSI Performance screens of the Local Manager.

Network-Initiated Loopbacks

The Platform Card with CSU T1 option card responds to standard loopback codes sent from the network. These are:

- TR54016 inband code used with D4 framing for line loopback.
- ANSI T1.403 ESF bit-oriented code for either payload loopback or line loopback. Used with ESF framing.
- TR54016 ESF data link message for either payload loopback or line loopback. Used with ESF framing.

A line loopback (see [Figure 7](#)) loops back the entire 1.544 Mbps data stream without changing framing or removing bipolar violations. A payload loopback loops back the 1.536 Mbps payload of the receive signals with newly-generated framing. Both loopbacks are transparent, i.e. the receive data continues on to the channels. The network-initiated payload loopback takes place at the same point in the LIU as the manager-initiated payload loopback.

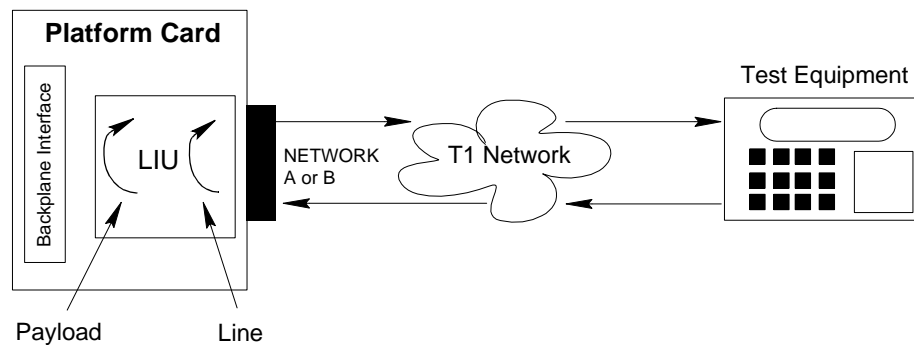


Figure 7 Line Loopback and Payload Loopback

DSX-1 LIU Option Card

Compatibility - This option card works with revision E- or later of the Platform Card firmware.

The DSX-1 LIU option card (see [Figure 8](#)) provides the 1.544 Mbps interface required to connect to a DSX-1 cross-connect. This card meets the requirements, and is supported, and fully configured by the Platform Card through network management.

Features

- Supports both Alternate Mark Inversion (AMI) and Bipolar with 8 Zero Substitution (B8ZS) line codes.
- Supports both Extended Superframe (ESF) and D4 framing formats.
- Supports LINE-BREAK jacks (see [Figure 9](#)) on the Platform Card front panel to allow connection of test equipment to the cross-connect.
- Supports MONITOR jacks on the Platform Card front panel to allow connection of test equipment to monitor Tx and Rx data at the cross-connect.
- Selectable pre-equalization capabilities of 0-133, 133-266, 266-399, 399-533, and 533-655 feet.
- Indicates/detects OOF, LOS, RAI, AIS and excessive error rate (ESF mode only).
- Supports both manager and carrier initiated loopbacks.
- Supports Technical Reference 54016 ESF user and network performance parameters.
- Supports ANSI T1.403 ESF performance parameters.

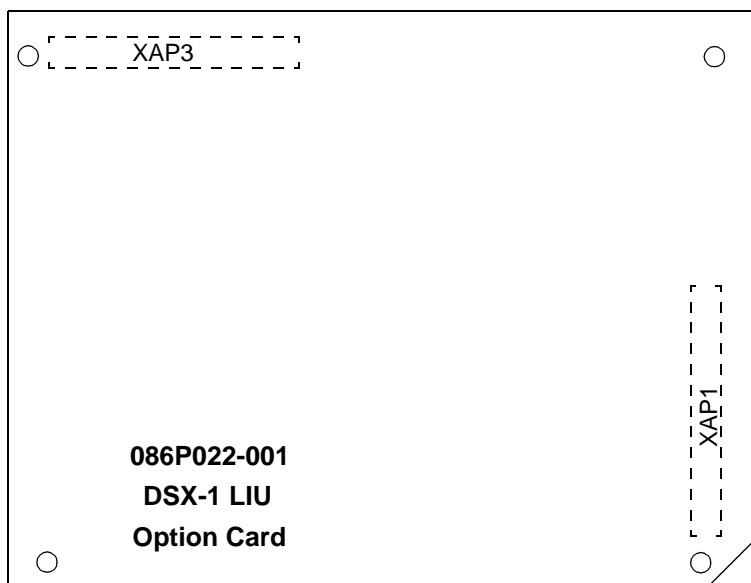


Figure 8 DSX-1 LIU Option Card

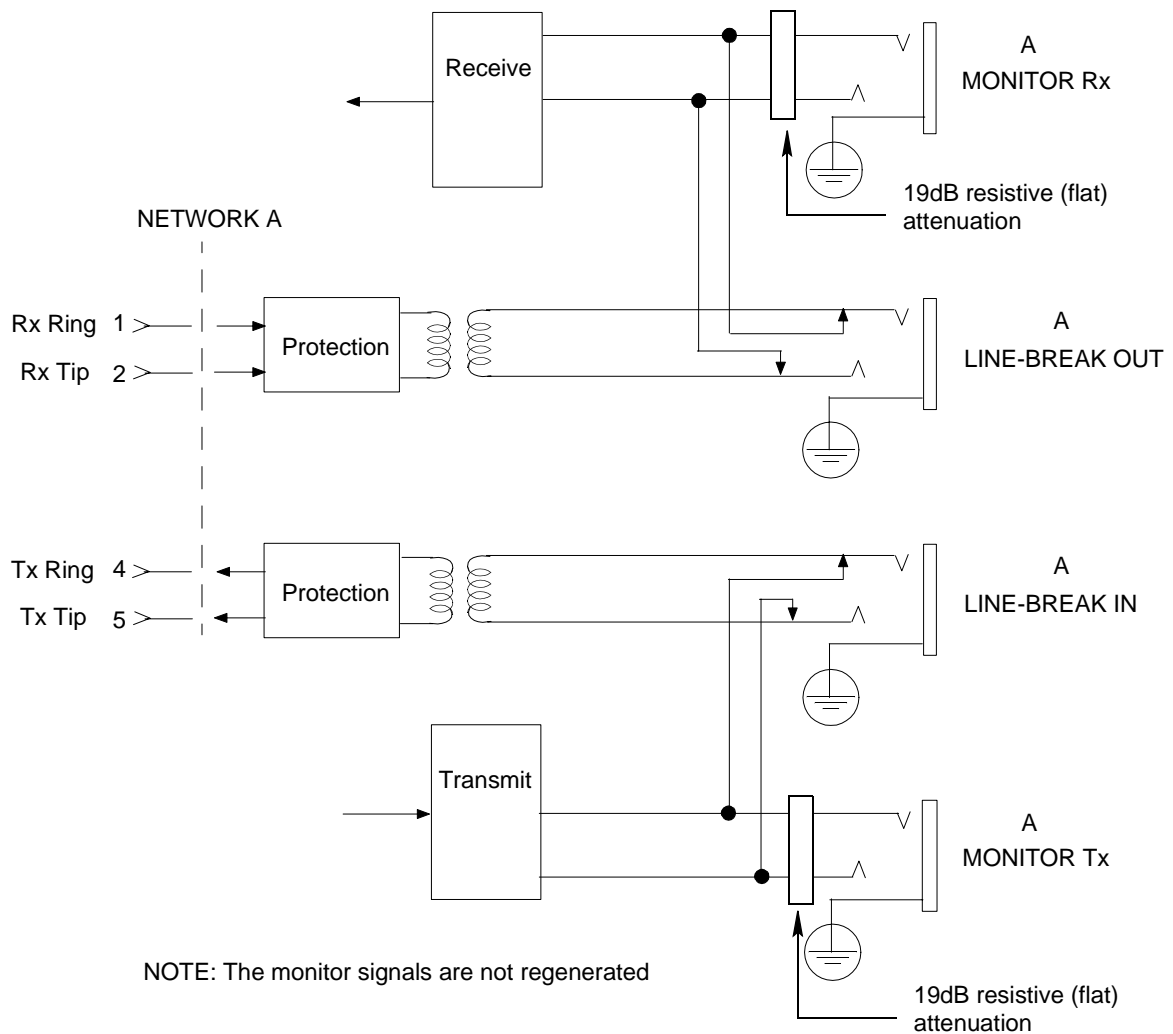


Figure 9 Line-Break and Monitor Jack Functions for LIU A (LIU B is similar)

ESF Performance Parameters

On the T1 LIU Configuration screen, you can select how the Platform Card responds to ESF Performance Parameters requests from the network over the ESF (Extended Super Frame) data link. Performance parameters include such things as errored seconds, loss of frame count, etc. Two standards are available, TR54016 and ANSI T1-403. The Platform Card is fully compatible with these standards. You can also select None to disable any responses. This may be useful if there is another CSU between the Metroplex™ 6000 and the network. The Platform Card maintains two sets of performance parameter registers for each LIU. Each set of registers accumulates the same performance parameters. One set can be read and cleared by the network, the other set can be read and cleared by the Local Manager. Whether you select TR54016, ANSI or None on the T1 LIU Configuration screen, you can still view both TR54016 and ANSI parameters on the Monitor -> TR54015 Performance or Monitor -> ANSI Performance screens of the Local Manager.

Network-Initiated Loopbacks

The Platform Card with DSX-1 LIU option card responds to standard loopback codes sent from the network. These are the same as for the CSU T1 option card:

- TR54016 inband code used with D4 framing for line loopback.
- ANSI T1.403 ESF bit-oriented code for either payload loopback or line loopback. Used with ESF framing.
- TR54016 ESF data link message for either payload loopback or line loopback. Used with ESF framing.

A line loopback (*see Figure 10*) loops back the entire 1.544 Mbps data stream without changing framing or removing bipolar violations. A payload loopback loops back the 1.536 Mbps payload of the receive signals with newly-generated framing. Both loopbacks are transparent, i.e. the receive data continues on to the channels. The network-initiated payload loopback takes place at the same point in the LIU as the manager-initiated payload loopback.

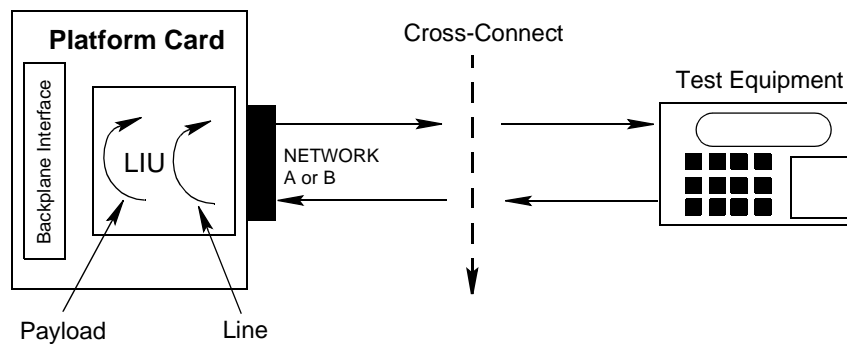


Figure 10 Line Loopback and Payload Loopback

E1 LIU Option Card

Compatibility - This option card requires revision G- or later of the Platform Card firmware.

The E1 LIU option card (see [Figure 11](#)) provides the 2.048 Mbps interface required to connect to an E1 line.

Features

- Recommendations G.703, G.704, G.706, G.823 and ETSI TBR 12.
- Supports High Density Bipolar Code of Order 3 (HDB3) line coding.
- Supports Basic, CRC-4 Multiframe and Channel Associated Multiframe formats.
- Selectable 75 or 120 ohm interface impedance.
- Provides network interfacing and protection.
- Supports LINE-BREAK jacks on the Platform Card front panel which allows you to connect test equipment to the E1 line.
- Supports MONITOR jacks on the Platform Card front panel which allows you to connect test equipment to monitor Tx and Rx data on the E1 line.
- Supported and configured by the Platform Card through network management.
- Supports Channel Associated Signaling (CAS) frames and non-CAS multiframe formats.
- Indicates/detects OOF, LOS, RAI, AIS, TS16RAI, TS16 AIS and TS16 OOF.
- Supports Manager-initiated loopbacks.

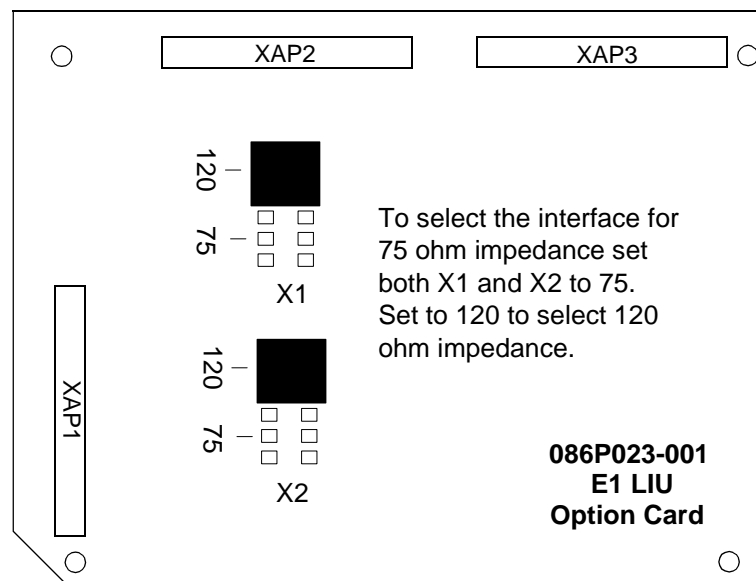
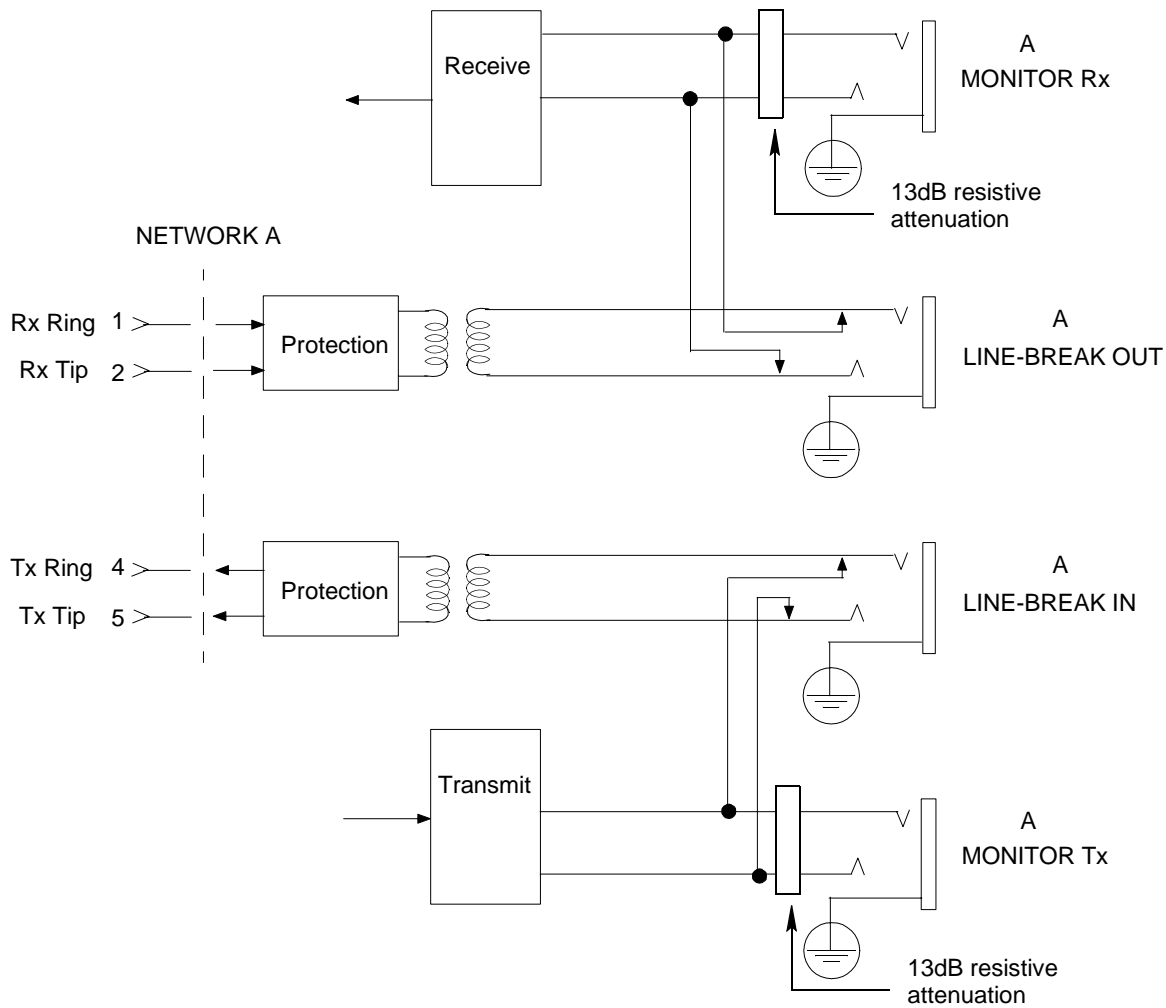


Figure 11 E1 LIU Option Card (Top Side)

Select 120 ohm impedance when connecting to a twisted-pair E1 line. Connect the E1 cable directly to the front panel NETWORK jack. Select 75 ohm impedance when connecting to a coaxial E1 line. Use the adapter cable 029H111-002 connected to the front panel NETWORK jack to provide two BNC connectors for connection to the E1 line.

Figure 12 shows the line-break functions.



NOTE: The monitor signals are not regenerated. Transient errors may occur on the receive side as you insert the plug into the Rx Monitor jack.

Figure 12 Line-Break and Monitor Jack Functions for LIU A (LIU B is similar)

Network-Initiated Loopbacks

The E1 LIU option card does not respond to any network-initiated loopbacks.

Application Information

CRC-4 - The E1 LIU Configuration screen allows you to enable or disable CRC-4 Multiframe.

Select CRC-4: On to enable E1 Performance parameters, but only if the far-end E1 also supports CRC-4 Multiframe.

CAS - The E1 LIU Configuration screen allows you to enable or disable CAS Multiframe. CAS (Channel Associated Signaling) reserves timeslot 16 for voice channel signaling. If any voice channels are configured, you cannot disable CAS. If you have no voice channels, then you can disable CAS and use timeslot 16 for user data, but only if the far-end E1 also has CAS disabled.

HDSL E1 LIU Option Card

Compatibility - This option card requires revision H- or later of the Platform Card firmware.

The HDSL E1 LIU option card (see [Figure 13](#)) provides an interface to one or two HDSL loops. Each loop operates at a rate of 1168 kbps and two loops provide a full 2.048 Mbps of bandwidth. The LINE-BREAK and MONITOR jacks on the Platform Card front panel are not supported.

Features

- HDSL framing per ETSI ETR 152.
- Operates as LTU or NTU.
- One or two loop operation.
- Provides network interfacing and protection.
- Configure for Basic, CRC-4 Multiframe and Channel Associated Multiframe formats.
- Alarms and Status Conditions Reported:
 - E1: Out Of Frame (OOF), Remote Alarm Indication (RAI), Remote Loss Of Signal (R-LOS).
 - E1 TS16 (CAS Enabled): TS16 Out Of Frame (TS16-OOF), Remote Alarm Indication (TA16 RAI), TS16 All Ones (TS16 AIS).
 - HDSL: Loss HDSL Sync Word, Loss Of Signal (LOS), Bit Error Rate Threshold (BER), Noise Margin, Pulse Attenuation, and Loop Exchange.
- Error detection and performance collection of HDSL FEBEs.
- Supports Manager- Initiated loopbacks.
- Major or Minor Alarm BER thresholds.
- Performance monitoring and alarm indication through configuration of the threshold and measurement interval.
- Meets performance specifications of ETR 152 and ETSI RTR/TM-03036.
- Supported and configured by the Platform Card through network management.

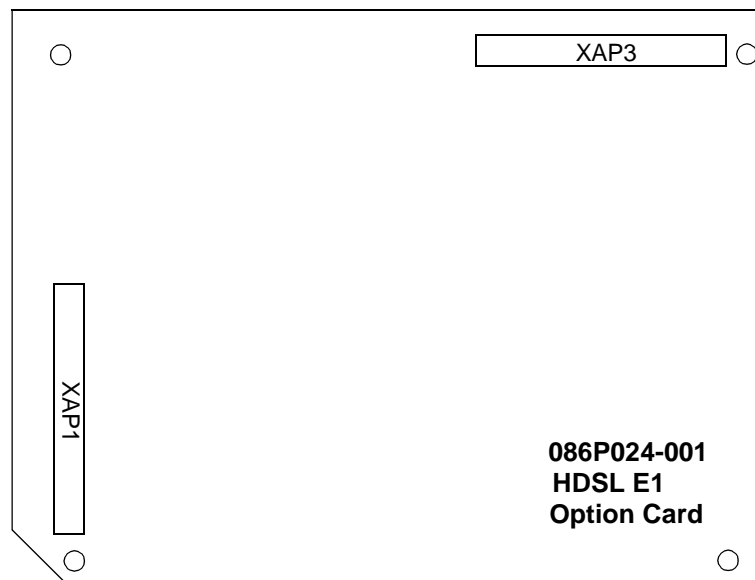


Figure 13 HDSL E1 LIU Option Card (Top Side)

Network-Initiated Loopbacks

The HDSL E1 LIU option card does not respond to any network-initiated loopbacks.

Application Information

The following options are configurable via the LIU Configuration Screen. All options must be compatible with the far-end equipment.

- **CRC-4** - Option CRC-4 On to enable CRC-4 multiframe. Option Off to disable CRC-4 multiframe. Default is CRC-4 On.
- **CAS (Channel Associated Signaling)** - Option CAS On to enable voice channel signaling over TS16. Option CAS Off to disable voice channel signaling over TS16. If CAS is Off, and voice is not required, TS16 is available for user bandwidth. Default is CAS On.
- **LTU/NTU (Line Termination Unit/Network Termination Unit) Operation:** - When optioned as an LTU, the HDSL E1 LIU will imitate loop handshake and act as the "master" unit. Optioned as an NTU, the HDSL E1 LIU will wait for the LTU's initiation of communications to begin handshaking. Default is NTU.
- **2 Loops/1 Loop:** Option the HDSL E1 LIU for 2 loops to accommodate a full E1 of data. Half of an E1 is routed over each loop with TS16 transmitted on each loop if CAS is enabled. Option the HDSL E1 for 1 loop if only half an E1 of bandwidth is required. Note that the "lower" half of the E1 is supported over loop 1. (i.e. Timeslots 1 through 17 and CRC-4 is forced Off). Signaling can be passed by enabling CAS.
- **Major BER Threshold:** This option allows you to set a programmable bit error rate to indicate the performance of the loop. An alarm is activated upon crossing of this threshold. You can option thresholds of 10^{-4} , 10^{-5} , 10^{-6} , and 10^{-7} . Default is 10^{-4} .
- **Minor BER Threshold:** This option allows you to set a programmable bit error rate to indicate the performance of the loop. An alarm is activated upon crossing of this threshold. You can option thresholds of 10^{-4} , 10^{-5} , 10^{-6} , and 10^{-7} . Default is 10^{-6} .

Note

The major BER threshold should always be set for a worse line condition than the minor BER threshold.

Application of Metroplex-to-Metroplex

Figure 14 shows an application of Metroplex-to-Metroplex. *One Metroplex must be configured as an LTU and the other as an NTU.*

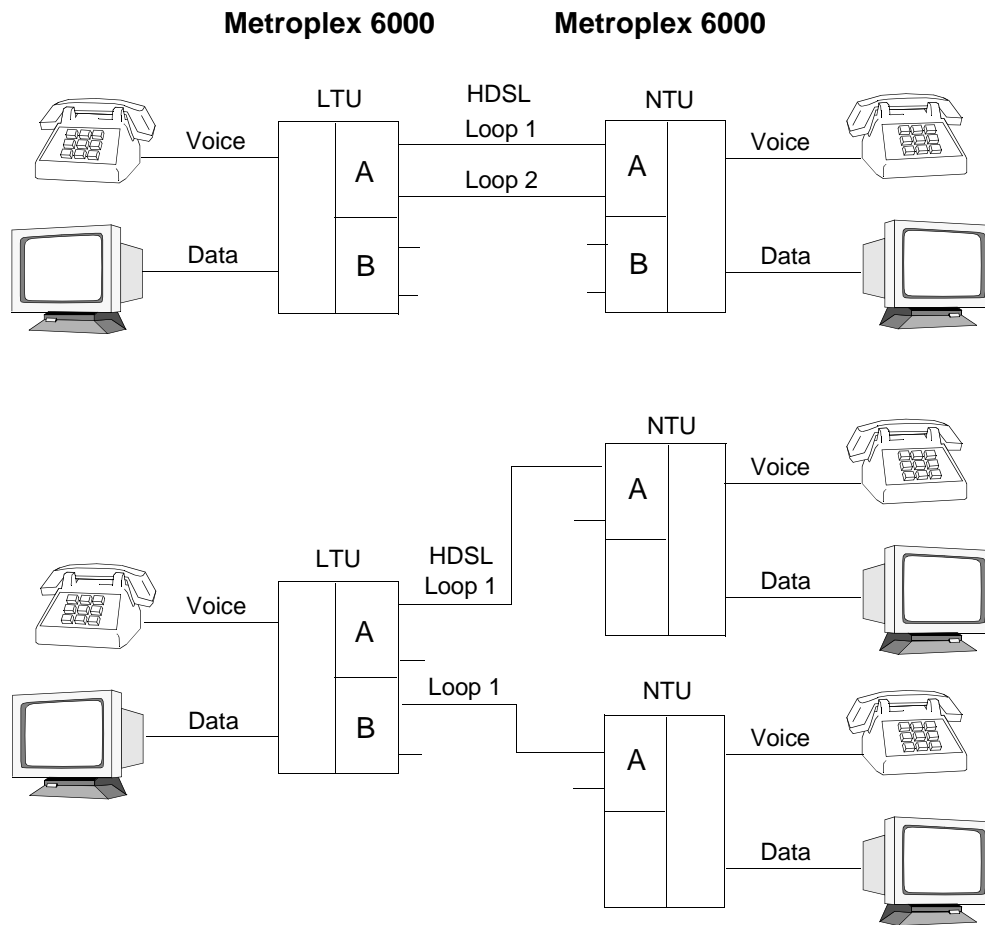


Figure 14 Application Metroplex-to-Metroplex

Application of Metroplex-to-GDC UAS 700 Products

Figure 15 shows an application of Metroplex-to-GDC UAS 700 products.

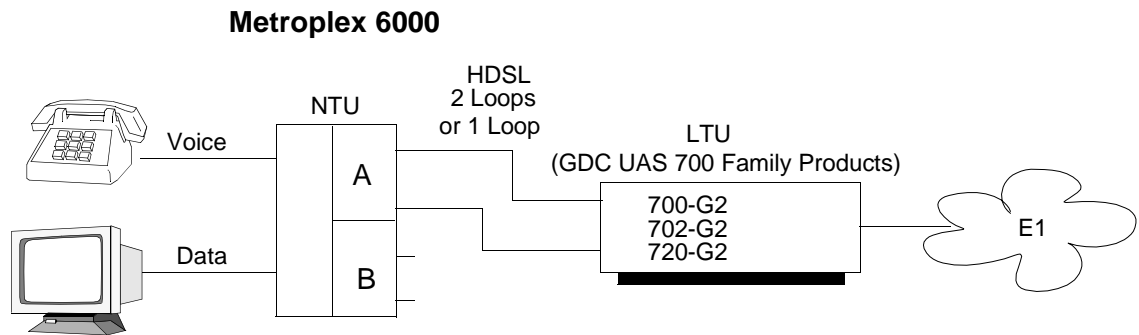
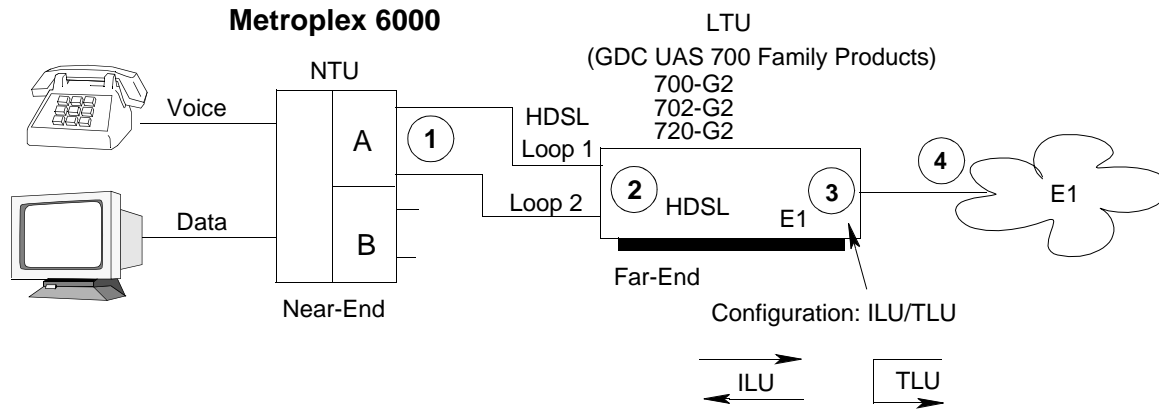


Figure 15 Application - Metroplex-to-GDC UAS 700 Products

Status and Alarm Indications

You may use *Figure 16* and *Table 8* through *Table 10* for problem solving status and alarm indications that appear on the Manager’s screen. The circled numbers in the figure are the locations described in each table.



ILU - The E1 data is passed transparently without frame regeneration.
 TLU - The G.704 frame structure is regenerated and the CRC-4 error checking of the G.704 frame structure is recalculated.

Figure 16 Status and Alarm Indications

Table 8 Platform/E1 LIU Monitor Screen Alarm or Status Indications

Alarm or Status	Problem or Indication
E1 OOF	Location 3 not sending proper frame sequence.
E1 RAI	Location 4 sending location 3 AIS.
E1 R-LOS	Location 3 has loss of signal from location 4.
TS 16 AIS	Location 4 is transmitting all ones alarm in TS 16.
TS 16 RAI	Location 3 or 4 has indication of all ones alarm in TS 16.
TS 16 OOF	Location 4 not sending proper multiframe alignment pattern.
HDSL Loop Exchange	Location 1 loop 1 and loop 2 are swapped.
HDSL Loop 1/Loop 2 Noise Margin	Indicates the noise level of the receive signal at location 1. The higher the value, the less noise on the line and the lower the error rate. 0 dB corresponds approximately to a BER of 10 ⁻⁷ . A usable line should have a noise margin greater than 5 dB.
HDSL Loop 1/Loop 2 Pulse Attenuation.	Indicates the attenuation of the signal sent from location 2 to location 1, caused by the loop. The higher the value, the more attenuated is the received signal. The pulse attenuation measurement assumes the standard transmit level of 13.5 dBm. A typical value for a very short line is 2-3 dB .
HDSL Loop 1/Loop 2 LOS	Location 1 is not receiving any signal from location 2.
HDSL Loop 1/Loop 2 Loss HDSL Sync	Location 1 has lost synchronization word from location 2.
HDSL Loop 1/Loop 2 UAS	Location 1’s threshold for unavailable seconds has been exceeded.
HDSL Loop 1/Loop 2 MAJ	Location 1’s incoming BER rate exceeds the selected major alarm threshold.
HDSL Loop 1/Loop 2 MIN	Location 1’s incoming BER rate exceeds the selected minor alarm threshold.

Table 9 E1 Performance Screen Alarm or Status Indications

Alarm or Status	Problem or Indication
Near-End Errored Seconds	Location 1 receiving over a one second period one or more errored blocks.
Near-End Severely Errored Seconds	Location 1 receiving over a one second period more than 300 CRC errors.
Near-End Unavailable Seconds	Location 1 reporting the number of unavailable seconds after 10 consecutive severely errored seconds.
Near-End Background Block Errors	Location 1 reporting a number of errored seconds with less than 300 CRC errors.
Far-End Errored Seconds	Location 3 reporting to location 1 it is receiving over a one second period one or more CRC errors.
Far-End Severely Errored Seconds	Location 3 reporting to location 1 it is receiving over a one second period more than 300 CRC errors.
Far-End Unavailable Seconds	Location 3 reporting to location 1 the number of unavailable seconds after 10 consecutive severely errored seconds.
Far-End Background Block Errors	Location 3 reporting to location 1 the number of errored seconds with less than 300 CRC errors.

Table 10 HDSL Performance Screen Alarm or Status Indications

Alarm or Status	Problem or Indication
HDSL Loop 1 or Loop 2 Errored Seconds	Location 1 receiving over a one second period one or more errored blocks.
HDSL Loop 1 or Loop 2 Severely Errored Seconds	Location 1 receiving over a one second period more than 150 CRC errors.
HDSL Loop 1 or Loop 2 Unavailable Seconds	Location 1 reporting the number of unavailable seconds after 10 consecutive severely errored seconds.
HDSL Loop 1 or Loop 2 Far-End Block Errors	Location 2 reporting to location 1 the number of errored seconds with less than 150 CRC errors.

HDSL Operation Over Twisted-Pair Telephone Lines

HDSL uses a line code called 2B1Q (2 Binary, 1 Quaternary), which sends two binary digits for each 4-level (quaternary) transmission symbol. High speed digital signal processing technology is used to provide echo cancellation and correction for cable impairments in order to recover error free data. Data is sent in both directions over the loop at a rate of 1168 kbps, at distances of up to 3.2 km (2 miles). The extent to which the HDSL will successfully operate depends on the cable gauge and construction, the amount of crosstalk and noise, and the number of bridged taps on the line. When bridged taps are present on the line (no more than two) each tap must be no more than 500 meters. There must be no loading coils on the loop. The amount of attenuation of the loop (measured at a frequency of 150 kHz) must be no more than 27 dB. [Table 11](#) describes some of the parameters for different cable gauges.

Table 11 Cable Gauge Parameters

Cable Gauge (PE)	Loss at 150 kHz dB/km	Maximum Loop for 27 dB Loss	Ohms per km
0.4 mm - 26 AWG	10.5	2.57 km	268
0.5 mm - 24 AWG	5.55	4.86 km	172
0.6 mm - 22 AWG	6.72	4.02 km	119
0.8 mm	3.58	7.54 km	67

Ethernet Option Card

Compatibility - This option card requires Platform Card firmware revision C- or later.

The Ethernet option card (see *Figure 17*) provides the 10Base-T interface required to connect a 10Base-T network. The medium for 10Base-T is twisted-pair wire. This card meets the IEEE 802.3/ANSI 8802-3 requirements and is fully supported and configured by the Platform Card (-003 and -004 only).

Features

- Supports message traffic at a data rate of 10 Mbps.
- Supports operation over 0 to at least 100 meters (328 ft.) of twisted pair without the use of a repeater.
- Supports network configurations using the CSMA/CD (Carrier Sense Multiple Access with Collision Detection) access method.

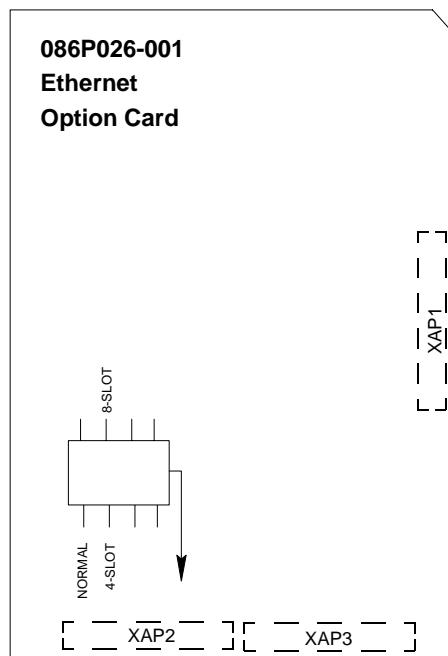


Figure 17 Ethernet Option Card

Setup

The Ethernet option card is pre-programmed at the factory with an Ethernet (hardware) address. You can view this address using the Local Manager's System Utilities -> IP Address screen. You need to set the Platform Card's X15 jumper to **ETH** in order to use the Ethernet card. You also need to setup the Platform Card with an IP address. *Figure 18* show two possible applications of the Ethernet option card.

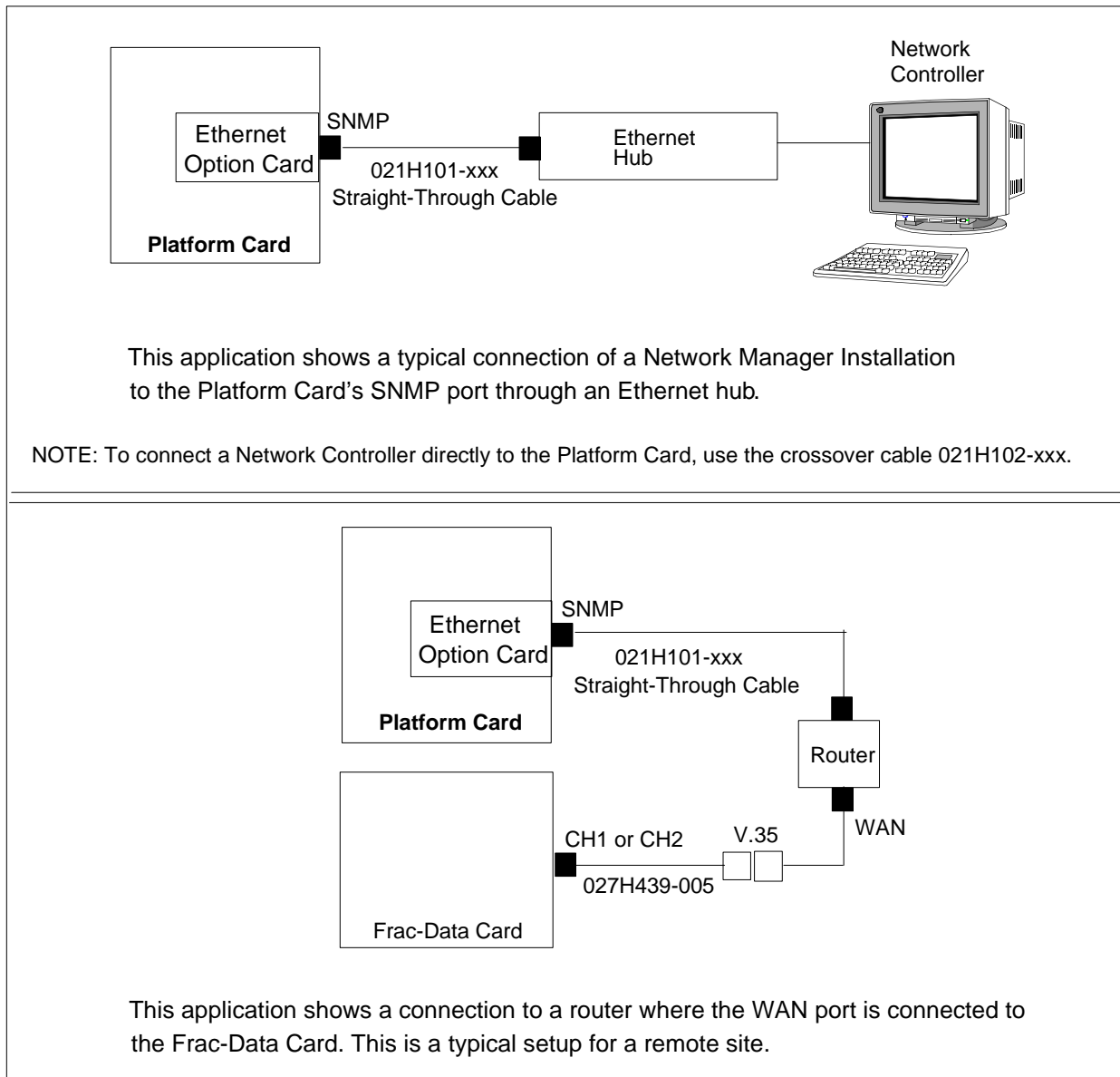


Figure 18 Ethernet Applications

Pinouts

Figure 19 through Figure 28 show the cables that may be used with the Platform Card.

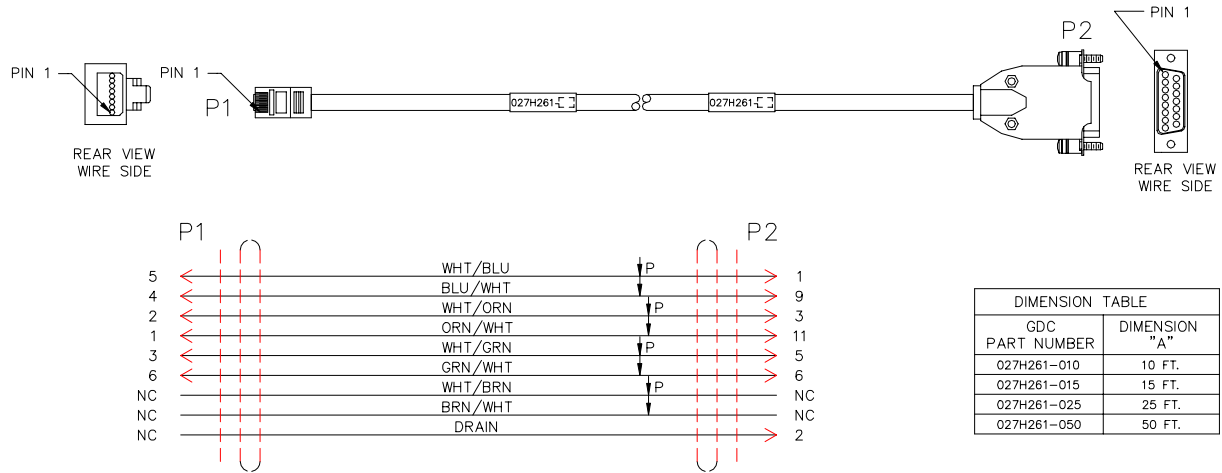


Figure 19 027H261 - 8-pin modular plug to DB15 (M) - Network Port

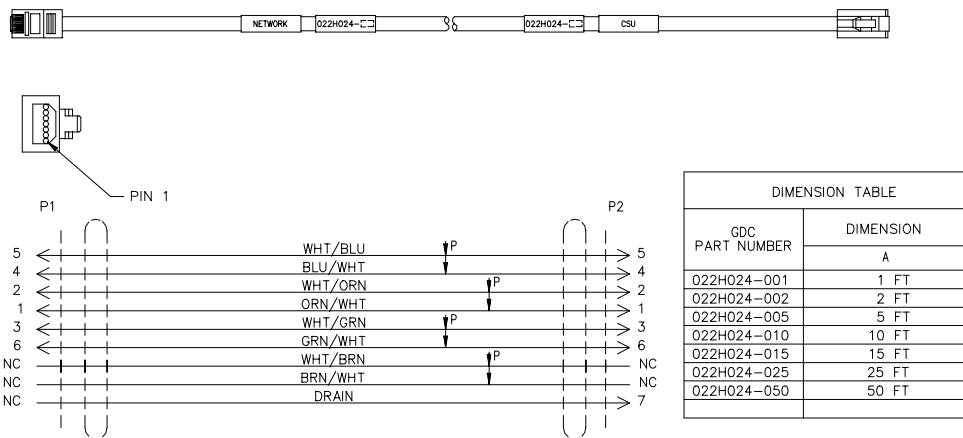


Figure 20 022H024 - 8-pin modular plug to 8-pin modular shielded - Network Port

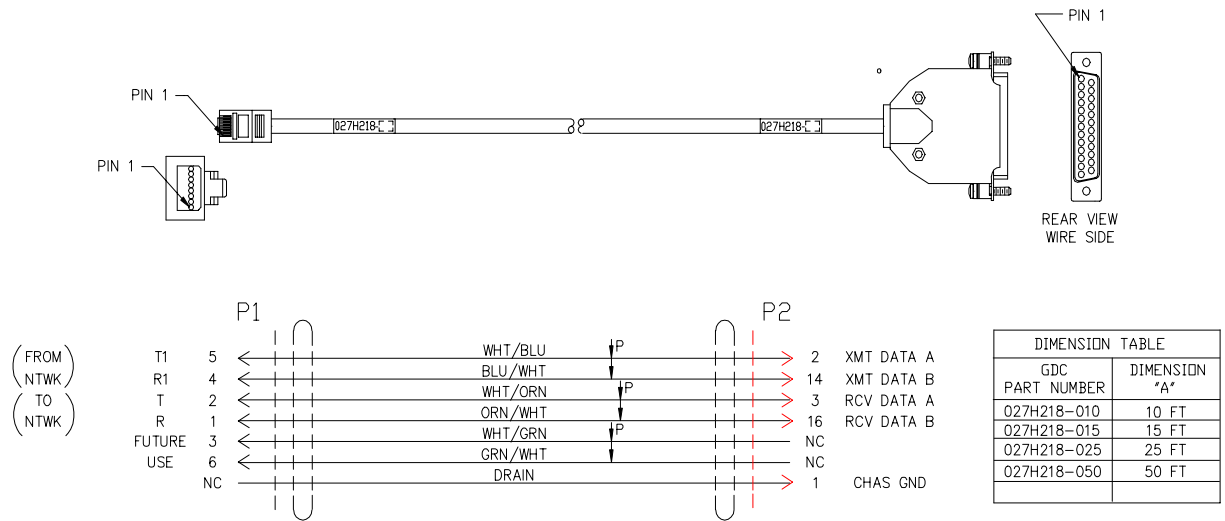


Figure 21 027H218 - 8-pin modular plug to DB25 male

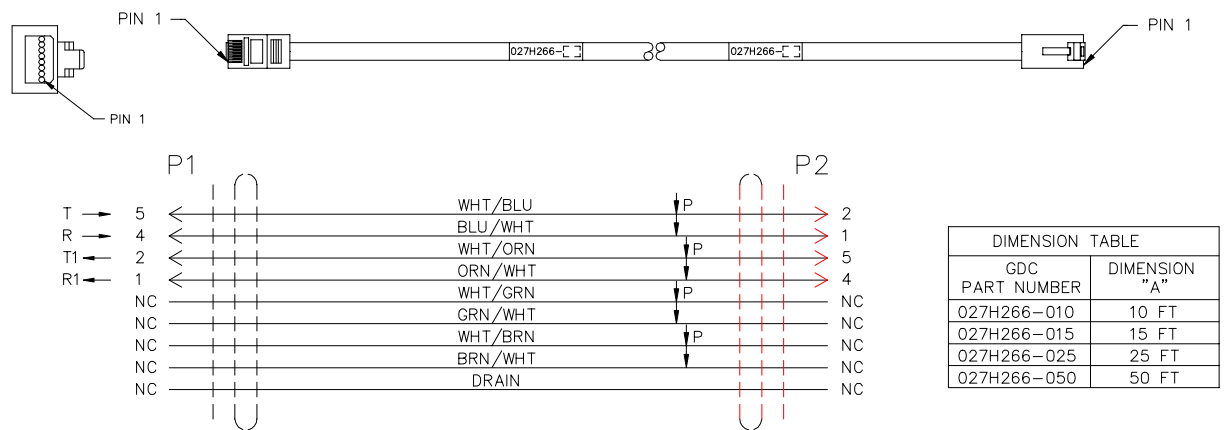


Figure 22 027H266 - 8-pin modular plug to 8-pin modular, shielded, twisted pairs, T1 crossover

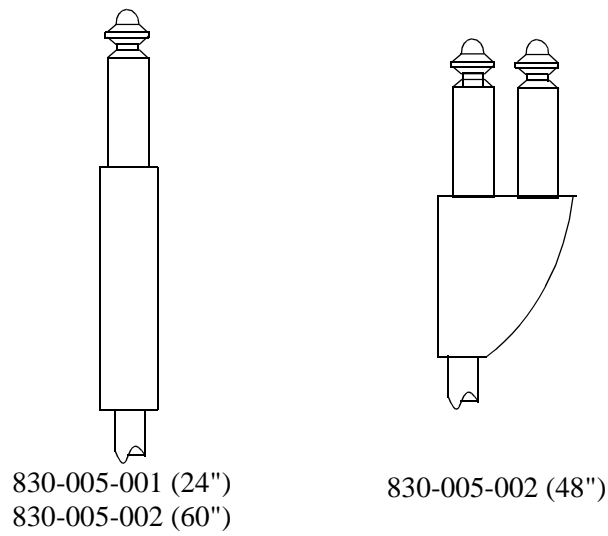


Figure 23 Bantam Test Cords

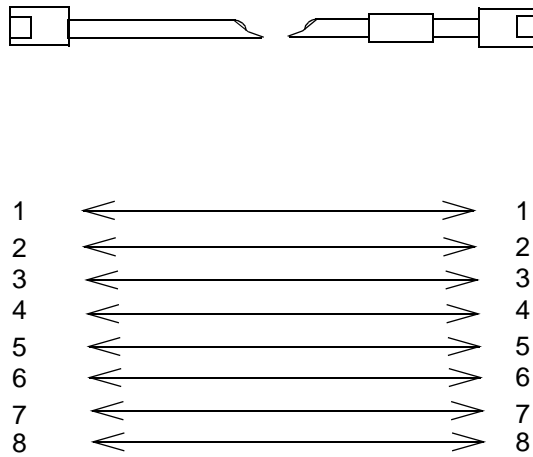


Figure 24 830-128-807 - 8-position modular to modular non-keyed Terminal Port, Dial Port or SNMP Port for PPP

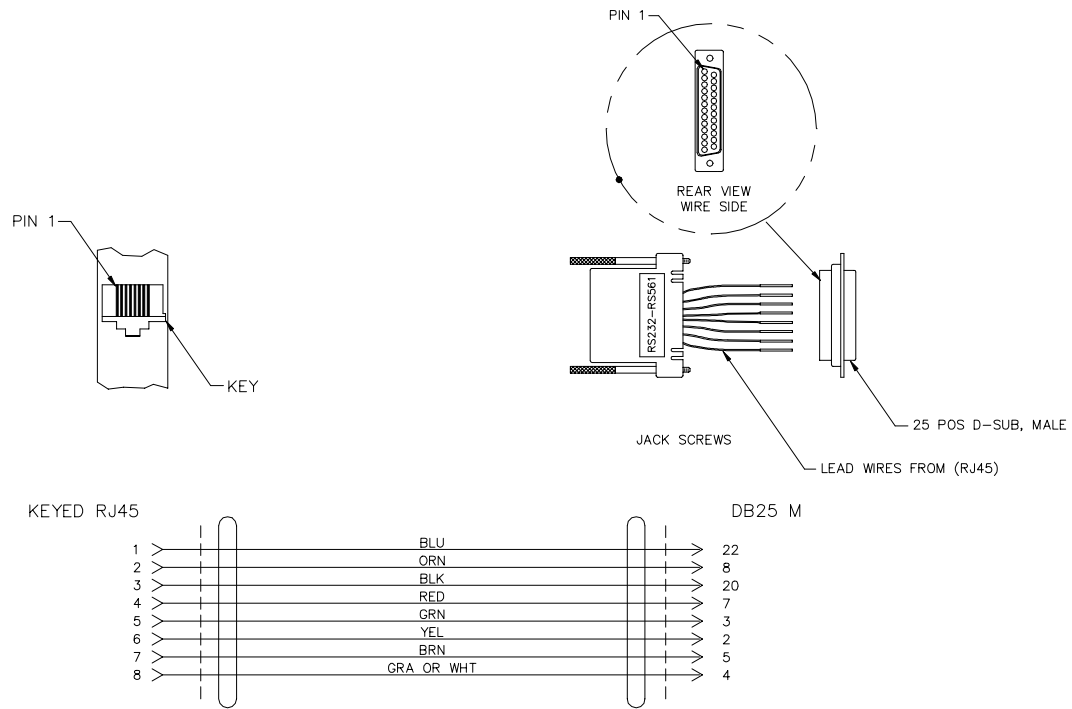


Figure 25 029H210-001 - Adapter, 8-pin modular to DB25 (M) - Terminal Port or Dial Port

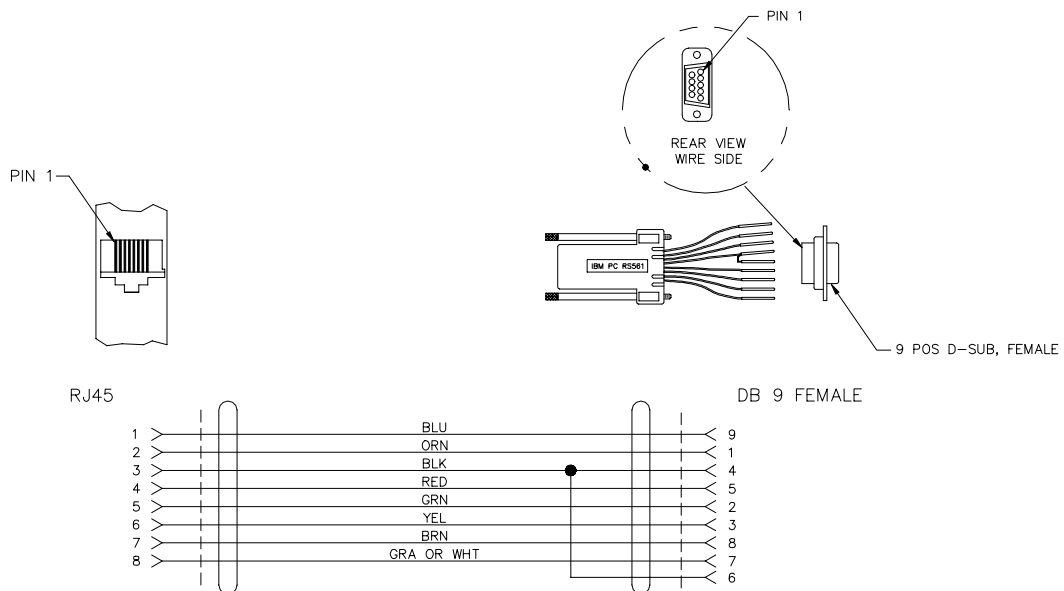


Figure 26 029H211-001 Adapter, 8-pin modular to DB9 (F) - Terminal Port

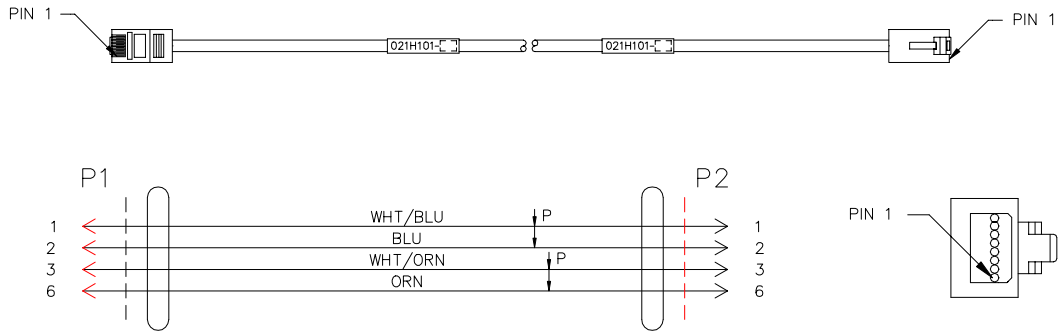


Figure 27 021H101 - 8-pin modular to 8-pin modular unshielded, 10Base-T straight-thru

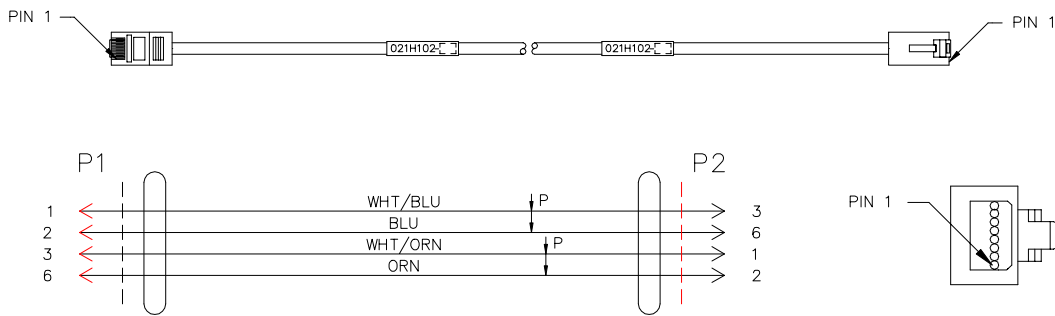


Figure 28 021H102 - 8-pin modular to 8-pin modular unshielded, 10Base-T crossover

Specifications and Parts List

The specifications and parts list for the Platform Card are found in [Table 12](#).

Table 12 Specifications and Parts List

Physical	
Card Assembly (086P020-001, -002, -003, -004)	
Height	10.4 in. (264 mm)
Width	0.85 in. (22 mm)
Depth	10.75 in. (273 mm)
Weight	1 lb. 2 oz (0.54 kg)
Temperature	
Operating	0 to 50 C (32 to 122 F) (derate by 1 C/1000 ft. above sea level)
Non-operating	-40 to 85 C (-40 to 185 F)
Humidity	
Operating	5% to 95%, without condensation
Altitude	
Operating	0 to 10,000 ft. (0 to 3,048 m)
Non-operating	0 to 40,000 ft. (0 to 12,192 m)
Electrical	
Power requirements	Power may be either 22 VAC, -24 VDC, or -48 VDC
Power dissipation	10W maximum
Fusing	One 3.0A, 125V, SB (GDC Part No. 215-311W300)
Supervisory Ports	
TERM	Electrical: EIA/TIA-232-E Pinout: EIA/TIA-561
DIAL (modem)	Electrical: EIA/TIA-232-E Pinout: EIA/TIA-561
SNMP (selectable)	
Ethernet Port	10Base-T standard
PPP Port	Electrical: EIA/TIA-232-E Pinout: EIA/TIA-561
Network port physical interface	RJ48 modular jack
Built in CSU (-001, -003 Platform Cards only)	
All CSU parameters are the same as the CSU T1 Option Card	
CSU T1 Option Card (086P021-001)	
Communications Line	T1 digital carrier
Line Impedance	100 ohm
Network transmitter frequency	1,544,000 ± 50 Hz
Line Build-Out	0, 7.5, or 15 dB at 772 kHz
Timing source	Internal clock, network (received timing looped back)
Operating range	0 to 36 dB of cable loss at 772 kHz (relative to 3.6V launch pulse)
Jitter tolerance	Conforms to specifications defined in AT&T PUB 6211, December 1988
Line coding	AMI and B8ZS
Clear channel capability	1.544 Mbps channelized DS1 in consecutive timeslots

Table 12 Specifications and Parts List (Continued)

Framing format	D4 Superframe Format, AT&T 54016 Extended Superframe Format (ESF, and ANSI T1.403 ESF)
Alarms and status conditions	Out Of Frame (OOF), Alarm Indication Signal (AIS or Blue alarm), Loss Of Signal (LOS)
Diagnostics	DS1 Line Loop, DS1 Payload Loop, DS1 ToChan Loop
Compliance	FCC Part 68 registered UL 1459 compliant
DSX-1 LIU Option Card (086P022-001)	
Communications Line	DSX-1 Digital Cross-Connect
Line Impedance	100 ohm
Network transmitter frequency	1,544,000 \pm 50 Hz
Timing source	Internal clock, network (received timing looped back)
Pre-equalization	0-133, 133-266, 266-399, 399-533, 533-655 feet
Line coding	AMI and B8ZS
Clear channel capability	1.544 Mbps channelized DS1 in consecutive timeslots
Framing format	D4 Superframe Format, AT&T 54016 Extended Superframe Format (ESF, and ANSI T1.403 ESF)
Alarms and status conditions	Out Of Frame (OOF), Alarm Indication Signal (AIS or Blue Alarm), Loss Of Signal (LOS)
Diagnostics	DS1 Line Loop, DS1 Payload Loop, DS1 ToChan Loop
E1 LIU Option Card (086P023-001)	
Communications Line	E1 digital carrier
Line Impedance	75 or 120 ohm
Network transmitter frequency	2,048,000 \pm 50 Hz
Timing source	Internal clock, network (received timing looped back)
Operating range	0 to 6 dB of cable loss at 1024 kHz
Jitter tolerance	Conforms to specifications defined in ITU-T Recommendation G.823
Line coding	HDB3
Framing format	Basic frame, CRC-4 Multiframe, Channel Associated Multiframe
Alarms and status conditions	Out Of Frame (OOF), Loss Of Signal (LOS), Remote Alarm Indication (RAI), Alarm Indication Signal (AIS), TS16 OOF, TS16 RAI, TS16 AIS
Diagnostics	E1 Payload Loop, E1 ToChan Loop
Compliance	ITU-T Recommendation: G.703: 1991 G.704: 1991 G.706: 1991 G.823: 1998 TBR 12: December 1993

Table 12 Specifications and Parts List (Continued)

HDSL E1 Option Card (086P024-001)	
Rate	Dual duplex 1168 kbps line rate, with 2B1Q encoding (each loop)
Framing	HDSL framing per ETSI ETR 152.
Transmit Power	13.5 dBm (± 0.5 dBm)
E1 Alarms and Status Conditions:	Out Of Frame (OOF), Remote Alarm Indication (RAI), Remote Loss of Signal (R-LOS)
E1 Alarms and Status Conditions (CAS Enabled):	TS16 Out Of Frame (TS16 OOF), TS16 Remote Alarm Indication (TS16 RAI), TS16 All Ones (TS16 AIS)
Alarms and Status Conditions HDSL E1:	Loss Of Sync Word, Loss Of Signal (LOS), Bit Error Rate Threshold (BER), Noise Margin, Pulse Attenuation, and Loop Exchange.
Diagnostics	Payload Loopback, ToChan loopback.
Compliance:	ETR 152, ETSI-RTR-03036
Ethernet Option Card (086P026-001)	
Data rates	10 Mbps
10Base-T medium	Twisted-pair (22 to 26 gauge) unshielded
Termination	100 ohm
Operating range	0 to at least 328 ft. (100 m)
Peak differential voltage	Between 2.2 and 2.8V
Parts List	
Cables	
8-position modular to 8 position modular non-keyed (TERM, DIAL, SNMP Ports)	830-128-807
Adapter, 8-pin modular to DB25 (male)	029H210-001
Adapter, 8-pin modular to DB9 (female)	029H211-001
8-pin modular to 8-pin modular, shielded, twisted pairs (NETWORK Ports)	022H024-010, -015, -025, -050
8-pin modular to 8-pin modular, shielded, twisted pairs, T1 crossover (NETWORK Ports)	027H266-010, -015, -025, -050
Double bantam test cord, 40 inch	830-005-102
Bantam test cord, 24 inch	830-003-001
Bantam test cord, 60 inch	830-005-002
8-pin modular plug to DB25 (male) (NETWORK Ports)	027H218-010, -015, -025, -050
8-pin modular plug to DB15 (male) (NETWORK Ports)	027H261-010, -015, -025, -050
8-pin modular to 8-pin modular, unshielded, twisted pairs, 10Base-T straight-thru (SNMP Ports)	021H101-005, -015, -025, -050, -100
8-pin modular to 8-pin modular, unshielded, twisted pairs, 10Base-T crossover (SNMP Ports)	021H102-005, -015, -025, -050, -100
8-pin modular plug to dual isolated BNC adapter, E1 75 ohm (NETWORK Ports)	029H111-002

Platform Card

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