Meridian 1

QPC723, RS-232 Interface Line Card

Description, installation, and operation

Document Number: 553-2731-106
Document Release: Standard 4.0
Date: December 1994

Printed in the United States of America

Revision history

June 10, 1987

Standard, release 1.0.

August 10, 1990

Standard, release 2.0. Revised for Northern Telecom standard 164.0.

December 31, 1992

Standard, release 3.0. This document was reissued to include technical content updates.

December 1994

Standard, release 4.0. Reissued to include editorial changes and indexing. Due to the extent of the changes, revision bars are not used.

Contents

List of figures

List of tables

Introduction

This document describes the QPC723 RS-232 Interface Line Card (RILC) and the interconnection between the RILC, the Data Termination Equipment (DTE) or Data Communication Equipment (DCE) and the Meridian 1 system. The installation and operation of the card and associated hardware are also described.

The RILC provides the interface through which asynchronous ASCII data equipment can connect through the network to other data equipment for data switching. Transmission between the data equipment and the RILC uses RS-232-C levels.

The RILC provides four interface ports. These ports are software configurable as SL-1 stations or Add-On Data Module (ADM) trunks and provide a direct interface to RS-232-C asynchronous ASCII equipment. Refer to Figure 1 for an example of some RILC applications.

Purpose

The RILC eliminates the need for data modules like the ADM, Stand Alone Data Module (SADM), or Multi-Channel Data System (MCDS) in specific applications. The RILC replaces the Data Line Card (QPC311 or QPC432) and the data modules where the distance limitation imposed by RS-232-C is not exceeded.

The RILC is compatible with all existing Meridian 1 data products. It conforms to the data module–to–data module (DM-DM) protocol. The data products are the following:

— Asynchronous Interface Line Card (AILC)

— Data Line Card (DLC) and Four Port Data Line Card (4PDLC)

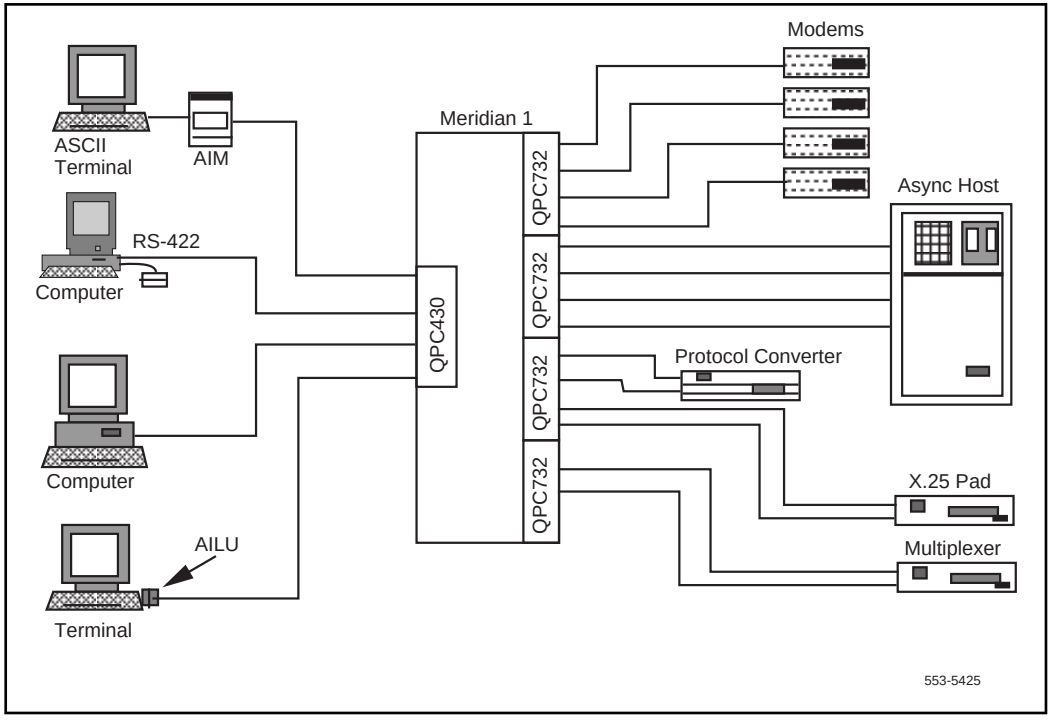
— Integrated Services Digital Line Card (ISDLC)

— Digital Trunk Interface (DTI)

— Computer-to-PBX Interface (CPI)

— Remote Peripheral Equipment (RPE)

Figure 1
RILC connection diagram



Features

The QPC723 RS-232 Interface Line Card (RILC) operates with these features:

— asynchronous and full duplex operation

— keyboard dialing including autobaud and autoparity

— Data Termination Equipment (DTE) and Data Communication Equipment (DCE) connectivity

— terminal and host computer connectivity in DCE mode

— inbound modem pooling with any asynchronous modems

— outbound modem pooling using auto-dialer modems such as the Hayes Smartmodem

— hotline operation

— forced or normal Data Terminal Ready (DTR)

— loopback test

— self-diagnostics

— Auto-dial

— Ring again

— Speed-call

Call origination

The RILC uses keyboard dialing (KBD) and hotline operation for call origination from data terminating equipment to local and remote hosts.

KBD refers to the capability of originating the data call to local and remote hosts or DTE by using the terminal keyboard.

Related documents

For complete information concerning the Meridian data features, refer to these documents.

— *QMT21 High Speed Data Module description, installation, and operation* (553-2731-107)

— *QPC918 High Speed Data Card description, installation, and operation* (553-2731-108)

— *Meridian data features traffic engineering and configuration* (553-2731-151)

— *Enhanced Asynchronous Interface Line Unit description and formats* (553-2731-203)

— *Meridian data features operation and tests* (553-2731-300)

— *NT7D16 Data Access Card description and operation* (553-3001-191)

— *X11 input/output guide* (553-3001-400)

Note: For the purposes of this document, Meridian 1 refers to SL-1 ST, NT, RT, and XT machines as well as Meridian 1 system options 21, 51, 61, 71, and 81. Meridian 1 option 11 does not support the RILC. With this option use the Data Access Card (NT7D16AA).

Description

The RS-232 Interface Line Card (RILC) is contained on one four-layer printed circuit pack (PCP). The card is 12.5 in. x 10 in. (317.5 mm x 254 mm) and conforms to the Meridian 1 common features drawing for a peripheral card. It has a gray metal faceplate that contains LED indicators and DIP switch controls for each of the four ports.

> ***Note:*** The RILC cannot be used in single density peripheral shelves or in the Intelligent Peripheral Equipment (IPE) modules. However, it can be used in the following PE modules and shelves: NT8D13, QSD64, QSD65, QSD80, QSP35, and QSP36.

The PCP is equipped with the following CMOS component parts (Figure 2):

— The microprocessor handles the asynchronous communication channel with the DTE or DCE, converts the data into the Meridian 1 data format, and interfaces with the Meridian 1 signaling channel for call establishment and tear down.

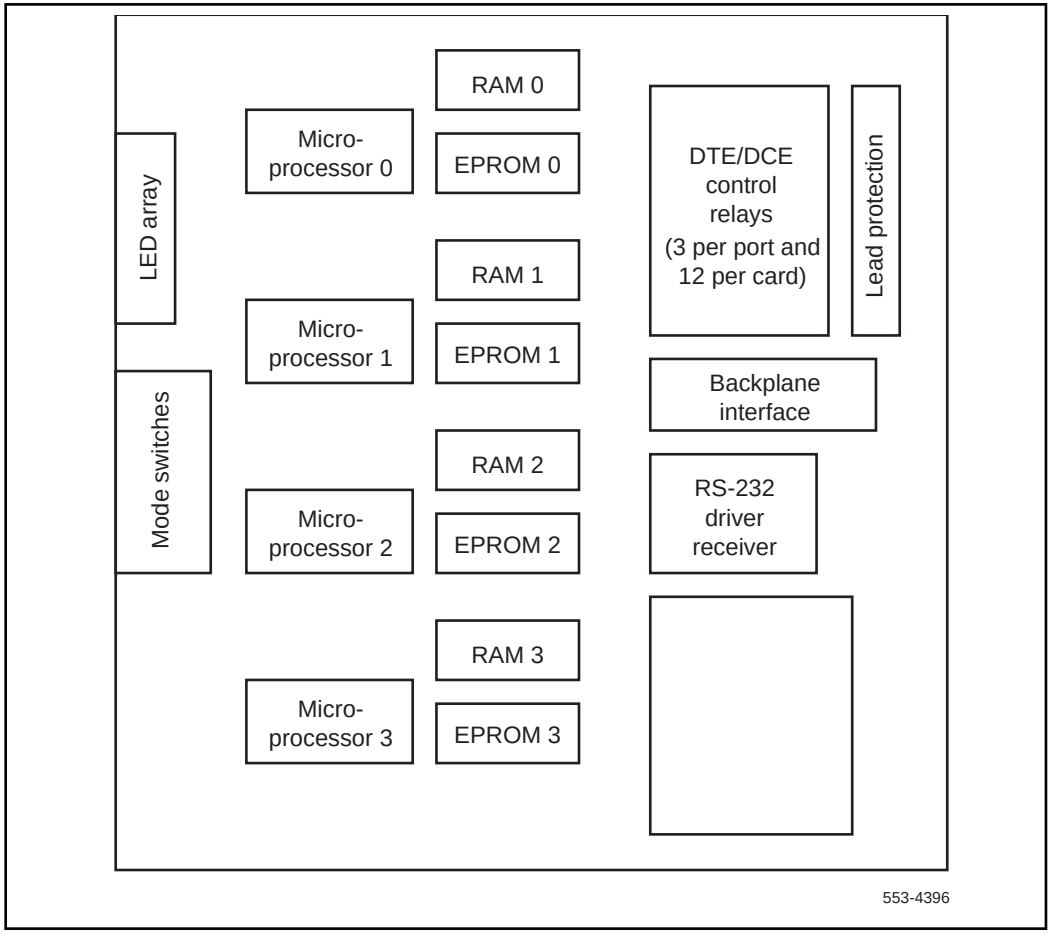
— The converters change the eight-bit parallel bus from the microprocessor to the bit interleaved format of the Meridian 1 network. The signaling interface does the level shifting and retiming of the signals from the peripheral shelf.

— EPROM and RAM are used for memory.

— The RS-232-C drivers and receivers are standard 1488 or 1489 chips (or equivalent). These EIA leads are protected against –48 V ringing and ±15 V with back-to-back zener diodes.

— Three Double-Pole-Double-Throw (DPDT) relays are used to route the RS-232 leads for configuring the port into the DTE or DCE mode. There are 3 relays for each port or 12 relays for the four ports on the RILC.

Figure 2
RILC block diagram



Controls and indicators

The RILC faceplate provides Light Emitting Diode (LED) indicators and DIP switches to monitor the status of the RS-232 interface signals, to control the interface mode and lead states, and to set the interface baud rate. Figure 3 shows the RILC faceplate and configuration switches and indicator LEDs.

The RILC has nine LEDs that function as follows:

— Six LEDs are for monitoring the status of the RS-232 leads. The LEDs are shared among the four ports and are controlled by a push-button (SEL) switch.

— Two LEDs indicate which port is selected for monitoring.

— A single LED indicates ON when the RILC card is disabled.

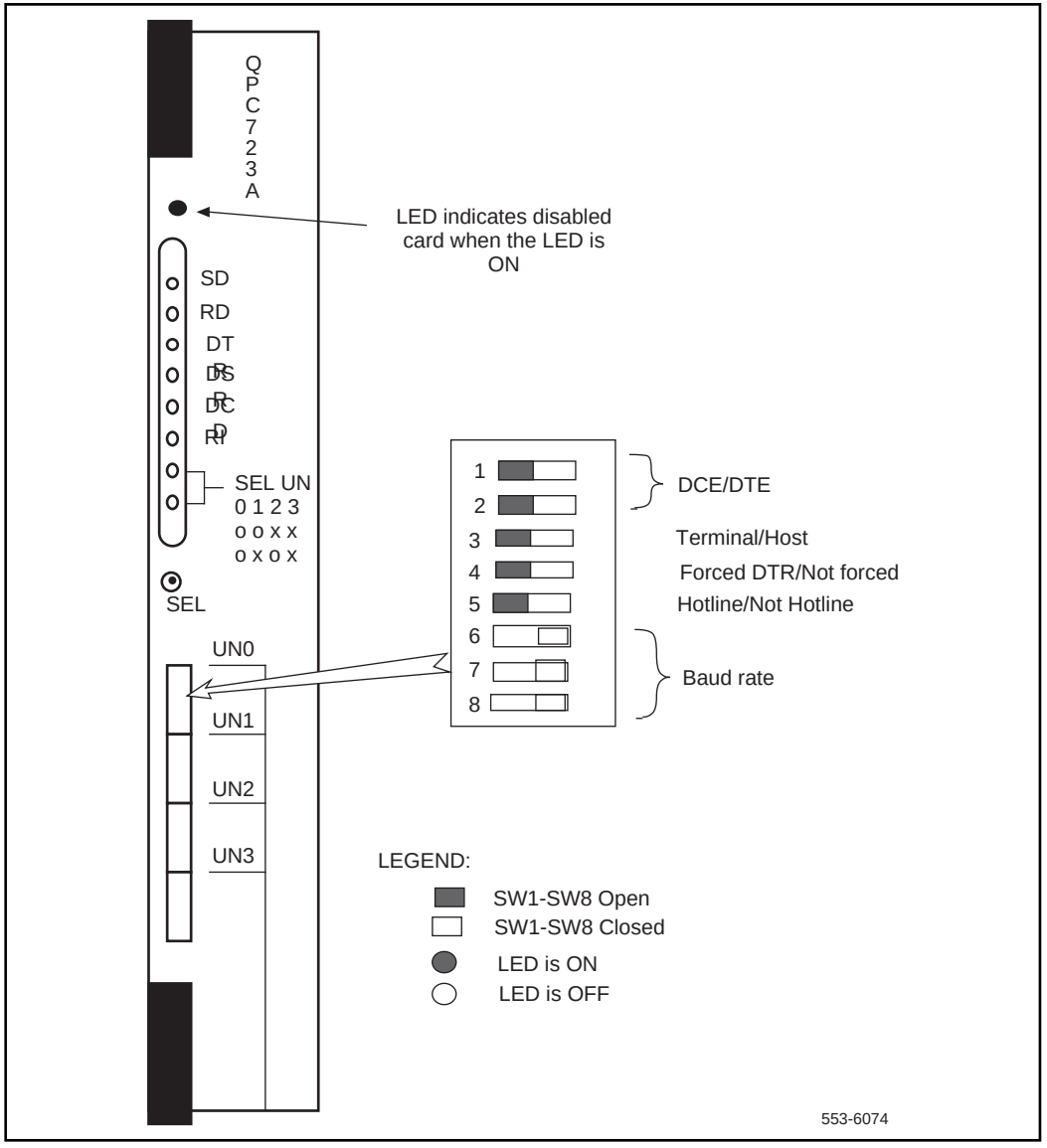
The RILC has one eight-position DIP switch for each of the four ports. The faceplate switches function to control each port characteristic as follows:

Switch 1: DTE/DCE mode control
Switch 2: DTE/DCE mode control
Switch 3: Host/terminal mode control
Switch 4: Forced DTR/normal
Switch 5: Hotline/KBD control
Switch 6: Baud rate control
Switch 7: Baud rate control
Switch 8: Baud rate control

A switch-setting change is effective only when a port is idle (not carrying on a data call).

The faceplate also displays charts that define the LED port selection and the switch settings.

Figure 3
RILC faceplate layout



Switch definitions

Switch 1 controls selection of the Data Termination Equipment (DTE) or Data Communication Equipment (DCE) logical and electrical modes of operation. Three Double-Pole-Double-Throw (DPDT) relays direct RS-232 signal directions for DTE or DCE modes of operation as specified in "Signals supported" on page 16

> ***Note:*** When the DTE mode is selected, the unit is operating as a DTE and is expecting to be connected to a DCE. Data from the unit appears on pin 2 of a correctly connected DB-25 connector. When DCE mode is selected, the unit is operating as a DCE and is expecting to be connected to a DTE. Data from the unit appears on pin 3 of a correctly connected DB-25 connector.

Switch 2 controls the Clear-To-Send (CTS) lead to the backplane. In the DCE mode, the CTS lead is passed through the switch and driven high (ON). In the DTE mode, switch 2 cuts off the signal to the backplane and the RILC assumes that the signal is high. **Switch 2 must always be set in the same position as switch 1.**

> ***Note:*** If switch 1 is in the DTE mode and switch 2 is left in the DCE mode, the CTS lead (usually pin 5 of the DB-25 connector) will be driven high or low. CTS status under these conditions is undefined and may cause a "bucking" driver condition in the external DCE that could cause a failure of other driver leads in the external DCE (for example, DSR, DCD, RD, and RI may not operate properly).

Switch 3 controls the prompts and messages to execute keyboard dialing (KBD). When the interface is connected to a host computer, or a host-like device, the KBD prompts and messages can cause a ping-pong effect where both interfacing devices declare INVALID COMMANDS to each other. However, these prompts and commands are necessary for a terminal user to execute KBD.

When set to the "Host" position, the switch suppresses these prompts and messages. However, the host may proceed with blind dialing in some configurations.

When set to the "Terminal" position, the RILC provides KBD prompts.

Switch 4 controls the characteristics of DTR (typically pin 20 of the DB-25 connector, driven by DTE, received by DCE), and depends on the selection of switches 1 and 5 for variances in operation.

In the DCE mode, DTR is always viewed as ON even when the electrical DTR signal from the external DTE is OFF.

In the DTE mode, DTR is driven to an electrical ON condition except when a call is being connected. At disconnect, DTR is dropped (electrical OFF condition) for approximately 400 ms, then returned to the ON condition. This permits the external DCE to recognize remote disconnects.

Switch 5 provides for optional hotline control. This allows five methods for a call to be originated to a single predefined number without manually dialing the number. The following options depend upon other switch settings:

— When in DCE mode

- Originate the hotline call when DTR is toggled from OFF to ON.
- Originate the hotline call when DTR is not forced ON and a Carriage Return character is received.
- Originate the hotline call continuously as long as DTR is ON.

— When in DTE mode

- Originate the hotline call when RI is ON.
- Originate the hotline call when DCD is ON.

Switches 6, 7, and 8 determine the baud rate of a port. The switch settings and the corresponding speeds are shown on a chart attached to the faceplate. When the switches are set to auto, the port looks for a Carriage Return <CR> to determine the baud rate. When set to a fixed baud rate, the port works at that baud rate when originating a call, but always conforms to the baud rate set by the originating data module when receiving a call.

Specifications

Data characteristics

The RILC provides the following communication characteristics:

Data type	ASCII (ANSI standard X3.4)
Synchronization	Asynchronous, start-stop (ANSI standard X3.15)
Number of bits	8 bits including parity
Parity	Treated as data and transported unchanged
Data rate	110, 150, 300, 600, 1200, 2400, 4800, 9600, and 19200 bits per second
Stop bits	2 bits for 110 bps 1 bit for all other speeds
Handshake	Full duplex
Data Terminal Interface	RS-232/CCITT V.24

The RILC transmits and receives at a rate of +0.9 percent above the bit rates to allow operation with data equipment that transmits above the nominal bit rate without data loss.

In the keyboard dialing (KBD) mode, the default parity is space and can be changed to even, odd, or mark with the autoparity feature. In the data transfer mode, the parity bit is passed transparently as the eighth bit. When the calling data module specifies 7 bit with even or odd parity, the parity bit is regenerated by the RILC before data is passed to the external data equipment.

Parameter exchange

During a call setup with another data module, the characteristics of the called end are automatically configured according to those of the calling end unless an incompatible configuration is specified.

During the keyboard dialing (KBD) mode, the RILC will autobaud and autoparity so that the menu and prompts are properly displayed on the user's terminal. The parity stays unchanged until specifically changed by another autoparity operation.

When a call is made to the RILC from another data module, the RILC configures its characteristics according to the parameters sent down from the other module regardless of whether it has autobauded or not. If the far end specifies 7 bit plus parity, the parity bit will be reconstructed. The RILC rejects calls with certain parameter mismatches such as calls specifying synchronous, half duplex, or 8 bit plus parity.

The RILC permits re-down-line-load (RDLL) from the far end, but does not provide for initiating RDLL.

Data equipment interface

A subset of the EIA signals and their CCITT V.24 equivalents are shown in Table 1. This subset is found on asynchronous data equipment, although not all leads are used.

Table 1
RS-232-C signals as applicable to asynchronous transmission

Circuit designation					
EIA	**Common**	**CCITT**	**Pin no. (DB-25)**	**Signal source**	**Signal name**
AA	FG	101	1		Frame ground
AB	GND	102	7		Signal ground
BA	TXD	103	2	DTE	Transmit data
BB	RXD	104	3	DCE	Receive data
CA	RTS	105	4	DTE	Request to send
CB	CTS	106	5	DCE	Clear to send
CC	DSR	107	6	DCE	Data set ready
CD	DTR	108.2	20	DTE	Data terminal ready
CE	RI	125	22	DCE	Ring indicator
CF	CD	109	8	DCE	Received line signal detector

Signals supported

The RILC supports only a subset of the listed RS-232-C signals, as shown in the following table. This is because only 8 leads per port are brought out through the backplane connector for a total of 32 leads per card slot on the double density shelf. Signal collisions with adjacent cards prevent support of RILC in single density shelves.

Signal Supported		Signal Direction	
DB-25	**Signal name**	**DCE mode**	**DTE mode**
Pin 2	TD	In	Out
Pin 3	RD	Out	In
Pin 5	CTS	Out	In
Pin 6	DSR	Out	In
Pin 7	GND	—	—
Pin 8	DCD	Out	In
Pin 20	DTR	In	Out
Pin 22	RI	Out	In

Pin 1 (FG) and Pin 4 (RTS) are not supported by the RILC.

Pin 1 (FG) may be supported by the data equipment, but is generally not used by the wire in the interconnecting cable.

Pin 4 (RTS) will be assumed ON all the time by the RILC in the DCE mode since half duplex is not supported. In the DTE mode, since the user DCE is most likely to be a modem and RTS is normally ignored by full duplex modems, it is permissible to drop the RTS signal support. Strapping in the interconnecting cable to force RTS on can be used for special situations.

Operating distance

RS-232-C is defined for speeds up to 19,200 baud at a maximum distance of 50 ft to prevent signal distortion. This specification is based on cable capacitance of 50 pF per foot and total line capacitance of 2500 pF. The capacitance of a typical 24 gauge and 26 gauge inside cable is shown below:

Wire Gauge	**Capacitance/ft**
24 AWG	24 pF
26 AWG	15 pF

To extend the distance beyond 50 ft, shielded cable, reduced bit rate low capacitance cable, and continuous cable runs can be considered.

The RILC is powered completely from the peripheral shelf backplane. The power requirements (shown below) are obtained from the –48 V or –52 V backplane supply, except for ±6 V, which is provided by the peripheral buffer.

Voltage	**Current**	
	Nominal	Maximum
+5 V	0.9 A	1.3 A
+6 V	12 mA	21 mA
–6 V	14 mA	27 mA
+9 V	75 mA	100 mA
–9 V	75 mA	100 mA
–48 V	250 mA	320 mA
–52 V	250 mA	320 mA

The card dissipates less than 15 W of heat, which must be considered when the system heat dissipation is being determined.

Product compatibility

The RILC is compatible with all existing Meridian 1 data products (AILC, AIM, AILU, ADM, SADM, ADO, MCDS, ASIM, MPDA, and CIM/VT100). It is also compatible with DTI/CPI, RPE, and any combination.

Environment

The RILC is designed to operate without degradation under the following conditions:

Specification	Operating	Storage
Ambient temperature	0°C to 60°C	–40°C to +70°C
Relative humidity (noncondensing)	5% to 95%	5% to 95%

Reliability

The RILC has a predicted mean time between failure (MTBF) of ten years at 40°C.

Self-diagnostics

When the card is powered up, each unit of the RILC executes a self-diagnostic routine. The six faceplate LEDs indicate the results of the diagnostics. At power-up, all six LEDs light momentarily and any malfunctioning LED is visually checked. If the hardware passes the self-diagnostics, the LEDs go off. If a unit fails the diagnostics, the LED blinks on and off two times per second indefinitely. Pressing the unit selection switch while the LED is blinking puts the LED into monitor mode, showing the RS-232 status. The LED returns to the diagnostic mode when the card is powered down and up again.

The top two LEDs (marked SD and RD) in the group indicate the diagnostic result of unit 0 of the RILC. The next two LEDs (marked DTR and DSR) indicate the result of port 1 and so on. If all four units pass the diagnostics, all the LEDs will be off at the end of the diagnostics. At this time, push the selection switch to enter monitor mode.

EIA control lead characteristics

The functional and procedural requirements of the EIA leads vary under different circumstances. To initiate KBD, a terminal or personal computer (PC) may require DSR, DCD, or Clear-To-Send (CTS) or be ON. However, a host computer may require the DCD and DSR leads to reflect the true condition of the communications channel to provide security to each individual user. Due to these conflicting requirements, the same option switches, namely DCE/DTE control and Host/Terminal control, also specify the interaction of the EIA leads during the call setup state. After a call is established, DSR, DCD, CTS, and DTR are usually on.

The RILC considers a “BREAK” condition (continuous Space condition) lasting longer than 1.5 s as DTE or DCE not ready, and releases an established call. Breaks lasting less than 1.2 s are passed transparently as data to the far end. An Open line (zero voltage) is treated as OFF on the control leads but as mark on the data leads. This ensures that a physical disconnect of a DTE or DCE from the Line Card always results in a call disconnect for security.

EIA leads protection

The RS-232-C leads are protected against foreign and transient voltages before exiting to the backplane. A short to a 500/2500 line, or an SL-1 line, with any of the interface leads does not cause any damage to the RILC. Because the protecting circuitry reduces hazardous voltages on the line, the external DTE or DCE is protected when properly connected to the RILC.

Installation

Power and thermal limitations permit installing only a maximum of six RILCs per peripheral equipment (PE) shelf. Traffic limitations may further limit the number of cards per shelf.

> ***Note:*** A maximum of four RILCs can be installed in the Meridian SL-1 ST shelf because of the density of the cards in the shelf.

After the RILC is installed in the assigned slot of the Meridian 1 and the card has passed self-diagnostic tests, use the faceplate DIP switches to configure the assigned units to the operating modes and baud rates. Make the necessary cross-connections to connect the RILC to the assigned DTE or DCE.

WARNING

Be very careful when connecting the RILC I/O leads at the MDF. If leads from a 500/2500 or an SL-1 line card touch the leads to the computer or terminal equipment connected to the RILC, that equipment may be severely damaged.

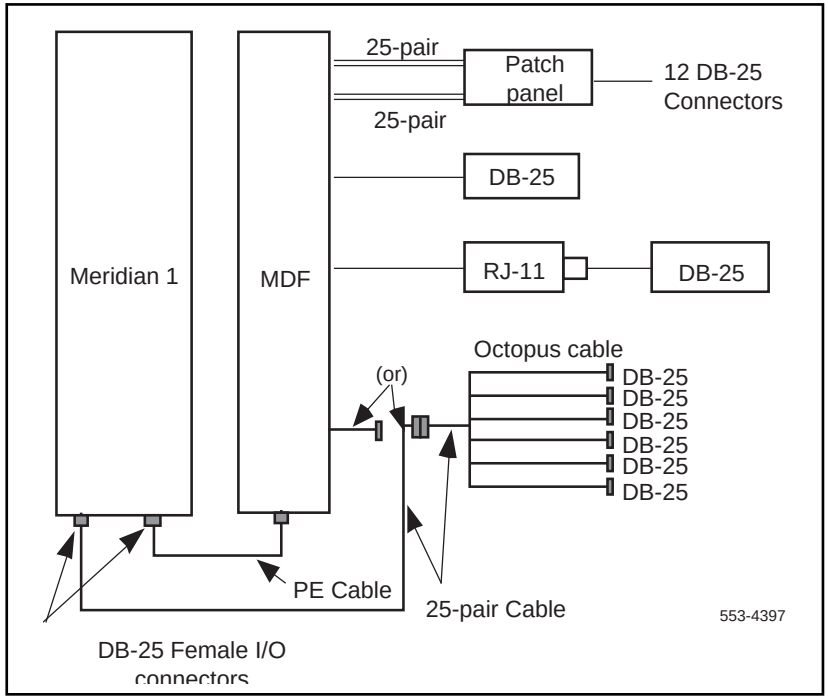
Do not apply any foreign voltage to check the cable continuity while the RILC or computer equipment is connected to the MDF.

Special clips (SSM or SSP) should be installed on the MDF to identify the RILC leads or the RILC leads should be routed to an MDF that is physically apart from the rest of the system.

Cabling scheme

The EIA signal leads exiting from the RILC normally terminate on the Meridian 1 Main Distribution Frame (MDF). Physical connectors are necessary to provide an industry-compatible interface to the user for complete RS-232 connectivity. There are four methods to provide the industry-standard DB-25 connector from the MDF (Figure 4):

Figure 4
Four cabling options to data equipment



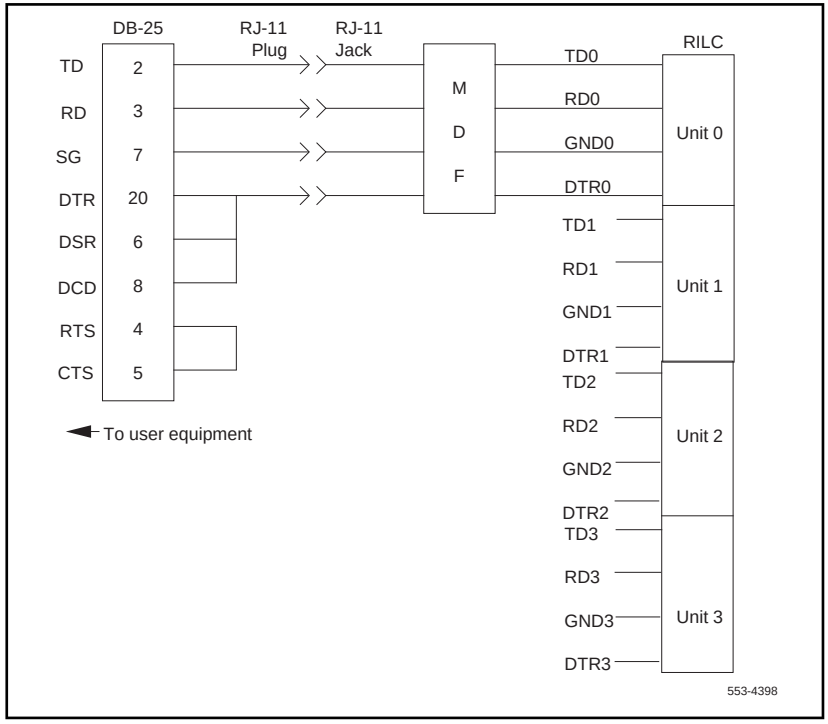
RS-232 cable

This cable is tailored to suit individual needs and uses solid wire to allow punch-down on the MDF.

RJ-11 (or RJ-45) jack at the user station

Four to eight wires are used to connect the RJ-11 (or RJ-45) jack to the MDF. Another cable is necessary to convert the RJ-11 (or RJ-45) into the DB-25. Figure 5 defines the RJ-11 to terminal connection.

Figure 5
Cabling with RJ-11 using four wires (for terminals)



Patch panel

A panel can be designed to branch out two 50-pin connectors into twelve DB-25 connectors. Figure 6 shows the patch panel and 25-pair cables connecting the patch panel to the MDF. The leads from the MDF are connected through 25-pair cables to the patch panel located near the user data equipment. RS-232 cables are used to connect the data equipment to the patch panel. The connectors on the panel must meet mechanical specifications of ISO-2110-1980 and be equipped with 4-40 socket screw locks.

Figure 6
Patch panel layout

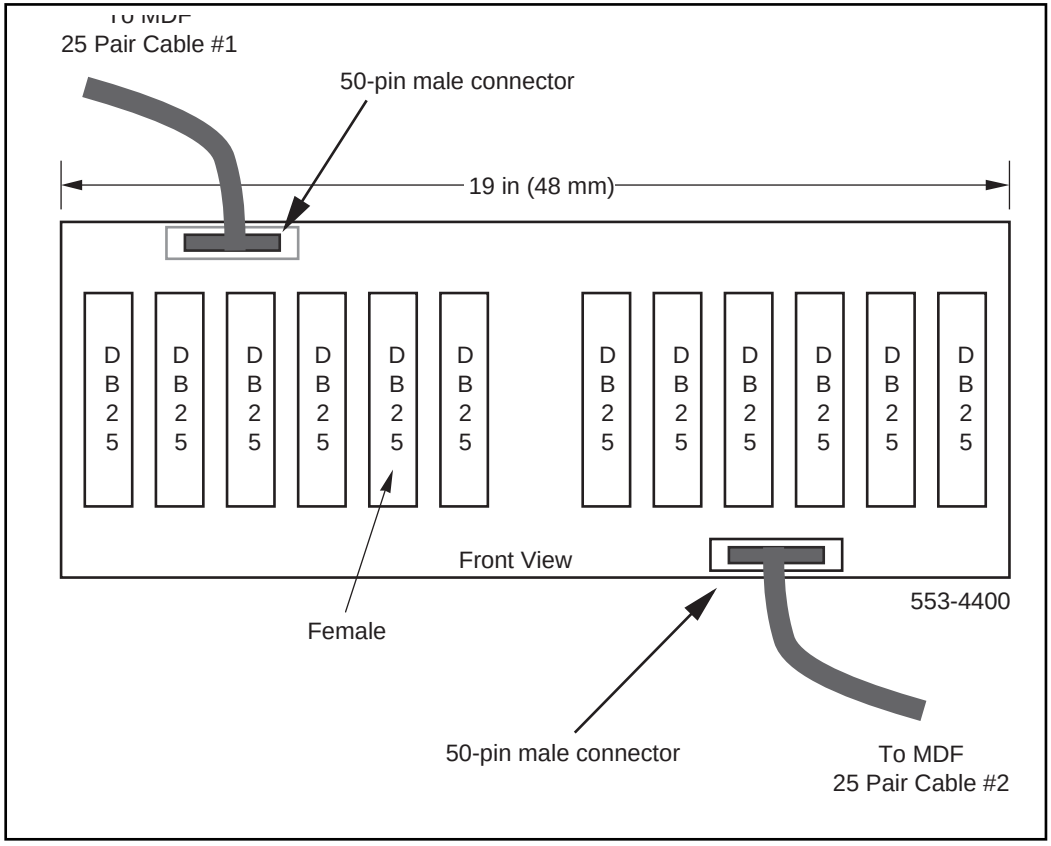
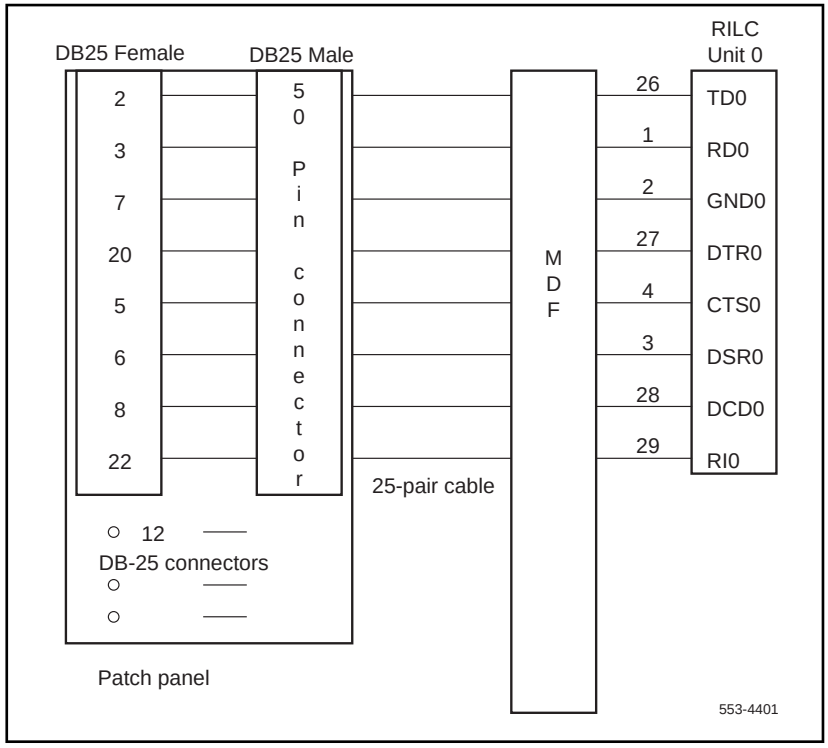


Figure 7 shows a typical signal path from the patch panel to unit 0 of an RILC. A patch panel with two 50-pin plugs and 12 DB-25 sockets is available from Northern Telecom.

Figure 7
Cabling with patch panel



Octopus cable

This cable (Figure 8 and Table 2) replaces the combination of the patch panel and the RS-232 cables. The 25-pair cable from the MDF (or directly from the system I/O connector) is split into six RS-232 plugs or sockets for direct interconnection with the user data equipment. Two types of Octopus cables, 914 mm (3 ft) long, are available from Northern Telecom: male 50-pin to female DB-25 cable QCAD318, and male 50-pin to male DB-25 cable QCAD319.

Figure 8
Male to female octopus cable

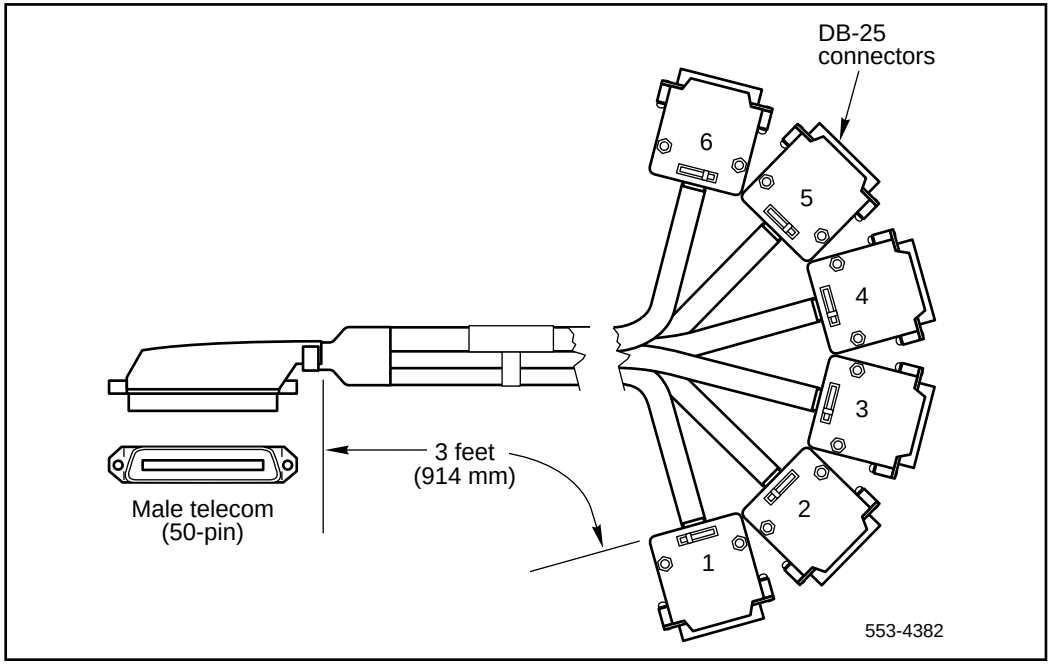


Table 2
Typical pinouts for octopus cable and patch panel

Telecom 50-pin number	DB-25 connector/pin number	Telecom 50-pin number	DB-25 connector/pin number
1	1-3	26	1-2
2	1-7	27	1-20
3	1-6	28	1-8
4	1-5	29	1-22
5	2-3	30	2-2
6	2-7	31	2-20
7	2-6	32	2-8
8	2-5	33	2-22
9	3-3	34	3-2
10	3-7	35	3-20
11	3-6	36	3-8
12	3-5	37	3-22
13	4-3	38	4-2
14	4-7	39	4-20
15	4-6	40	4-8
16	4-5	41	4-22
17	5-3	42	5-2
18	5-7	43	5-20
19	5-6	44	5-8
20	5-5	45	5-22
21	6-3	46	6-2
22	6-7	47	6-20
23	6-6	48	6-8
24	6-5	49	6-22
25	Not used	50	Not used

Note: The DB-25 connector pinouts are identified by the connector number followed by the pin number, for example, 1-3, 2-3.

Connecting to the MDF

To contain the RILC I/O leads in a Main Distribution Frame (MDF) connector and away from other I/O leads, follow these rules:

— When there is only one RILC to be installed, use slot 10 and all the pins will terminate on connector G (Figure 9).

— When there are two RILCs to be installed, use slots 1, 2 or 4, 5 or 7, and 8. Slots 3, 6, or 9 could then be used for cards that do not use I/O pins, for example, Digital Tone Receivers (DTR). With this arrangement the RILC I/O pins are contained totally in connectors AB, CD, or EF (Figure 9).

— When there are three RILCs to be installed, use slots 1, 2, and 3 or 4, 5, and 6 or 7, 8, and 9. The RILC I/O pins are then contained totally in connectors AB, CD, or EF (Figure 9).

To further illustrate, if three RILCs are placed in adjacent slots 1, 2, and 3 or 4, 5, and 6 or 7, 8, and 9 of the peripheral equipment (PE) shelf and one patch panel (or two octopus cables) is used, the I/O signals are totally enclosed in two 25-pair cables. This provides maximum segregation from voice signals that may otherwise be present in the same 25-pair cable. Figure 9 shows the layout of the shelf slots and shelf connectors.

Table 3 shows typical backplane pin assignments for MDF connectors.

Figure 9
Layout of shelf slots and shelf connectors

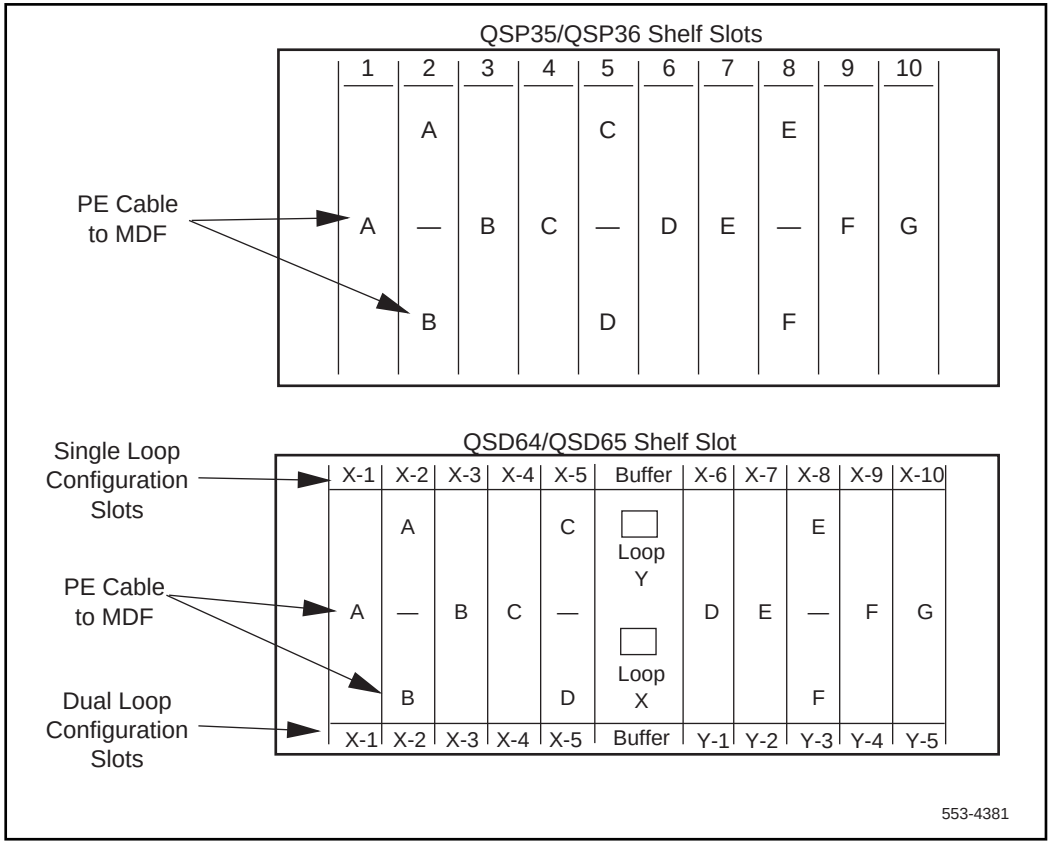


Table 3
Typical backplane pin assignments for MDF connections for Cable A (Part 1 of 2)

Pin	Pin	Terminal Number					
		Unit					
		Pair color	Card no.	Signal name	RS-232 pin no.	Pack conn no.	Unit no.
1T 1R 2T 2R	26 1 27 2	W-BL BL-W W-O O-W	1	TD0 RD0 DTR0 GD	(2) (3) (20) (7)	36A 37A 38A 39A	Unit 0
3R 3R 4T 4R	28 3 29 4	W-G G-W W-BR BR-W		DCB0 DSR0 R10 CTS0	(8) (6) (22) (5)	29A 30A 31A 32A	
5T 5R 6T 6R	30 5 31 6	W-S S-W R-BL BL-B		TD1 RD1 DTR1 GD	(2) (3) (20) (7)	02A 03A 04A 05A	1 Unit
7T 7R 8T 8R	32 7 33 8	R-O O-R R-G G-R		DCD1 DSR1 RI1 CTS1	(8) (6) (22) (5)	09A 10A 11A 12A	
9T 9R 10T 10R	34 9 35 10	R-BR BR-R R-S S-R		TD2 RD2 DTR2 GD	(2) (3) (20) (7)	36B 37B 38B 39B	Unit 2
11T 11R 12T 12R	36 11 37 12	BK-BL BL-BK BK-O O-BK		DCD2 DSR2 R12 CTS2	(8) (6) (22) (5)	29B 30B 31B 32B	

Table 3
Typical backplane pin assignments for MDF connections for Cable A (Part 2 of 2)

Pin	Pin	Terminal Number					
		Unit					
		Pair color	Card no.	Signal name	RS-232 pin no.	Pack conn no.	Unit no.
13T 13R 14T 14R	38 13 39 14	BK-G G-BK BK-BR BR-BK	(Note 1) 1 or X-1 for single loop and X-1 for dual loop (Note 2)	TD3 RD3 DTR3 GD	(2) (3) (20) (7)	02B 03B 04B 05B	Unit 3
15T 15R 16T 16R	40 15 41 16	BK-S S-BK Y-BL BL-Y		DCD3 DSR3 R13 CTS3	(8) (6) (22) (5)	09B 10B 11B 12B	
17T 17R 18T 18R	42 17 43 18	Y-O O-Y Y-G G-Y		TD0 RD0 DTR0 GD	(2) (3) (20) (7)	36A 37A 38A 39A	Unit 0
19T 19R 20T 20R	44 19 45 20	Y-BR BR-Y Y-S S-Y		DCB0 DSR0 R10 CTS0	(8) (6) (22) (5)	29A 30A 31A 32A	
21T 21R 22T 22R	46 21 47 22	V-BL BL-V V-O O-V	2 or X-2 for single loop and X-2 for dual loop	TD1 RD1 DTR1 GD	(2) (3) (20) (7)	02A 03A 04A 05A	Unit 1
23T 23R 24T 24R	48 23 49 24	V-G G-V V-BR BR-V		DCD1 DSR1 RI1 CTS1	(8) (6) (22) (5)	09A 10A 11A 12A	

Note 1: This column shows the card position for a single loop mode in PE shelves QSP35, QSP36, QSD64, and QSD65. It also shows a dual mode in PE shelf QSD65.

Note 2: X-1 represents the first card slot of loop X connected to the bottom jack of the QPC659 PE buffer in the PE shelf QSD65.

Table 4
Typical backplane pin assignments for MDF connections for Cable B (Part 1 of 2)

Pin	Pin	Terminal Number					
		Unit					
		Pair color	Card no. (see note)	Signal name	RS-232 pin no.	Pack conn no.	Unit no.
1T 1R 2T 2R	26 1 27 2	W-BL BL-W W-O O-W	2 or X-2 for single loop and X-2 for dual loop	TD2 RD2 DTR2 GD	(2) (3) (20) (7)	36B 37B 38B 39B	Unit 2
3T 3R 4T 4R	28 3 29 4	W-G G-W W-BR BR-W		DCB2 DSR2 R12 CTS2	(8) (6) (22) (5)	29B 30B 31B 32B	
5T 5R 6T 6R	30 5 31 6	W-S S-W R-BL BL-R		TD3 RD3 DTR3 GD	(2) (3) (20) (7)	02B 03B 04B 05B	Unit 3
7T 7R 8T 8R	32 7 33 8	R-O O-R R-G G-R		DCD3 DSR3 RI3 CTS3	(8) (6) (22) (5)	09B 10B 11B 12B	
9T 9R 10T 10R	34 9 35 10	R-BR BR-R R-S S-R	3 or X-3 for single loop and X-3 for dual loop	TD0 RD0 DTR0 GD	(2) (3) (20) (7)	36A 37A 38A 39A	Unit 0
11T 11R 12T 12R	36 11 37 12	BK-BL BL-BK BK-O O-BK		DCD0 DSR0 R10 CTS0	(8) (6) (22) (5)	29A 30A 31A 32A	

Note: This column shows the card position for a single loop mode in PE shelves QSP35, QSP36, QSD64, and QSD65. It also shows a dual mode in PE shelf QSD65.

Table 4
Typical backplane pin assignments for MDF connections for Cable B (Part 2 of 2)

Pin	Pin	Terminal Number					
		Unit					
		Pair color	Card no. (see note)	Signal name	RS-232 pin no.	Pack conn no.	Unit no.
13T 13R 14T 14R	38 13 39 14	BK-G G-BK BK-BR BR-BK	3 or X-3 for single loop and X-3 for dual loop	TD1 RD1 DTR1 GD	(2) (3) (20) (7)	02A 03A 04A 05A	Unit 1
15T 15R 16T 16R	40 15 41 16	BK-S S-BK Y-BL BL-Y		DCD1 DSR3 R13 CTS3	(8) (6) (22) (5)	09A 10A 11A 12A	
17T 17R 18T 18R	42 17 43 18	Y-O O-Y Y-G G-Y		TD2 RD2 DTR2 GD	(2) (3) (20) (7)	36B 37B 38B 39B	Unit 2
19T 19R 20T 20R	44 19 45 20	Y-BR BR-Y Y-S S-Y		DCB2 DSR2 R12 CTS2	(8) (6) (22) (5)	29B 30B 31B 32B	
21T 21R 22T 22R	46 21 47 22	V-BL BL-V V-O O-V		TD3 RD3 DTR3 GD	(2) (3) (20) (7)	02B 03B 04B 05B	Unit 3
23T 23R 24T 24R	48 23 49 24	V-G G-V V-BR BR-V		DCD3 DSR3 RI3 CTS3	(8) (6) (22) (5)	09B 10B 11B 12B	
25T 25R	50 25	V-S S-V		SPARE			

Note: This column shows the card position for a single loop mode in PE shelves QSP35, QSP36, QSD64, and QSD65. It also shows a dual mode in PE shelf QSD65.

Table 5
Typical backplane pin assignments for MDF connections for Cable C (Part 1 of 2)

Pin	Pin	Terminal Number					
		Unit					
		Pair color	Card no. (see note)	Signal name	RS-232 pin no.	Pack conn no.	Unit no.
1T	26	W-BL	4 or X-4 for single loop and X-4 for dual loop	TD0	(2)	36A	Unit 0
1R	1	BL-W		RD0	(3)	37A	
2T	27	W-O		DTR0	(20)	38A	
2R	2	O-W		GD	(7)	39A	
3T	28	W-G		DCB0	(8)	29A	
3R	3	G-W		DSR0	(6)	30A	
4T	29	W-BR		R10	(22)	31A	
4R	4	BR-W		CTS0	(5)	32A	
5T	30	W-S		TD1	(2)	02A	Unit 1
5R	5	S-W		RD1	(3)	03A	
6T	31	R-BL		DTR1	(20)	04A	
6R	6	BL-R		GD	(7)	05A	
7T	32	R-O		DCD1	(8)	09A	
7R	7	O-R		DSR1	(6)	10A	
8T	33	R-G		RI1	(22)	11A	
8R	8	G-R		CTS1	(5)	12A	
9T	34	R-BR		TD2	(2)	36B	Unit 2
9R	9	BR-R		RD2	(3)	37B	
10T	35	R-S		DTR2	(20)	38B	
10R	10	S-R		GD	(7)	39B	
11T	36	BK-BL		DCD2	(8)	29B	
11R	11	BL-BK		DSR2	(6)	30B	
12T	37	BK-O		R12	(22)	31B	
12R	12	O-BK		CTS2	(5)	32B	

Note: This column shows the card position for a single loop mode in PE shelves QSP35, QSP36, QSD64, and QSD65. It also shows a dual mode in PE shelf QSD65.

Table 5
Typical backplane pin assignments for MDF connections for Cable C (Part 2 of 2)

Pin	Pin	Terminal Number					
		Unit					
		Pair color	Card no. (see note)	Signal name	RS-232 pin no.	Pack conn no.	Unit no.
13T 13R 14T 14R	38 13 39 14	BK-G G-BK BK-BR BR-BK	4 or X-4 for single loop and X-4 for dual loop	TD3 RD3 DTR3 GD	(2) (3) (20) (7)	02B 03B 04B 05B	Unit 3
15T 15R 16T 16R	40 15 41 16	BK-S S-BK Y-BL BL-Y		DCD3 DSR3 R13 CTS3	(8) (6) (22) (5)	09B 10B 11B 12B	
17T 17R 18T 18R	42 17 43 18	Y-O O-Y Y-G G-Y	5 or X-5 for single loop and X-5 for dual loop	TD0 RD0 DTR0 GD	(2) (3) (20) (7)	36A 37A 38A 39A	Unit 0
19T 19R 20T 20R	44 19 45 20	Y-BR BR-Y Y-S S-Y		DCB0 DSR0 R10 CTS0	(8) (6) (22) (5)	29A 30A 31A 32A	
21T 21R 22T 22R	46 21 47 22	V-BL BL-V V-O O-V		TD1 RD1 DTR1 GD	(2) (3) (20) (7)	02A 03A 04A 05A	Unit 1
23T 23R 24T 24R	48 23 49 24	V-G G-V V-BR BR-V		DCD1 DSR1 RI1 CTS1	(8) (6) (22) (5)	09A 10A 11A 12A	
25T 25R	50 25	V-S S-V		SPARE			

Note: This column shows the card position for a single loop mode in PE shelves QSP35, QSP36, QSD64, and QSD65. It also shows a dual mode in PE shelf QSD65.

Table 6
Typical backplane pin assignments for MDF connections for Cable D (Part 1 of 2)

Pin	Pin	Terminal Number					
		Unit					
		Pair color	Card no.	Signal name	RS-232 pin no.	Pack conn no.	Unit no.
1T 1R 2T 2R	26 1 27 2	W-BL BL-W W-O O-W	(Note 1) 5 or X-5 for single loop and X-5 for dual loop	TD2 RD2 DTR2 GD	(2) (3) (20) (7)	36B 37B 38B 39B	Unit 2
3T 3R 4T 4R	28 3 29 4	W-G G-W W-BR BR-W		DCB2 DSR2 R12 CTS2	(8) (6) (22) (5)	29B 30B 31B 32A	
5T 5R 6T 6R	30 5 31 6	W-S S-W R-BL BL-R		TD3 RD3 DTR3 GD	(2) (3) (20) (7)	02B 03B 04B 05B	Unit 3
7T 7R 8T 8R	32 7 33 8	R-O O-R R-G G-R		DCD3 DSR3 RI3 CTS3	(8) (6) (22) (5)	09B 10B 11B 12B	
9T 9R 10T 10R	34 9 35 10	R-BR BR-R R-S S-R	6 or X-6 for single loop and Y-1 for dual loop (Note 2)	TD0 RD0 DTR0 GD	(2) (3) (20) (7)	36A 37A 38A 39A	Unit 0
11T 11R 12T 12R	36 11 37 12	BK-BL BL-BK BK-O O-BK		DCD0 DSR0 R10 CTS0	(8) (6) (22) (5)	29A 30A 31A 32A	

Note 1: This column shows the card position for a single loop mode in PE shelves QSP35, QSP36, QSD64, and QSD65. It also shows a dual mode in PE shelf QSD65.

Note 2: Y-1 Is the first card slot of loop Y connected to the top jack of the QPC659 PE buffer in the QSD65 PE shelf.

Table 6
Typical backplane pin assignments for MDF connections for Cable D (Part 2 of 2)

Pin	Pin	Terminal Number					
		Unit					
		Pair color	Card no.	Signal name	RS-232 pin no.	Pack conn no.	Unit no.
13T 13R 14T 14R	38 13 39 14	BK-G G-BK BK-BR BR-BK	(Note 1) 6 or X-6 for single loop and Y-1 for dual loop (Note 2)	TD1 RD1 DTR1 GD	(2) (3) (20) (7)	02A 03A 04A 05A	Unit 1
15T 15R 16T 16R	40 15 41 16	BK-S S-BK Y-BL BL-Y		DCD1 DSR3 R13 CTS3	(8) (6) (22) (5)	09A 10A 11A 12A	
17T 17R 18T 18R	42 17 43 18	Y-O O-Y Y-G G-Y		TD2 RD2 DTR2 GD	(2) (3) (20) (7)	36B 37B 38B 39B	Unit 2
19T 19R 20T 20R	44 19 45 20	Y-BR BR-Y Y-S S-Y		DCB2 DSR2 R12 CTS2	(8) (6) (22) (5)	29B 30B 31B 32B	
21T 21R 22T 22R	46 21 47 22	V-BL BL-V V-O O-V		TD3 RD3 DTR3 GD	(2) (3) (20) (7)	02B 03B 04B 05B	Unit 3
23T 23R 24T 24R	48 23 49 24	V-G G-V V-BR BR-V		DCD3 DSR3 RI3 CTS3	(8) (6) (22) (5)	09B 10B 11B 12B	
25T 25R	50 25	V-S S-V		SPARE			

Note 1: This column shows the card position for a single loop mode in PE shelves QSP35, QSP36, QSD64, and QSD65. It also shows a dual mode in PE shelf QSD65.

Note 2: Y-1 Is the first card slot of loop Y connected to the top jack of the QPC659 PE buffer in the QSD65 PE shelf.

Table 7
Typical backplane pin assignments for MDF connections for Cable E (Part 1 of 2)

Pin	Pin	Terminal Number					
		Unit					
		Pair color	Card no. (see note)	Signal name	RS-232 pin no.	Pack conn no.	Unit no.
1T 1R 2T 2R	26 1 27 2	W-BL BL-W W-O O-W	7 or X-7 for single loop and Y-2 for dual loop	TD0 RD0 DTR0 GD	(2) (3) (20) (7)	36A 37A 38A 39A	Unit 0
3T 3R 4T 4R	28 3 29 4	W-G G-W W-BR BR-W		DCB0 DSR0 R10 CTS0	(8) (6) (22) (5)	29A 30A 31A 32A	
5T 5R 6T 6R	30 5 31 6	W-S S-W R-BL BL-R		TD1 RD1 DTR1 GD	(2) (3) (20) (7)	02A 03A 04A 05A	Unit 1
7T 7R 8T 8R	32 7 33 8	R-O O-R R-G G-R		DCD1 DSR1 RI1 CTS1	(8) (6) (22) (5)	09A 10A 11A 12A	
9T 9R 10T 10R	34 9 35 10	R-BR BR-R R-S S-R		TD2 RD2 DTR2 GD	(2) (3) (20) (7)	36B 37B 38B 39B	Unit 2
11T 11R 12T 12R	36 11 37 12	BK-BL BL-BK BK-O O-BK		DCD2 DSR2 R12 CTS2	(8) (6) (22) (5)	29B 30B 31B 32B	

Note: This column shows the card position for a single loop mode in PE shelves QSP35, QSP36, QSD64, and QSD65. It also shows a dual mode in PE shelf QSD65.

Table 7
Typical backplane pin assignments for MDF connections for Cable E (Part 2 of 2)

Pin	Pin	Terminal Number					
		Unit					
		Pair color	Card no. (see note)	Signal name	RS-232 pin no.	Pack conn no.	Unit no.
13T 13R 14T 14R	38 13 39 14	BK-G G-BK BK-BR BR-BK	7 or X-7 for single loop and Y-2 for dual loop	TD3 RD3 DTR1 GD	(2) (3) (20) (7)	02B 03B 04B 05B	Unit 3
15T 15R 16T 16R	40 15 41 16	BK-S S-BK Y-BL BL-Y		DCD3 DSR3 R13 CTS3	(8) (6) (22) (5)	09B 10B 11B 12B	
17T 17R 18T 18R	42 17 43 18	Y-O O-Y Y-G G-Y	8 or X-8 for single loop and Y-3 for dual loop	TD0 RD0 DTR0 GD	(2) (3) (20) (7)	36A 37A 38A 39A	Unit 0
19T 19R 20T 20R	44 19 45 20	Y-BR BR-Y Y-S S-Y		DCB0 DSR0 R10 CTS0	(8) (6) (22) (5)	29A 30A 31A 32A	
21T 21R 22T 22R	46 21 47 22	V-BL BL-V V-O O-V		TD1 RD1 DTR1 GD	(2) (3) (20) (7)	02A 03A 04A 05A	Unit 1
23T 23R 24T 24R	48 23 49 24	V-G G-V V-BR BR-V		DCD1 DSR1 RI1 CTS1	(8) (6) (22) (5)	09A 10A 11A 12A	
25T 25R	50 25	V-S S-V		SPARE			

Note: This column shows the card position for a single loop mode in PE shelves QSP35, QSP36, QSD64, and QSD65. It also shows a dual mode in PE shelf QSD65.

Table 8
Typical backplane pin assignments for MDF connections for Cable F (Part 1 of 2)

Pin	Pin	Terminal Number					
		Unit					
		Pair color	Card no. (see note)	Signal name	RS-232 pin no.	Pack conn no.	Unit no.
1T 1R 2T 2R	26 1 27 2	W-BL BL-W W-O O-W	8 or X-8 for single loop and Y-3 for dual loop	TD2 RD2 DTR2 GD	(2) (3) (20) (7)	36B 37B 38B 39B	Unit 2
3T 3R 4T 4R	28 3 29 4	W-G G-W W-BR BR-W		DCB2 DSR2 R10 CTS2	(8) (6) (22) (5)	29B 30B 31B 32B	
5T 5R 6T 6R	30 5 31 6	W-S S-W R-BL BL-R		TD3 RD3 DTR3 GD	(2) (3) (20) (7)	02B 03B 04B 05B	Unit 3
7T 7R 8T 8R	32 7 33 8	R-O O-R R-G G-R		DCD3 DSR3 RI3 CTS3	(8) (6) (22) (5)	09B 10B 11B 12B	
9T 9R 10T 10R	34 9 35 10	R-BR BR-R R-S S-R	9 or X-9 for single loop and Y-4 for dual loop	TD0 RD0 DTR0 GD	(2) (3) (20) (7)	36A 37A 38A 39A	Unit 0
11T 11R 12T 12R	36 11 37 12	BK-BL BL-BK BK-O O-BK		DCD0 DSR0 R10 CTS0	(8) (6) (22) (5)	29A 30A 31A 32A	

Note: This column shows the card position for a single loop mode in PE shelves QSP35, QSP36, QSD64, and QSD65. It also shows a dual mode in PE shelf QSD65.

Table 8
Typical backplane pin assignments for MDF connections for Cable F (Part 2 of 2)

Pin	Pin	Terminal Number					
		Unit					
		Pair color	Card no. (see note)	Signal name	RS-232 pin no.	Pack conn no.	Unit no.
13T 13R 14T 14R	38 13 39 14	BK-G G-BK BK-BR BR-BK	9 or X-9 for single loop and Y-4 for dual loop	TD1 RD1 DTR1 GD	(2) (3) (20) (7)	02A 03A 04A 05A	Unit 1
15T 15R 16T 16R	40 15 41 16	BK-S S-BK Y-BL BL-Y		DCD1 DSR3 R13 CTS3	(8) (6) (22) (5)	09A 10A 11A 12A	
17T 17R 18T 18R	42 17 43 18	Y-O O-Y Y-G G-Y		TD2 RD2 DTR2 GD	(2) (3) (20) (7)	36B 37B 38B 39B	Unit 2
19T 19R 20T 20R	44 19 45 20	Y-BR BR-Y Y-S S-Y		DCB2 DSR2 R12 CTS2	(8) (6) (22) (5)	29B 30B 31B 32B	
21T 21R 22T 22R	46 21 47 22	V-BL BL-V V-O O-V		TD3 RD3 DTR3 GD	(2) (3) (20) (7)	02B 03B 04B 05B	Unit 3
23T 23R 24T 24R	48 23 49 24	V-G G-V V-BR BR-V		DCD3 DSR3 RI3 CTS3	(8) (6) (22) (5)	09B 10B 11B 12B	
25T 25R	50 25	V-S S-V		SPARE			

Note: This column shows the card position for a single loop mode in PE shelves QSP35, QSP36, QSD64, and QSD65. It also shows a dual mode in PE shelf QSD65.

Table 9
Typical backplane pin assignments for MDF connections for Cable G (Part 1 of 2)

Pin	Pin	Terminal Number					
		Unit					
		Pair color	Card no.	Signal name	RS-232 pin no.	Pack conn no.	Unit no.
1T 1R 2T 2R	26 1 27 2	W-BL BL-W W-O O-W	(Note 1) 10 or X-10 for single loop and Y-5 for dual loop	TD0 RD0 DTR0 GD	(2) (3) (20) (7)	36A 37A 38A 39A	Unit 0
3T 3R 4T 4R	28 3 29 4	W-G G-W W-BR BR-W		DCB0 DSR0 R10 CTS0	(8) (6) (22) (5)	29A 30A 31A 32A	
5T 5R 6T 6R	30 5 31 6	W-S S-W R-BL BL-R		TD1 RD1 DTR1 GD	(2) (3) (20) (7)	02A 03A 04A 05A	Unit 1
7T 7R 8T 8R	32 7 33 8	R-O O-R R-G G-R		DCD1 DSR1 RI1 CTS1	(8) (6) (22) (5)	09A 10A 11A 12A	
9T 9R 10T 10R	34 9 35 10	R-BR BR-R R-S S-R		TD2 RD2 DTR2 GD	(2) (3) (20) (7)	36B 37B 38B 39B	Unit 2
11T 11R 12T 12R	36 11 37 12	BK-BL BL-BK BK-O O-BK		DCD2 DSR2 R12 CTS2	(8) (6) (22) (5)	29B 30B 31B 32B	

Note 1: * This column shows the card position for a single loop mode in PE shelves QSP35, QSP36, QSD64, and QSD65. It also shows a dual mode in PE shelf QSD65.

Note 2: Cables from all PE shelves terminate as above.

Table 9
Typical backplane pin assignments for MDF connections for Cable G (Part 2 of 2)

Pin	Pin	Terminal Number					
		Unit					
		Pair color	Card no.	Signal name	RS-232 pin no.	Pack conn no.	Unit no.
13T 13R 14T 14R	38 13 39 14	BK-G G-BK BK-BR BR-BK	(Note 1) 10 or X-10 for single loop and Y-5 for dual loop	TD3 RD3 DTR3 GD	(2) (3) (20) (7)	02B 03B 04B 05B	Unit 3
15T 15R 16T 16R	40 15 41 16	BK-S S-BK Y-BL BL-Y		DCD3 DSR3 R13 CTS3	(8) (6) (22) (5)	09B 10B 11B 12B	
17T 17R 18T 18R	42 17 43 18	Y-O O-Y Y-G G-Y					
19T 19R 20T 20R	44 19 45 20	Y-BR BR-Y Y-S S-Y					
21T 21R 22T 22R	46 21 47 22	V-BL BL-V V-O O-V					
23T 23R 24T 24R	48 23 49 24	V-G G-V V-BR BR-V					
25T 25R	50 25	V-S S-V		SPARE			

Note 1: * This column shows the card position for a single loop mode in PE shelves QSP35, QSP36, QSD64, and QSD65. It also shows a dual mode in PE shelf QSD65.

Note 2: Cables from all PE shelves terminate as above.

Figure 10 shows the left and the right I/O panel of the NT8D13 PE Module.

Figure 10
NT8D13 I/O panel connectors

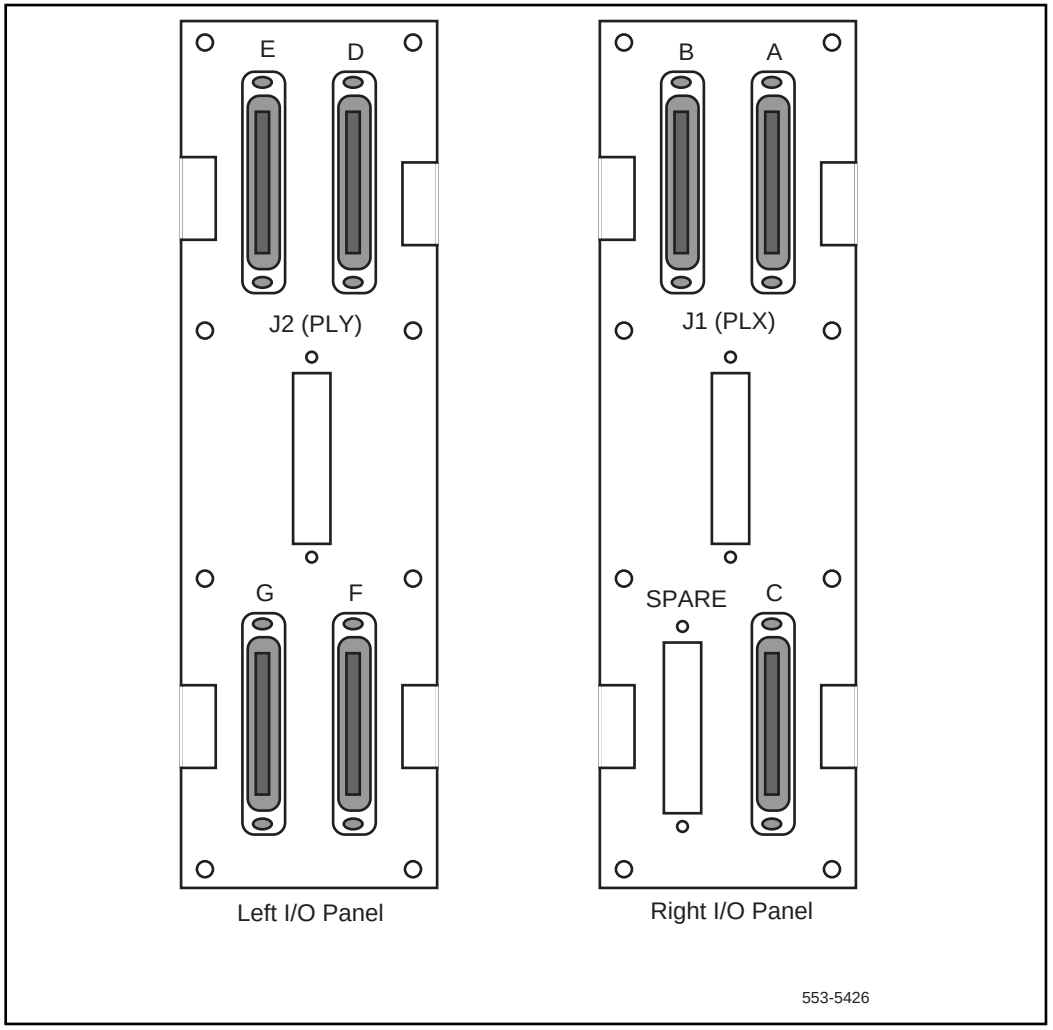


Table 10 shows typical backplane pin assignments for Main Distribution Frame (MDF) connectors for the NT8D13 peripheral equipment (PE) module configured in the single loop mode.

Table 10
RILC pair-terminations for the NT8D13 PE module I/O panel (Part 1 of 2)

Port pairs	Connector pin number and wire color code		I/O panel connectors				RILC	I/O panel connectors			RILC
			A	C	E	G		B	D	F	
1T 1R 2T 2R 3T 3R 4T 4R	26 1 27 2 28 3 29 4	W-BL BL-W W-O O-W W-G G-W W-BR BR-W	Slot X-1 card 1	Slot X-4 card 4	Slot X-7 card 7	Slot X-10 card 10	Unit 0	Slot X-2 card 2	Slot X-5 card 5	Slot X-8 card 8	Unit 2
5T 5R 6T 6R 7T 7R 8T 8R	30 5 31 6 32 7 33 8	W-S S-W R-BL BL-R R-O O-R R-G G-R					Unit 1				Unit 3
9T 9R 10T 10R 11T 11R 12T 12R	34 9 35 10 36 11 37 12	R-BR BR-R R-S S-R BL-BL BL-BK BL-O O-BL					Unit 2	Slot X-3 card 3	Slot X-6 card 6	Slot X-9 card 9	Unit 0
13T 13R 14T 14R 15T 15R 16T 16R	38 13 39 14 40 15 41 16	BK-G G-BK BK-BR BR-BK BK-S S-BK Y-BL BL-Y					Unit 3				Unit 1

Table 10
RILC pair-terminations for the NT8D13 PE module I/O panel (Part 2 of 2)

Port pairs	Connector pin number and wire color code		I/O panel connectors				RILC	I/O panel connectors			RILC
			A	C	E	G		B	D	F	
17T 17R 18T 18R 19T 19R 20T 20R	42 17 43 18 44 19 45 20	Y-O O-Y Y-G G-Y Y-BR BR-Y Y-S S-Y	Slot X-2 card 2	Slot X-5 card 5	Slot X-8 card 8	Spare	Unit 0	Slot X-3 card 3	Slot X-6 card 6	Slot X-9 card 9	Unit 2
21T 21R 22T 22R 23T 23R 24T 24R	46 21 47 22 48 23 49 24	V-BL BL-V V-O O-V V-BR BR-V V-S S-V					Unit 1				Unit 3

Table 11 shows typical backplane pin assignments for MDF connectors for the NT8D13 PE module configured for the dual loop mode.

Table 11
RILC pair-terminations for the NT8D13 PE module I/O panel connectors A, C, E, and G (dual loop mode) (Part 1 of 2)

Port pairs	Connector pin number and wire color code		I/O panel connectors				RILC	I/O panel connectors			RILC
			A	C	E	G		B	D	F	
1T 1R 2T 2R 3T 3R 4T 4R	26 1 27 2 28 3 29 4	W-BL BL-W W-O O-W W-G G-W W-BR BR-W	Slot X-1 card 1	Slot X-4 card 4	Slot Y-2 card 2	Slot Y-5 card 5	Unit 0	Slot X-2 card 2	Slot X-5 card 5	Slot Y-3 card 3	Unit 2
5T 5R 6T 6R 7T 7R 8T 8R	30 5 31 6 32 7 33 8	W-S S-W R-BL BL-R R-O O-R R-G G-R					Unit 1				Unit 3
9T 9R 10T 10R 11T 11R 12T 12R	34 9 35 10 36 11 37 12	R-BR BR-R R-S S-R BL-BL BL-BK BL-O O-BL					Unit 2	Slot X-3 card 3	Slot Y-1 card 1	Slot Y-4 card 4	Unit 0
13T 13R 14T 14R 15T 15R 16T 16R	38 13 39 14 40 15 41 16	BK-G G-BK BK-BR BR-BK BK-S S-BK Y-BL BL-Y					Unit 3				Unit 1

Table 11
RILC pair-terminations for the NT8D13 PE module I/O panel connectors A, C, E, and G (dual loop mode) (Part 2 of 2)

Port pairs	Connector pin number and wire color code		I/O panel connectors				RILC	I/O panel connectors			RILC
			A	C	E	G		B	D	F	
17T 17R 18T 18R 19T 19R 20T 20R	42 17 43 18 44 19 45 20	Y-O O-Y Y-G G-Y Y-BR BR-Y Y-S S-Y	Slot X-2 card 2	Slot X-5 card 5	Slot Y-3 card 3	Spare	Unit 0	Slot X-3 card 3	Slot Y-1 card 1	Slot Y-4 card 4	Unit 2
21T 21R 22T 22R 23T 23R 24T 24R	46 21 47 22 48 23 49 24	V-BL BL-V V-O O-V V-BR BR-V V-S S-V					Unit 1				Unit 3

Operating modes

There are 16 possible operation modes for the RILC (Table 12). The different modes enable the RILC to connect to different types of devices such as modems (modes 0, 1, 2, and 3), gateways (modes 4, 5, 6, and 7), hosts (modes 8, 9, 10, and 11), and terminals (modes 12, 13, 14, and 15). After selecting the appropriate group (for example, modem, gateway, host, or terminal), the installer should study the four different modes in that group to be able to make the proper selection.

Table 12
Mode of operation selection table mode—select switches (Part 1 of 2)

Operation mode	Host/ terminal	Forced DTR	Hotline	Type of device to be connected to the RILC	Group selection
Note: Switches 1 and 2 must always be set to the same operating mode.					
0 (DTE)	Host	Not forced	Not hotline	Modem pool inbound and outbound (like SADM in inbound)	Modes 0, 1, 2, and 3 are for modem connectivity
1 (DTE)	Host	Not forced	Hotline	Modem pool inbound only (hotline by RI—similar to SADM)	
2 (DTE)	Host	Forced	Not hotline	Modem pool inbound and outbound (for Hayes 1200 modem only)	
3 (DTE)	Host	Forced	Hotline	Modem pool inbound only (hotline for Hayes 1200 modem only)	
4 (DTE)	Terminal	Not forced	Not hotline	Gateway inbound and outbound (DTR is OFF in idle state)	Modes 4, 5, 6, and 7 are for gateway connectivity
5 (DTE)	Terminal	Not forced	Hotline	Gateway inbound only (hotline by DCD)	
6 (DTE)	Terminal	Forced	Not hotline	Gateway inbound and outbound (DTR is ON in idle state)	
7 (DTE)	Terminal	Forced	Hotline	Gateway inbound only (hotline by DCD) (DTR is ON in idle state)	Gateway connectivity

Table 12
Mode of operation selection table mode—select switches (Part 2 of 2)

Operation mode	Host/ terminal	Forced DTR	Hotline	Type of device to be connected to the RILC	Group selection
8 (DCE)	Host	Not forced	Not hotline	Outbound to host (similar to MCDS)	Modes 8, 9, 10, and 11 are for host connectivity (similar to MCDS)
9 (DCE)	Host	Not forced	Hotline	Host hotline by DTR (the call baud rate is determined by switches 6 to 8)	
10 (DCE)	Host	Forced	Not hotline	Host similar to MCDS but does not require DTR to be ON	
11 (DCE)	Host	Forced	Hotline	Continuous hotline mode when DTR is ON	
12 (DCE)	Terminal	Not forced	Not hotline	Terminal similar to ASIM when set to not forced DTR and not hotline	Modes 12, 13, 14, and 15 are for terminal connectivity (like ASIM)
13 (DCE)	Terminal	Not forced	Hotline	Terminal similar to ASIM when set to not forced DTR and hotline	
14 (DCE)	Terminal	Forced	Not hotline	Terminal similar to ASIM when set to forced DTR and not hotline	
15 (DCE)	Terminal	Forced	Hotline	Continuous hotline mode when DTR ON	

Selecting connectivity modes

Table 13 shows the connect and disconnect protocol for all modes. Use these tables in conjunction with the mode descriptions for more information. Refer to Figure 11 when selecting the modes described here.

Table 13
Connectivity modes—connect and disconnect protocol (Part 1 of 11)

Mode		Interface application
Mode 0	INBOUND AND OUTBOUND MODEM POOLS For inbound modem pools, most dumb modems may be used. For outbound modem pools, only smart modems (auto-dialer) modems may be used.	**INBOUND MODEM POOLING** **1** Modem sends ring/no-ring cycle (2 s ON, 4 s ON) to initiate connection. **2** RILC responds by driving DTR ON within the first ring cycle. **3** Modem responds by answering the incoming call and driving DCD ON within 35 seconds. **4** If modem did not drive DCD ON within 35 seconds, the RILC drops DTR and goes idle. **5** Remote DTE sends ON to the RILC and the RILC autobauds and sends ENTER NUMBER OR H (FOR HELP). **OUTBOUND MODEM POOLING** **1** Local DM user calls to the outbound modem access number. **2** The RILC answers the outbound call and drives DTR ON. **3** Modem receives DTR and prepares to receive commands. **4** Local DM user enters the proper commands for calling the remote modem. **5** Remote modem answers and the data call is completely established.

Table 13
Connectivity modes—connect and disconnect protocol (Part 2 of 11)

Mode		Interface application
		CALL DISCONNECTION Disconnection initiated by the RILC. **1** RILC drops DTR if the local DM user drops the call. Then, the modem must drop DCD. **2** RILC drops DTR if the remote modem sends a long break or three short breaks. Then, the modem must drop DCD. Disconnection initiated by the modem. Disconnection initiated by the modem. **1** Modem drops DCD. (DCD must be ON for 100 ms or more.) The RILC drops DTR and disconnects the local call. **2** Modem drops DSR. (DSR must be ON for 100 ms or more.) Then the RILC drops DTR and disconnects the local call.
Mode 1	INBOUND HOTLINE MODEM POOLS For this application, most dumb modems can be used.	**INBOUND HOTLINE MODEM POOLING** **1** Modem sends ring/no-ring cycle (2 s ON, 4 s OFF) to initiate connection. **2** RILC responds by trying to establish a hotline call to a specific data module (auto-dial). **3** When the called data module answers, then and only then, the RILC turns DTR ON. **4** The modem should answer the incoming call when DTR goes ON, and should turn DCD ON within 35 seconds; otherwise, the RILC will disconnect the call. **CALL DISCONNECTION** Disconnection is identical to Mode 0.

Table 13
Connectivity modes—connect and disconnect protocol (Part 3 of 11)

Mode		Interface application
Mode 2	INBOUND AND OUTBOUND MODEM POOLS (forced DTR) This mode is to be used with a Hayes 1200 modem.	**INBOUND AND OUTBOUND MODEM POOLING** The operation of the RILC is identical to Mode 0 except for DTR always being forced ON, except during call disconnection (DTR drops for 0.2 s). **CALL DISCONNECTION** Disconnection is identical to Mode 0 except for the following: When a call is released, the RILC turns DTR OFF for 0.2 s and then ON. DTR stays ON until the next call release. The RILC ignores RI and DCD for about 2 s after releasing a call. This is done to avoid a problem with Hayes 1200 modem.
Mode 3	INBOUND HOTLINE MODEM POOLS (forced DTR)	**INBOUND HOTLINE MODEM POOLING** The operation of the RILC is identical to Mode 1 except for DTR always being forced ON, except during call disconnection (DTR drops for 0.2 s). Use Hayes 1200 modem for this mode. **CALL DISCONNECTION** Disconnection is identical to Mode 2.
Mode 4	INBOUND AND OUTBOUND GATEWAY ACCESSING	**INBOUND GATEWAY CONNECTION PROTOCOL** **1** Gateway raises DCD to initiate connection. **2** RILC responds by driving DTR ON. **3** DSR is not required to be turned ON by the gateway. However, toggling DSR or DCD from ON to OFF will cause the RILC to disconnect the call. **4** Gateway user sends <CR> to the RILC. **5** RILC autobauds on the received <CR> and sends the following prompt to the gateway, ENTER NUMBER OR H (FOR HELP).

Table 13
Connectivity modes—connect and disconnect protocol (Part 4 of 11)

Mode	Interface application
	OUTBOUND GATEWAY CONNECTION PROTOCOL **1** Local DM user calls the RILC unit that is connected to a gateway. **2** The RILC answers the data call and drives DTR ON. **3** Gateway receives DTR and prepares to receive commands. **4** Local DM user is now transparently connected to the gateway. **5** The gateway is expected to drive DCD ON within 35 s from DTR ON. If the gateway fails to do so, the RILC drops DTR and the call. **CALL DISCONNECTION** Disconnection initiated by the RILC. **1** RILC drops DTR if the local DM user drops the call. Then, the gateway must drop DCD. **2** RILC drops DTR if the RILC receives a long break or three short breaks. Then, the gateway must drop DCD. Disconnection initiated by the gateway. **1** Gateway drops DCD. (DCD must be OFF for 100 ms or more.) Then, the RILC drops DTR and disconnects the local call. **2** Gateway drops DSR. (DSR must be OFF for 100 ms or more.) Then, the RILC drops DTR and disconnects the local call.

Table 13
Connectivity modes—connect and disconnect protocol (Part 5 of 11)

Mode		Interface application
Mode 5	INBOUND HOTLINE GATEWAY ACCESSING	**INBOUND-HOTLINE GATEWAY PROTOCOL** **1** Gateway raises DCD to initiate connection. **2** RILC responds by trying to establish a hotline call to a specific data module (auto-dial). **3** When the called data module answers, then and only then, the RILC turns DTR ON. **4** The gateway is not required to turn DSR ON. However, toggling DSR or DCD from ON to OFF causes the RILC to drop the call. **5** The gateway is now transparently linked to the equipment connected to the DM. **CALL DISCONNECTION** Disconnection is identical to Mode 4.
Mode 6	INBOUND AND OUTBOUND GATEWAY ACCESSING (with DTR forced)	**INBOUND AND OUTBOUND GATEWAY PROTOCOL** The operation of the RILC is identical to Mode 4 except for DTR always being forced ON, except when the call is being disconnected (DTR drops for 0.2 s). In this case, the establishment of the outbound call does not require DCD to be driven ON by the gateway within 35 s. **CALL DISCONNECTION** Disconnection is identical to Mode 4 except that when a call is released, the RILC turns DTR OFF for 0.2 s and then ON. DTR stays ON until the next call release.
Mode 7	INBOUND HOTLINE GATEWAY ACCESSING (with DTR forced	**INBOUND-HOTLINE GATEWAY PROTOCOL** The operation of the RILC is identical to Mode 5 except for DTR always being forced ON, except when the call is being disconnected (DTR drops for 0.2 s). **CALL DISCONNECTION** Disconnection is identical to Mode 6.

Table 13
Connectivity modes—connect and disconnect protocol (Part 6 of 11)

Mode		Interface application
Mode 8	HOST ACCESSING FOR CALL ORIGINATION AND ANSWERING	**HOST ANSWERING AN INCOMING DATA CALL** **1** Local DM user dials the access number to initiate the connection. **2** RILC responds by driving RI ON for 2 s and OFF for 4 s, until the host answers by turning DTR ON. (If the host always drives DTR ON, then the RILC immediately answers the call without driving RI ON.) **3** When the host receives RI ON, it should respond by turning DTR ON. **4** The RILC answers when it receives DTR ON. **5** The RILC turns DSR, DCD, and CTS ON when the call is completely established. The local DM user is now transparently linked to the host. **HOST ORIGINATING A DATA CALL** **1** Host turns DTR ON to initiate the connection. **2** The RILC prepares to receive <CR> for autobaud. **3** Host sends <CR> followed by other commands for establishing a data call (the RILC does not echo any command, nor does it send any prompt to the host [BLIND DIALING]). **4** When the data call is completely established, the RILC turns DSR, DCD, and CTS ON as long as the call is connected. **CALL DISCONNECTION** **A** Disconnection initiated by the RILC. **1** RILC drops DSR, DCD, and CTS if the local DM user drops the call. The host should drop the call.

Table 13
Connectivity modes—connect and disconnect protocol (Part 7 of 11)

Mode		Interface application
		2 RILC drops DSR, DCD, and CTS if the host sends a long break or three short breaks. The host should drop the call. **B** Disconnection initiated by the host. **1** Host toggles DTR from ON to OFF (DTR must be OFF for 100 ms or more). Then the RILC drops DSR, DCD, and CTS and disconnects the local call.
Mode 9	HOTLINE CALL ORIGINATION	**HOTLINE ORIGINATED BY HOST (INBOUND)** **1** Host toggles DTR from OFF to ON to initiate the hotline call. **2** RILC responds by trying to establish a hotline call to a specific data module (auto-dial). **3** When the called data module answers, then and only then, the RILC turns DSR, DCD, and CTS ON (the RILC does not send any prompts to the host). If the data module being called is busy or not responding, then the RILC requires another transition of DTR from OFF to ON to initiate another hotline call. If the host keeps DTR ON, then the RILC does not try to establish another hotline call, unless the host sends a <CR> while DTR is ON. **CALL DISCONNECTION** Disconnection is identical to Mode 8.
Mode 10	HOST ACCESSING FOR CALL ORIGINATION AND ANSWERING (forced DTR)	The operation of the RILC is identical to Mode 8 except for DTR being considered to be always ON, even when the host is driving DTR OFF.

Table 13
Connectivity modes—connect and disconnect protocol (Part 8 of 11)

Mode		Interface application
		CALL DISCONNECTION RILC drops DSR, DCD, and CTS if the local DM user drops the call. Then the host should drop the call. RILC drops DSR, DCD, and CTS if the host sends a long break or three short breaks. The host should then drop the call.
Mode 11	HOTLINE CALL ORIGINATION (virtual leased line)	**HOTLINE ORIGINATION BY HOST (CONTINUOUS HOTLINE MODE)** The operation of the RILC is similar to Mode 9 except that the host initiates the hotline call by driving DTR ON. However, if the called DM is busy or not answering, then the RILC will continuously try to originate hotline calls once every 40 s (as long as DTR remains ON) until the called data module answers the call. **CALL DISCONNECTION** Disconnection is identical to Mode 8.
Mode 12	TERMINAL ACCESSING FOR CALL ORIGINATION AND ANSWERING	TERMINAL ANSWERING INCOMING DATA CALL **1** RILC drives DSR, DCD, and CTS ON in the idle state. **2** Local DM user dials the access number to initiate the connection. **3** RILC responds by driving RI ON for 2 s and OFF for 4 s, until the terminal answers by turning DTR ON. (If the terminal always drives DTR ON, then the RILC immediately answers the call without driving RI ON.) **4** When the terminal receives RI ON, it should respond by turning DTR ON. **5** The RILC answers when DTR goes ON, and the local DM user is now transparently linked to the terminal.

Table 13
Connectivity modes—connect and disconnect protocol (Part 9 of 11)

Mode	Interface application
	TERMINAL ORIGINATING OUTGOING DATA CALL
	1 RILC drives DSR, DCD, and CTS ON in the idle state.
	2 Terminal turns DTR ON to initiate the connection.
	3 The RILC prepares to receive <CR> for autobaud.
	4 Terminal sends <CR> followed by other commands for establishing a data call (the RILC echoes all commands).
	CALL DISCONNECTION
	A Disconnection is initiated by the RILC. If the local DM user drops the call, the RILC turns DSR, DCD, and CTS OFF for 0.2 s and then ON.
	B Disconnection initiated by the terminal.
	1 Terminal toggles DTR from ON to OFF (DTR must be ON for 100 ms or more); then the RILC turns DSR, DCD, and CTS OFF for 0.2 s and then ON.
	2 Terminal sends a long break or three short breaks; then the RILC turns DSR, DCD, and CTS OFF for 0.2 s and then ON.

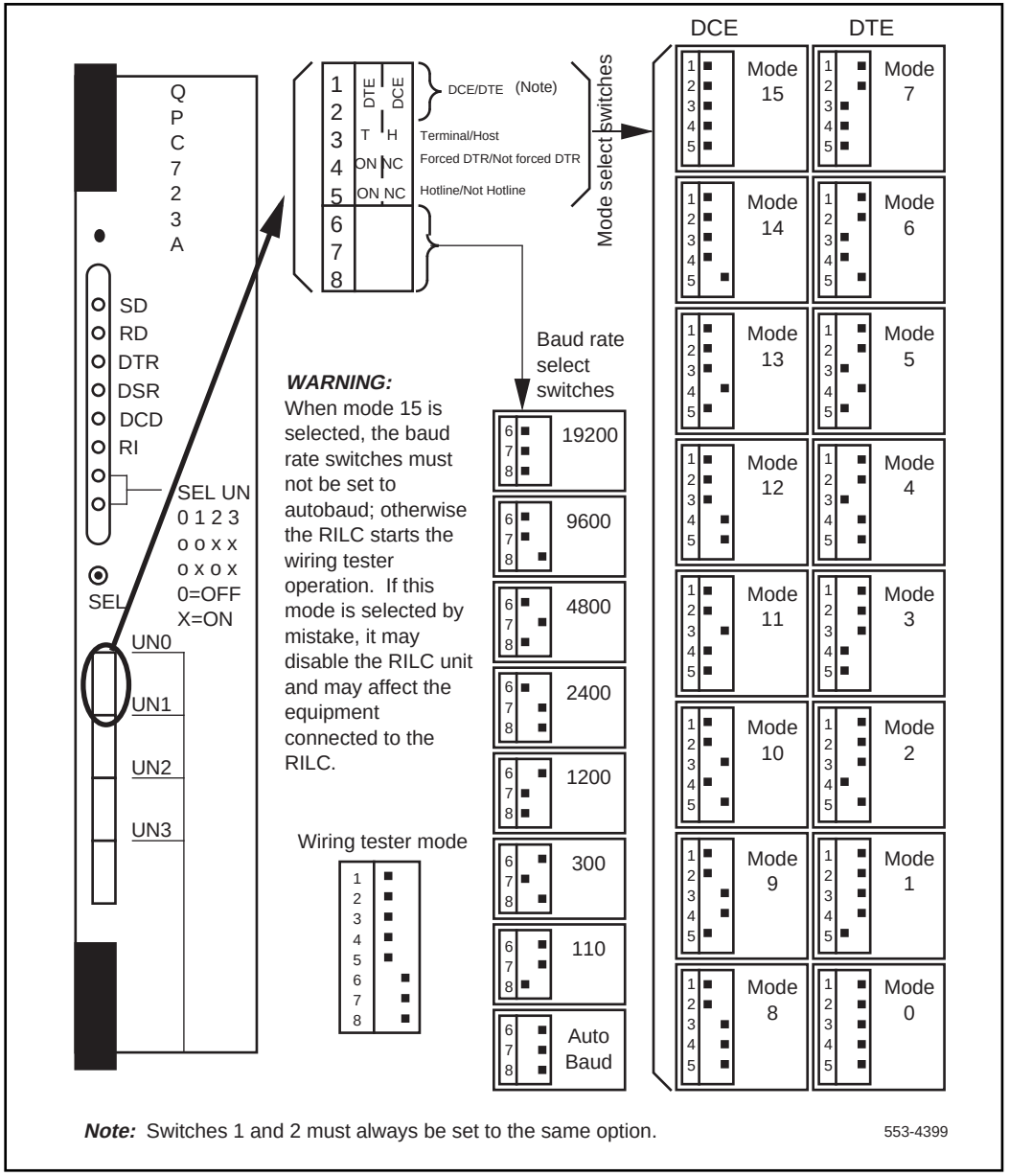
Table 13
Connectivity modes—connect and disconnect protocol (Part 10 of 11)

Mode		Interface application
Mode 13	HOTLINE CALL ORIGINATION	**HOTLINE ORIGINATED BY TERMINAL** **1** RILC drives DSR, DCD, and CTS ON in the idle state. **2** Terminal toggles DTR from OFF to ON to initiate the hotline call. **3** RILC responds by trying to establish a hotline call to a specific data module (auto-dial). **4** If the data module being called is busy or not responding, then the RILC requires another transition of DTR from OFF to ON to initiate another hotline call. If the terminal keeps DTR ON, then the RILC does not try to establish another hotline call, unless the terminal sends a <CR> while DTR is ON. **CALL DISCONNECTION** Disconnection is identical to Mode 12.
Mode 14	TERMINAL ACCESSING FOR CALL ORIGINATION AND ANSWERING (with forced DTR)	**TERMINAL ACCESSING FOR CALL ORIGINATION AND ANSWERING** The operation of the RILC is identical to Mode 12 except for DTR being considered to be always ON, even when the terminal is driving DTR OFF. **CALL DISCONNECTION** **A** Disconnection initiated by RILC. If the local DM user drops the call, the RILC turns DSR, DCD, and CTS OFF for 0.2 s and then ON. **B** Disconnection initiated by the terminal. Terminal sends a long break or three short breaks; then the RILC turns DSR, DCD, and CTS OFF for 0.2 s and then ON.

Table 13
Connectivity modes—connect and disconnect protocol (Part 11 of 11)

Mode		Interface application
Mode 15	HOTLINE CALL ORIGINATION (virtual leased line)	**HOTLINE ORIGINATION BY TERMINAL (CONTINUOUS HOTLINE MODE)** The operation of the RILC is similar to Mode 13 except that the terminal initiates the hotline call by driving DTR ON. However, if the called DM is busy or not answering, then the RILC will continually try to originate hotline calls once every 40 seconds (as long as DTR remains ON) until the data module answers the call. **CALL DISCONNECTION** Disconnection is identical to Mode 12.

Figure 11
Mode and speed switches



Note: Switches 1 and 2 must always be set to the same option.

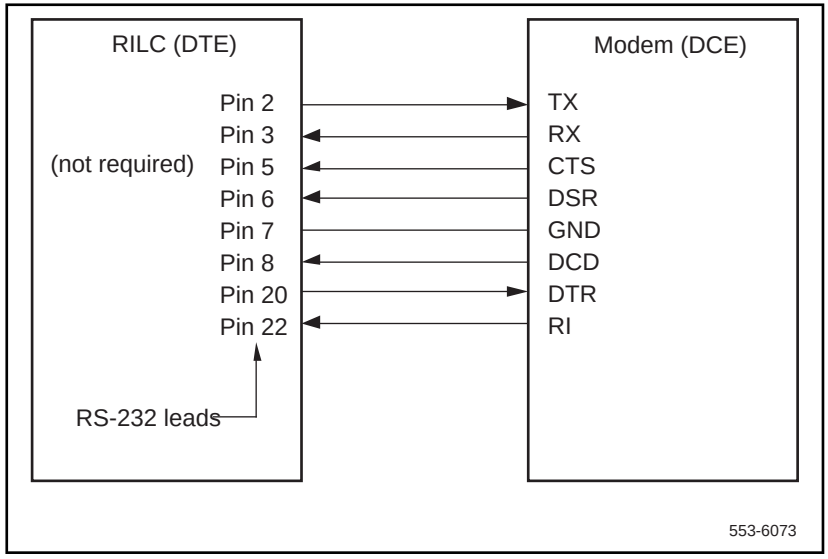
553-4399

Modes 0, 1, 2, and 3

Selecting the proper mode for modem connectivity

Select Modes 0, 1, 2, and 3 when the RILC is connected to different types of modems for inbound and outbound modem pooling. In these modes, the RILC operates as a DTE and monitors the DSR, DCD, and RI control leads and drives the DTR lead as shown in Figure 12.

Figure 12
RILC to modem connectivity



In Modes 0 and 1, the RILC drives the DTR lead OFF when in the idle state and ON when processing an incoming or outgoing call.

In Modes 2 and 3, the RILC drives the DTR lead ON except when the call is being disconnected. At disconnect, DTR is dropped for 0.2 s and then returns to ON.

In the case of outbound modem pooling, the RILC answers the data call and drives the DTR lead ON (Modes 0 and 1). Then the calling data module and the RILC form a transparent link between the calling DTE and the modem. The DTE user can then enter the appropriate commands to the modem for dialing a remote modem. When the call is established, the modem may cause the RILC to disconnect the call by dropping either DSR or DCD.

In the case of inbound modem pooling, the modem must drive the RI lead ON to activate the RILC. Then the RILC responds by driving the DTR lead ON and making the unit busy for outbound calls (Modes 0 and 1). The modem is expected to turn DCD to ON within 35 s; otherwise, the call will be dropped by the RILC. If the modem turns DCD ON before the 35-second time out, the RILC validates the incoming call and prepares to accept <CR> from the remote modem for autobaud. See Table 11 earlier in this section for more details.

Mode 0

This mode should be selected when the RILC is connected to a modem, except a Hayes 1200, for inbound and outbound modem pooling (see Modes 2 and 3 if you have Hayes 1200 modem). The characteristics of the modems to be used with the RILC are listed below.

Auto-answer capability

This feature is required when the modem is to be used for inbound modem pooling. This capability means that the modem is able to drive the RI lead ON when ringing is present at its tip and ring. In addition, the modem should auto-answer after the first ringing cycle if the DTR lead is ON (most modems support this feature).

Dynamic control of DCD

This feature must be supported by all modems to be connected to the RILC. The dynamic control of DCD means that the modem will be driving the DCD lead ON when the carrier is detected and OFF when the carrier is absent (most modems support this feature).

Auto-dial capability

This feature is required when the modem is to be used for outbound modem pooling. This capability means that the modem can go off-hook and dial the remote number (for example, a smart modem such as a Hayes 2400 or Bizcomp).

Auto-reset capability

This capability is required when the modem is to be used for outbound modem pooling (not required for inbound pooling). The auto-reset should be executed by the modem when the DTR lead goes OFF. As a result, the modem must reset all its internal parameters to the default values. This feature prevents the users of the modem pool from accidentally, or intentionally, modifying the modem's default parameters to inappropriate values.

How to configure modems for Mode 0

To configure the Hayes modem 2400, enter these commands:

AT&D2&W

ATV1&W

ATQ&W

ATE1&W

ATS01&W

AT&C1&S1&W

AT&J&W

ATB1&W

AT&D3&W

Since the default parameters are command programmable, they may be set differently. Be sure to check them before using the modem.

— To configure the Bizcomp 1200 modem, set the configuration switches as follows:

- switches 3 and 8 to ON
- all other switches to OFF; switch 7 selects the telephone jack type and must be OFF when RJ-11 is used

— To configure the MULTI MODEM 224E modem, set the configuration as follows:

  - switches 3 and 8 to the DOWN position
  - all other switches to the UP position; switch 7 should be UP when the RJ-11 jack is used

Programming the RILC in the configuration record for Mode 0

RILC used for inbound modem pool only

In this case, the RILC unit can be configured as an SL-1 telephone (use LD 11), or as an ADM trunk for inbound only (use LD 16 and LD 14). When the unit is configured as an ADM trunk, the following features cannot be used:

— speed-call

— auto-dial or hotline

— display of auto-dial or speed-call numbers

— outbound modem calls through a manual modem pool (SADM connected to a dumb modem). This is applicable when the inbound modem pool user tries to access a manual modem pool.

RILC used for outbound modem pool only

In this case, the RILC unit can be configured as an SL-1 telephone or as an ADM trunk. Call Data Record (CDR) recording is possible only when the unit is configured as an ADM trunk.

RILC used for both inbound and outbound modem pool

In this case, the RILC unit must be configured as an SL-1 telephone only. ADM trunks for inbound and outbound are not recommended because of the possibility of glare. When the RILC is programmed as an SL-1 telephone, the SL-1 station hunting for the outbound modem access should be in the opposite direction from the 500/2500 hunting for the inbound modem access. See Figure 13 for more details.

When programming the RILC as an SL-1 telephone, Call Data Record (CDR) cannot be used. If CDR is required, use separate outbound and inbound modem pools.

Database configuration

RILC should be configured using the Multi-line telephone set administration program LD 11. When configuring the RILC, use the following criteria:

— Configure the data DN as an SL-1 telephone with the digit display (ADD IN CLS).

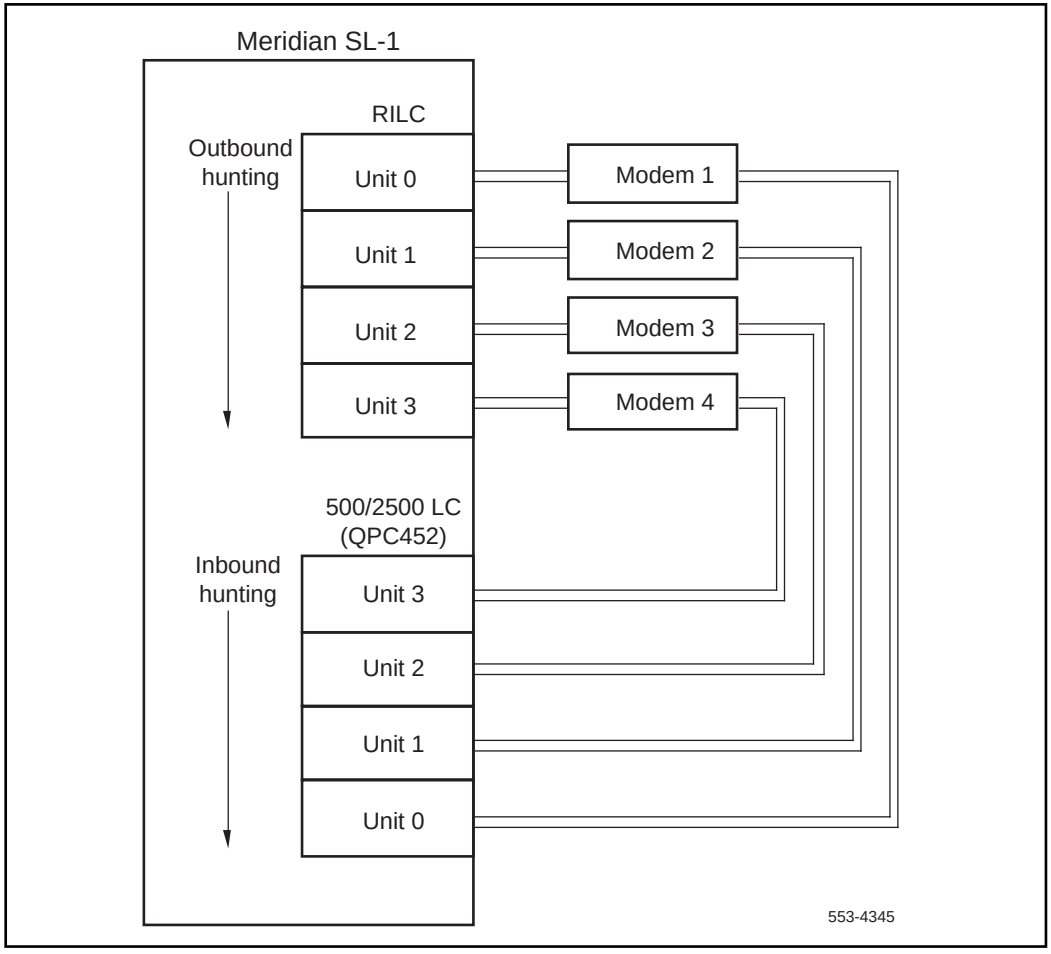
— The data DN must be a single appearance DN.

— Configure the data DN for Warning Tone Denied (WTD) and Data Terminal Allowed (DTA) in class of service.

— The virtual keys on the SL-1 telephone are assigned as follows:

Feature key assignments	Key number
Data ND	0
Secondary data DN	1
Call transfer key	2
Auto-dial key (see note)	3
Ring again	4
Make busy key	5
Speed-call key	6
Display key	7
Release	9
Note: Used for hotline operation.	

Figure 13
RILC using inbound and outbound modem pools



Mode 1

Select this mode when the RILC is connected to an auto-answer modem for inbound hotline operation. In this mode, the RILC automatically executes the hotline operation when R1 is driven ON by the modem. The modem to be used in this mode must support the following features:

— auto-answer (see Mode 0 for description)

— dynamic control of DCD (see Mode 0 for description)

The baud rate of the hotline call is determined by switches 6, 7, and 8. Program the Meridian 1 to allow inbound modem calls only.

How to configure modems for Mode 1

Most dumb modems can be configured for this mode. The modems must be able to auto-answer and have dynamic control of DCD as described in Mode 0. Smart modems can also be used if set to the dumb mode of operation. The Hayes 2400, Bizcomp 1200, and MULTI MODEM 224E can be used when set up as follows:

— For the Hayes 2400, the dumb-mode-strap should be moved to the dumb-position (see the Hayes manual).

— For the Bizcomp 1200 modem, all switches should be ON.

— For the MULTI MODEM 224E, all switches should be UP except for switch 4, which should be set DOWN.

The Hayes 1200 cannot be used in this mode when the default parameters are selected (see Mode 3).

Programming the RILC in Mode 1

Configure the RILC unit as an SL-1 telephone (the auto-dial feature is used for this mode). The RILC must not be configured as an ADM trunk.

Mode 2

Select this mode when the RILC is connected to the Hayes 1200 modem for inbound and outbound modem pooling. This mode is created especially to resolve some problems that were encountered with this modem, namely, the auto-reset implementation. When this modem is operating in the auto-reset mode, it drives both RI and DCD ON as long as DTR is ON. This problem was resolved by driving DTR ON in the idle state, and ON for 0.2 s and then ON when an established call is dropped. The RILC also ignores the status of RI and DCD for approximately 2 s after a call is released to avoid false inbound call initiation.

How to configure the Hayes 1200 for Mode 2

To configure this modem, set the configuration switches as follows:

— switches 3, 8, and 10 to DOWN

— all other switches to UP; switch 7 selects the telephone jack type and should be UP when RJ-11 is used

Programming the RILC in Mode 2

Configure the RILC unit as an SL-1 telephone.

Mode 3

Select this mode when the RILC is connected to a Hayes 1200 modem for inbound hotline operation. Use Mode 1 for inbound hotline operations if some other modem is available. However, if only Hayes 1200 modems are available, then this mode can be used. The baud rate of the inbound hotline calls is determined by switches 6, 7, and 8 (Figure 11). Program the Meridian 1 to allow inbound calls on the RILC unit only.

How to configure Hayes 1200 for Mode 3

The configuration of this modem should be as follows:

— All configuration switches should be UP except for switch 4. Switch 7 selects the telephone jack type used and should be UP when RJ-11 is used.

Programming the RILC in Mode 3

Configure the RILC unit as an SL-1 telephone.

Modes 4, 5, 6, and 7

How to select the proper mode for gateway connectivity

Select Modes 4, 5, 6, and 7 when the RILC is connected to different types of gateways for inbound and outbound operations. Refer to Figure 14 for the connection pin assignments. The term *gateway* refers to any equipment that supports the following characteristics:

— The equipment must be a DCE.

— The equipment does not drive the RI lead (optional, the RILC ignores this lead).

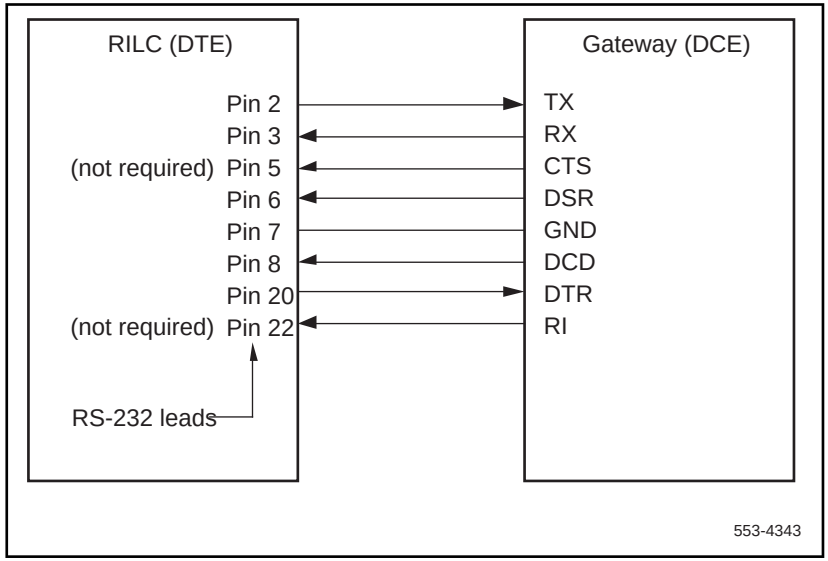
— The equipment must drive the DCD lead dynamically.

— The equipment drives the DSR lead (optional).

— The equipment can monitor the DTR lead (optional depending on the mode selected).

In these modes, the RILC operates as a DTE, monitors the DSR and DCD control leads, and drives the DTR lead (see Figure 14).

Figure 14
RILC to gateway connectivity



In Modes 4 and 5, the RILC drives the DTR lead OFF in the idle state and ON when processing an incoming or outgoing call.

In Modes 6 and 7, the RILC drives the DTR lead ON except when the call is being disconnected. At disconnect, DTR is dropped for 0.2 s and then returns to ON.

With outbound gateway access, the RILC answers the data call and drives the DTR lead ON (Modes 4 and 5; DTR is already ON in Modes 6 and 7). Then, the calling data module and the RILC form a transparent link between the calling DM and the gateway. The DM user can then enter the appropriate commands to the gateway to establish a data call. The RILC expects the gateway to drive DCD ON (Modes 4 and 5 only) within 35 s. If the gateway fails to do so, the RILC turns DTR ON and drops the call. When the call is established, the gateway may cause the RILC to disconnect the call by dropping either DSR or DCD.

In the case of inbound gateway access, the gateway must drive the DCD lead ON to activate the RILC. When the RILC receives this signal, it drives the DTR lead ON and makes the unit busy for outbound calls (Modes 4 and 5; DTR is already ON in Modes 6 and 7) and prepares to accept OFF for autobaud. The RILC expects DCD to remain ON for as long as the data call is established.

Mode 4

Select this mode when the RILC is connected to a gateway for inbound and outbound operation. The characteristics of the gateways to be used with this mode are listed below.

Auto-answer capability

This feature is required when the gateway is to be used for inbound operation. This capability means that the gateway is able to drive the DCD lead ON when the inbound data call is pending. In addition, the gateway should auto-answer when the DTR lead is ON.

Dynamic control of DCD

This feature must be supported by all gateways to be connected to the RILC. The dynamic control of DCD means that the gateway will be driving the DCD lead ON when the data call is established and OFF when the data call is disconnected.

In the inbound operation, the RILC drives the DTR lead OFF until the gateway drives the DCD lead ON. Then, the RILC drives the DTR ON and makes that unit busy for any outbound calls. After that, the user of the gateway can enter the proper commands to establish a local data call to any data module.

In the outbound operation, the RILC drives the DTR lead OFF until another data module calls it for outbound accessing. The RILC answers the data call and drives the DTR lead ON. Then the calling DM is transparently connected to the gateway. The RILC requires the gateway to drive the DCD lead to ON within 35 s after the outbound call is connected. Call disconnection can be initiated by dropping DCD (or DSR) from ON to OFF.

Programming the RILC in Mode 4

RILC is used for inbound gateway access. Configure the RILC unit as an SL-1 telephone, or as an ADM trunk for inbound only (use LD 16 and LD 14). When the unit is configured as an ADM trunk, the following features cannot be used:

— speed-call

— auto-dial or hotline

— display of auto-dial or speed-call numbers

— outbound modem calls through a manual modem pool (SADM connected to dumb modem); this is applicable when the inbound modem pool user tries to access a manual modem pool

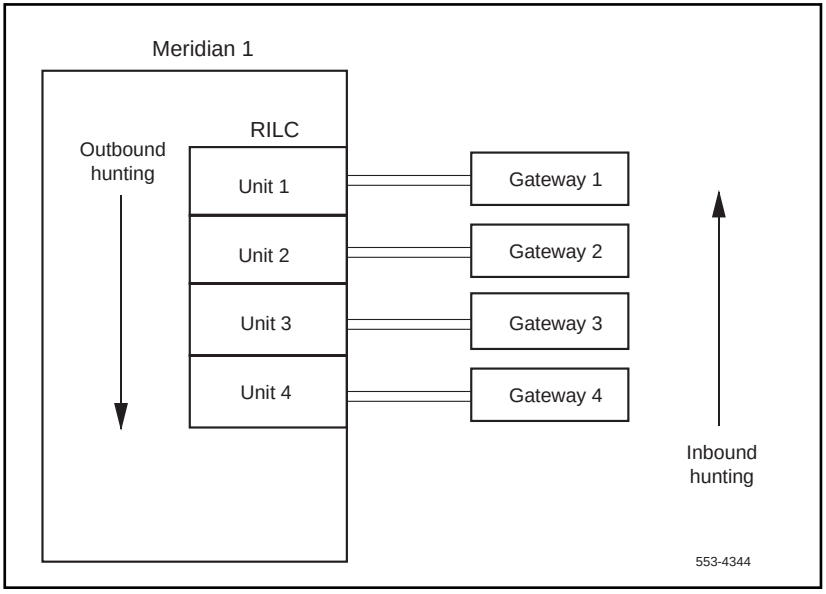
RILC used for outbound gateway access

Configure the RILC unit as an SL-1 telephone or as an ADM trunk. CDR recording is possible only when the unit is configured as an ADM trunk.

RILC used for both inbound and outbound access

Configure the RILC unit as an SL-1 telephone. ADM trunks for inbound and outbound are not recommended because of the possibility of glare. When the RILC is programmed as an SL-1 telephone, the SL-1 station hunting for the outbound gateway access should be in the opposite direction from the hunting for inbound gateway access (see Figure 15 for more details). When programming the RILC as an SL-1 telephone, CDR cannot be used. If CDR is required, separate outbound and inbound modem pools should be used.

Figure 15
Gateway access for station hunting



Mode 5

Use this mode when the RILC is connected to an auto-answer gateway for inbound hotline operation. In this mode, the RILC automatically executes hotline operation when DCD is driven ON by the gateway. If the data module being called by the hotline operation is busy or not answering, the RILC continuously places repeated hotline calls as long as the DCD lead is ON, until the called unit answers. The gateway used in this mode must support the following features:

— auto-answer (see Mode 4 for description)

— dynamic control of DCD (also see Mode 4 for description)

The baud rate of the hotline call is determined by switches 6, 7, and 8 (Figure 11). Program the Meridian 1 to allow inbound modem calls only.

Programming the RILC in Mode 5

Configure the RILC unit as an SL-1 telephone (the auto-dial feature is used for this mode). The RILC must not be configured as an ADM trunk.

Mode 6

Select this mode when the RILC is connected to a gateway requiring DTR to be ON always except during call disconnection. In this mode, the RILC can be used for both inbound and outbound operations. The operation of this mode is similar to Mode 4 except for the following:

— The DTR lead is ON in the idle state.

— The DTR lead will be dropped OFF for 0.2 s when an established call is disconnected.

Programming the RILC in Mode 6

Configure the RILC unit as an SL-1 telephone.

Mode 7

Select this mode when the RILC is connected to a gateway for inbound hotline operation. The operation of this mode is similar to Mode 5 except for the following:

— The DTR lead is ON in the idle state.

— The DTR lead will be dropped OFF for 0.2 s when an established call is disconnected.

The baud rate of the inbound hotline calls is determined by switches 6, 7, and 8 (Figure 11). Program the Meridian 1 to allow inbound calls only on the RILC unit.

Programming the RILC in Mode 7

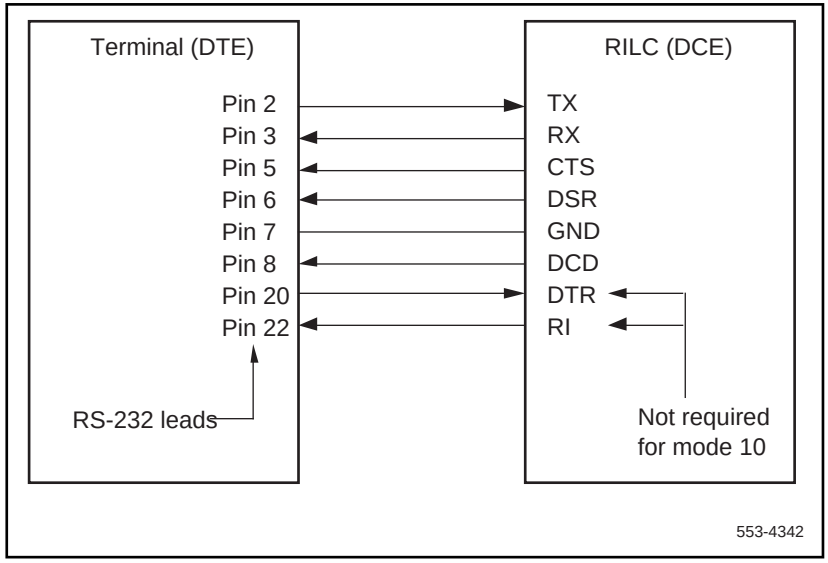
Configure the RILC unit as an SL-1 telephone.

Modes 8, 9, 10, and 11

How to select the proper mode for host connectivity

Select Modes 8, 9, 10, and 11 when the RILC is connected to different types of hosts (DTE). In these modes, the RILC operates as a DCE and drives DSR, DCD, and RI control leads (see Figure 16). The RILC does not send any menu or prompt to the host, and does not echo any command sent from the host. The CTS, DSR, and DCD will be driven ON until the call is released. An incoming call to the RILC causes the RI lead to go ON for 2 s and then OFF for 4 s until the call is answered by the host. When the host turns DTR ON, the RILC answers the call. If DTR was already ON, then the RILC does not drive RI ON.

Figure 16
RILC host connectivity



Mode 8

Use this mode when the RILC is connected to a host for host accessing. In this mode, the RILC operates like the Multi-Channel Data System (MCDS). The hosts to be used with this mode should have the following characteristics.

Auto-answer capability

The host should be capable of monitoring the RI lead for detection of incoming calls. When RI is turned ON by the RILC, the host should respond by driving DTR ON, which forces the RILC to answer the incoming call. If the host drives the DTR lead ON all the time, then incoming calls will always be immediately answered and the RI lead will not be turned ON by the RILC.

Dynamic control of DTR

This feature is required only if it is required that the host be capable of releasing an established call. The host should be able to drop an established data call by driving DTR ON for more than 100 ms.

In this mode, the RILC does not send any menus or prompts to the host. However, the host can still originate an outgoing call by blind-dialing (sending commands to the RILC without receiving echoes).

Programming the RILC in Mode 8

Configure the RILC unit as an SL-1 telephone.

Mode 9

Use this mode when the RILC is connected to a host and requires a hotline call origination. In this mode, the host hotline calls to a specific data unit by driving the DTR lead ON. The transition of DTR from OFF to ON causes the RILC to hotline to the auto-dial DN. The hosts to be used with this mode should have the following characteristics.

Dynamic control of DTR for call origination

The host should be capable of driving the DTR lead from ON to ON for initiating the hotline call. If the host always drives the DTR lead ON (not capable of dynamic control), then Mode 11 should be used.

Dynamic control of DTR for releasing established calls

This feature is required only if it is required that the host be capable of releasing an established call. The host should be able to drop an established data call by driving DTR OFF for more than 100 ms.

Programming the RILC in Mode 9

Configure the RILC unit as an SL-1 telephone (the auto-dial feature is used for this mode). The RILC must not be configured as an ADM trunk.

Mode 10

Choose this mode when the RILC is connected to a host for inbound host accessing. The host in this mode does not have to be capable of monitoring RI or driving DTR. This mode is similar to Mode 8 except for the following:

— The status of the DTR lead is assumed to be always ON, even when the actual condition of that lead is OFF (forced DTR). Therefore, the RILC always answers an incoming call regardless of the status of DTR.

— The host cannot release an established data call by driving DTR OFF. As a result, the host cannot initiate call release except with a long break or three short breaks.

In this mode, the RILC does not send any menus or prompts to the host. However, the host can still originate an outgoing call by blind-dialing (sending commands to the RILC without receiving echoes).

Programming the RILC in Mode 10

Configure the RILC unit as for Mode 4.

Mode 11

This mode provides a virtual leased line and the meaning of the forced DTR switch is redefined.

Use this mode when the RILC is connected to a host and requires continuous hotline operation. In this mode, the RILC repeatedly tries to hotline to the auto-dial DN as long as DTR is ON. This operation is like having a leased line feature, where the connection between two extensions is always established. When the RILC tries to hotline to a busy data module, ring again automatically activates and the connection is established as soon as the called unit is free.

After establishing the data call if the called unit releases the call for any reason, the RILC hotline calls again to reestablish the call. If the data unit being called does not answer the hotline call, the RILC places another hotline call every 40 s until the called unit answers. Use this mode only when requiring a permanent connection between a host and another data unit. The RILC does not send any menus or prompts to the host. The baud rate of the hotline call is determined by switches 6, 7, and 8 (Figure 11).

Programming the RILC in Mode 11

Configure the RILC unit as an SL-1 telephone.

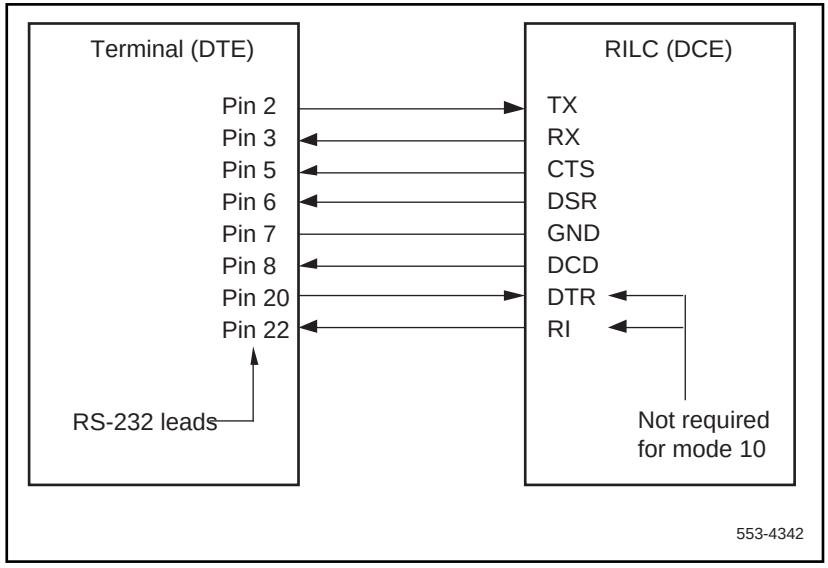
Modes 12, 13, 14, and 15

How to select the proper mode for terminal connectivity

Select Modes 12, 13, 14, and 15 when the RILC is connected to different types of terminals. In these modes, the RILC operates as a DCE and drives DSR, DCD, and RI control leads (see Figure 17). It also monitors the DTR lead in Modes 12, 13, and 15 (the DTR is ignored in Mode 14). All the menus and prompts are sent to the terminals and all the commands from the terminals are echoed.

The CTS, DSR, and DCD are driven OFF during the idle state (data call is not established). After the call is established, these leads are driven ON until the call is released. The RI lead is controlled only in Modes 12, 13, and 15 and is driven OFF in the idle and connect states. An incoming call to the RILC causes the RI lead to go ON for 2 s and then OFF for 4 s until the call is answered by the terminal. When the terminal turns DTR ON, the RILC answers the call.

Figure 17
Terminal connectivity



Mode 12

Select this mode when the RILC is connected to a terminal (DTE) for inbound and outbound data calls. This mode is like the ASIM when set to not forced DTR and not hotline. In this mode, call origination and auto-answer are not executed by the RILC, unless the DTR lead is driven ON by the terminal. Any terminal that drives the DTR lead ON can be used with this mode (such as VT100 or VT102). The RILC drives CTS, DSR, and DCD ON, except when a call is dropped or when Control-Z is typed in the idle state. In this case, the RILC drives those leads OFF for 0.2 s and then ON. When the DTR lead is driven OFF by the terminal, the RILC does not execute autobaud, nor will it respond to any command.

Programming the RILC in Mode 12

Configure the RILC unit as an SL-1 telephone since auto-dial, speed-call, and display commands are likely to be used.

Mode 13

Use this mode when the RILC is connected to a terminal (DTE) and requires hotline call origination. This mode is like the ASIM when set to not forced DTR and hotline. In this mode the terminal hotline calls a specific data unit by driving the DTR lead ON. The transition of DTR from ON to OFF causes the RILC to hotline the auto-dial DN. Any terminal that drives the DTR lead ON can be used with this mode (such as VT100 or VT102). The RILC drives CTS, DSR, and DCD ON, except when a call is dropped. In this case, the RILC drives those leads OFF for 0.2 s and then ON. The baud rate of the hotline call is determined by switches 6, 7, and 8 (Figure 11).

Programming the RILC in Mode 13

Configure the RILC unit as an SL-1 telephone.

Mode 14

Select this mode when the RILC is connected to a terminal (DTE) for inbound and outbound data calls. This mode is like the ASIM when set to forced DTR and not hotline. The terminal used with this mode is not required to drive the DTR lead. This mode of operation is similar to Mode 12 except for the following:

— The status of the DTR lead is assumed to be always ON, even when the actual condition of that lead is OFF (forced DTR). The RILC always answers an incoming call regardless of the status of DTR.

— The terminal cannot release an established data call by driving DTR OFF. As a result, the terminal cannot initiate call release except with a long break or three short breaks.

Programming the RILC in Mode 14

Configure the RILC unit as an SL-1 telephone.

Mode 15

This mode provides a virtual leased line and the meaning of the forced DTR switch is redefined.

Select this mode when the RILC is connected to a terminal (DTE) and continuous hotline call origination is required. In this mode, the RILC repeatedly hotline calls the auto-dial DN as long as DTR is ON. This operation is similar to having a leased line feature, where the connection between two extensions is always established. When the RILC hotline calls a busy data module, ring again is automatically activated and the connection is established as soon as the called unit is free.

After establishing the data call, if the called unit releases the call for any reason, the RILC automatically hotline calls again to reestablish the call. If the called data unit does not answer the hotline call, the RILC places another hotline call every 40 s until the called unit answers. This mode is recommended only when a permanent connection between a terminal and another data unit is required. The baud rate of the hotline call is determined by switches 6, 7, and 8 (Figure 11). The status of CTS, DSR, and DCD is controlled in a similar manner as described in Mode 13.

Programming the RILC in Mode 15

Configure the RILC unit as an SL-1 telephone.

Baud rates

The three baud select switches (6, 7, and 8) provide two functions for calls that originated from an RILC.

— The first function provides a way to select a baud rate of a hotline call. The RILC starts the hotline operation without receiving a <CR> for autobaud. If the switches are set to autobaud, the RILC defaults to 9600 bps except in Mode 15. Normally the RILC should be selected to operate at autobaud.

— The second function is to set the RILC to operate at a fixed baud rate. The RILC does not return the menu or hotline unless a <CR> is received at the selected baud rate. The fixed baud rate operation is useful in cases where the RS-232 lines exceed the 50 ft (15 m) limit by a large margin and the RILC fails to autobaud.

When the RILC receives a call, it adapts to the caller's baud rate, regardless of the switch settings.

Testing procedure

There are eight wires for each unit of the RILC. The correct installation of these wires is essential to proper operation of the unit, so the RILC has a special mode of operation that allows the installer to verify and troubleshoot any wiring error from the MDF to the RS-232 connector. Procedure 1 explains the steps for an easy and error-free wiring installation. Procedure 2 explains the installation test procedure for cabling with RJ-11 using four wires for terminal connectivity.

Procedure 1
Installation test procedure (Part 1 of 2)

Step	Procedure
1	Program the RILC units as SL-1 telephones or as ADM trunks. **CAUTION:** Do not insert the RILC in the PE shelf yet.
2	Install the wiring from the MDF to the data equipment (Modem, Host, Gateway, or Terminal). See Figure 18. **CAUTION:** Do not connect the wiring to the RS-232 connector from the data equipment until the test is completed.
3	Insert the QPC723 in the assigned location on the PE shelf.
4	Connect an RS-232 Breakout box to the RS-232 (DTE) connector (Figure 18). **Be sure the data equipment is not connected to anything yet.**
5	Set the configuration switches of the RILC under test to the wiring-tester mode (Figure 18).
6	Operate the faceplate select unit switches to select the RILC unit to be tested. When the proper “sel un” LED is displayed, the other LEDs should blink in sequence (Figure 19). If not, replace the RILC.
7	Observe the LED blink sequence at the RS-232 breakout box. The sequence should be as follows: RS-232 pin #2 (SD) LED blinks once, then RS-232 pin #3 (DR) LED blinks 2 times, then RS-232 pin #5 (CTS) LED blinks 3 times, then RS-232 pin #6 (DSR) LED blinks 4 times, then RS-232 pin #8 (DCD) LED blinks 5 times, then RS-232 pin #20 (DTR) LED blinks 6 times, then RS-232 pin #22 (RT) LED blinks 7 times The above process is repeated for as long as the unit is in the wiring-tester mode.
8	If the sequence is not as stated above, then the wiring at the MDF is not correct. The blinking rate of each of the leads may be helpful in finding the source of the problem. Pin #7 does not blink because it must be grounded.
9	If the blinking sequence is correct, go to the next step.
10	Follow steps 1 through 9 and verify the other units of the RILC.

Procedure 1
Installation test procedure (Part 2 of 2)

Step	Procedure
11	After a unit passes the wiring test, reset the configuration switches to the appropriate operation mode for that unit. If some units of the RILC are not used, they can be set to any mode except the wiring tester mode. **Do not leave any RILC unit configured for the wiring tester mode after the testing is completed.**
12	When the appropriate mode of operation for each unit has been properly set, enable the RILC card in LD 32.
13	Once the tests have been completed and the card is enabled, connect the data equipment to the RILC unit.
14	Data calls can now be established and data connectivity can be verified.

Figure 18
Breakout box—blinking sequence during wire testing

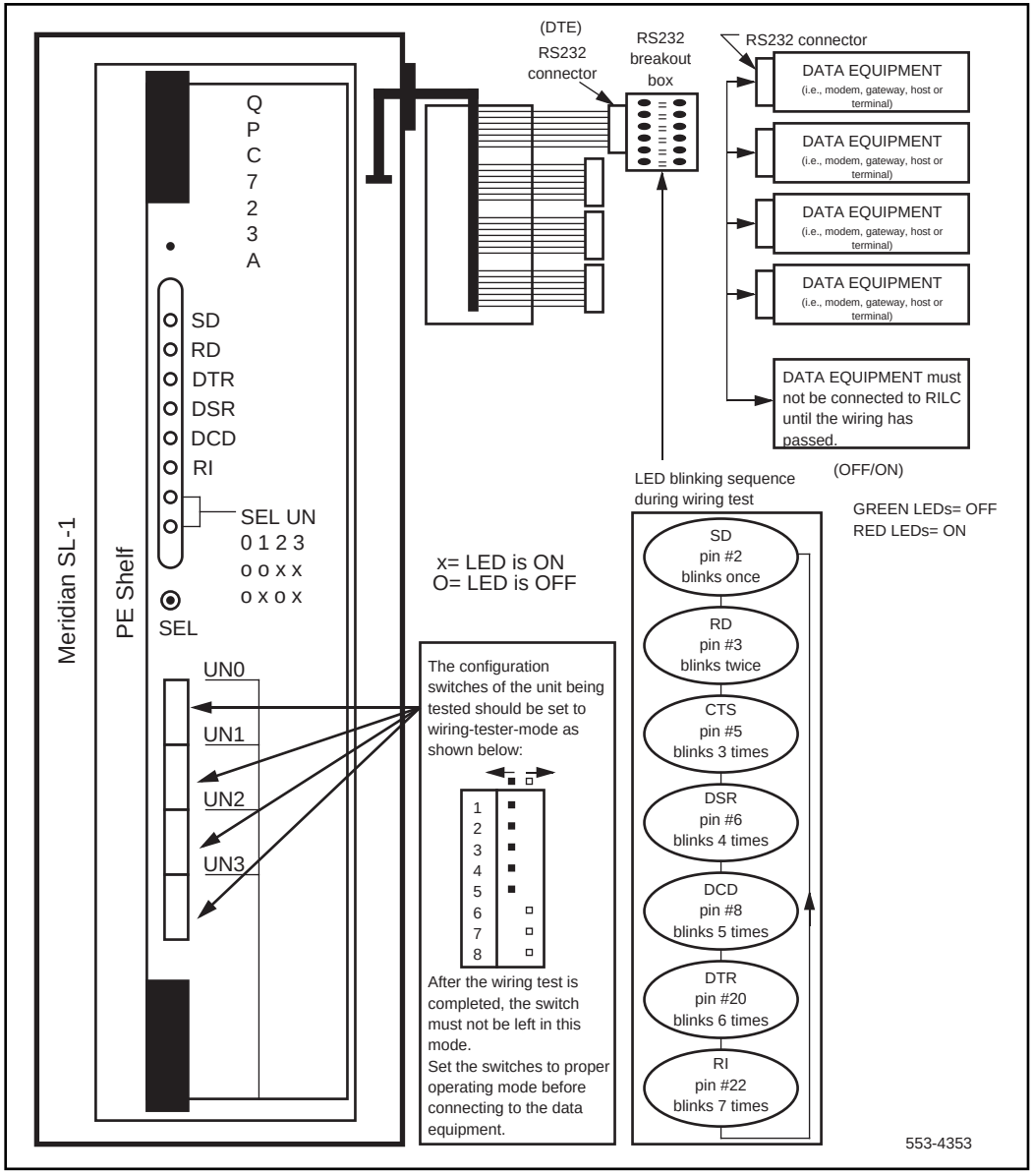
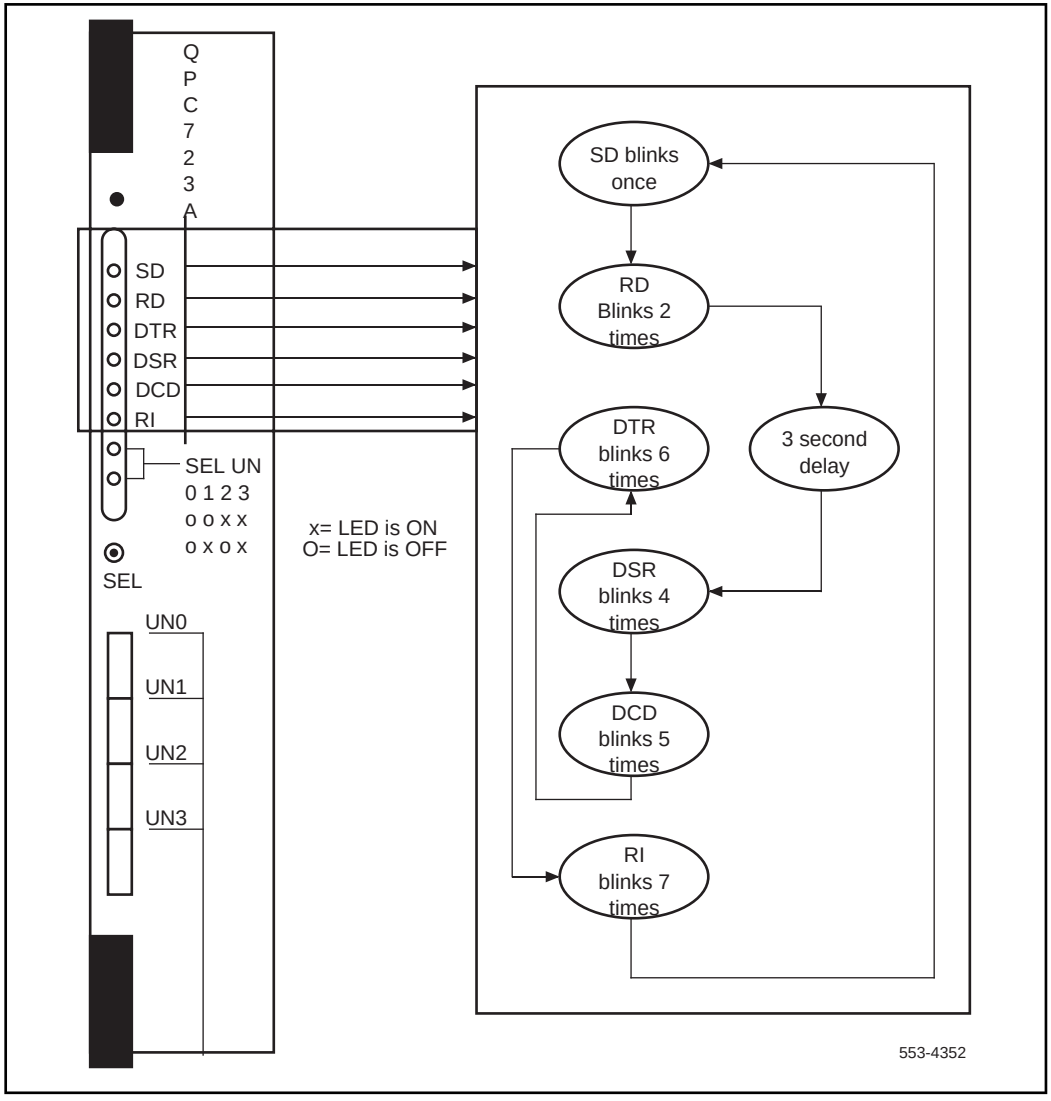


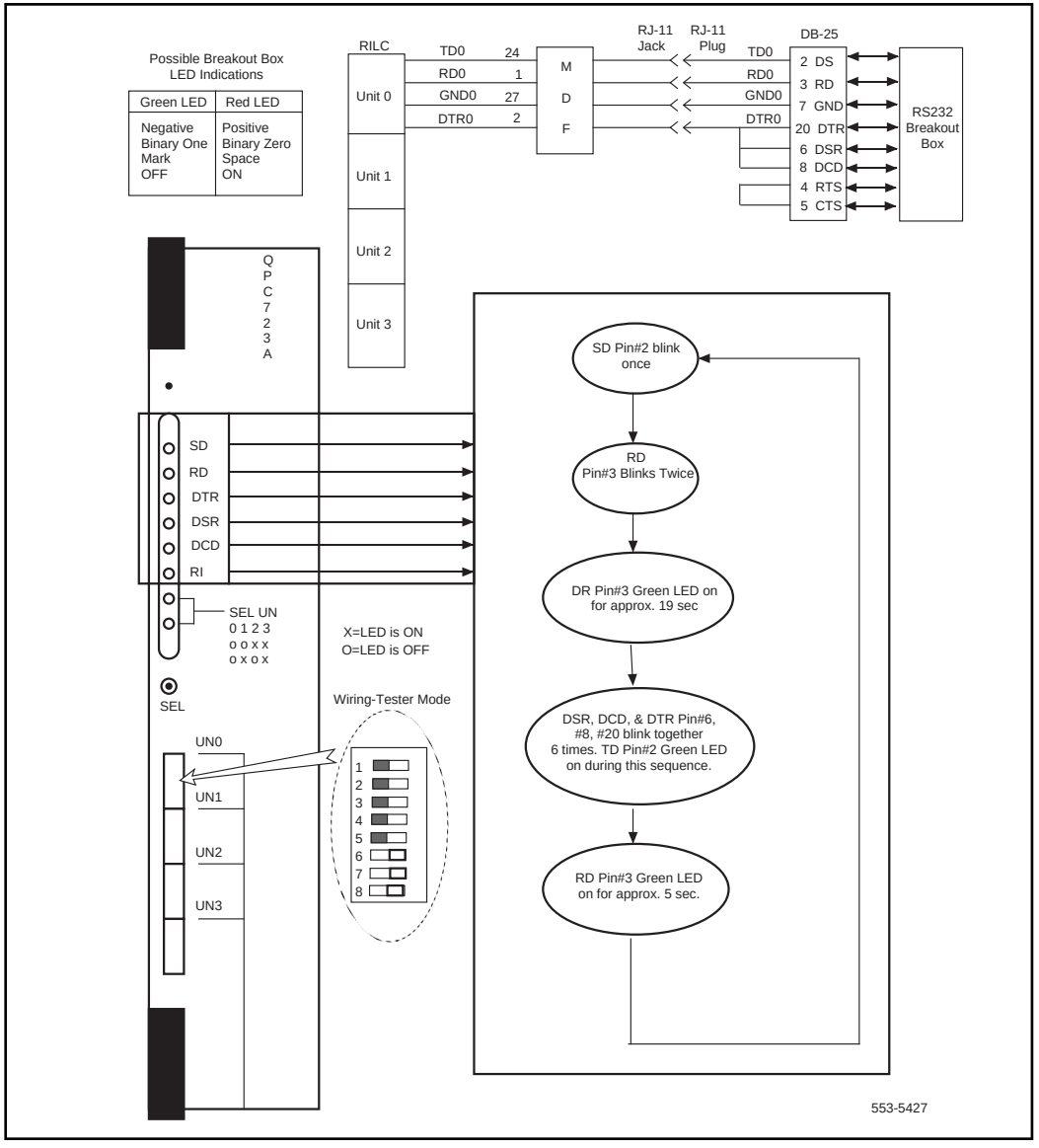
Figure 19
RILC faceplate—blinking sequence during wire testing



Procedure 2
Installation test procedure for RJ-11 4-wire cabling

Step	Procedure
1	Program the RILC units as SL-1 telephones. **CAUTION:** Do not insert the RILC in the PE shelf yet.
2	Install the wiring from the MDF to the terminal. See Figure 20. **CAUTION:** Do not connect to terminal until the test is completed.
3	Insert the QPC723 in the assigned location on the PE shelf if not already done.
4	Connect an RS-232 breakout box to the RS-232 (DTE) connector (Figure 20). Be sure the data equipment is not connected to anything yet.
5	Set the configuration switches of the RILC under test to the wiring-tester mode (Figure 20).
6	Operate the faceplate select unit switches to select the RILC unit to be tested. When the proper “sel un” LED is displayed, the other LEDs should blink in sequence (Figure 20). If not, replace the RILC.
7	Observe the LED blink sequence at the RS-232 breakout box. The sequence should be as follows: RS-232 pin #2 (SD) LED blinks once, then RS-232 pin #3 (DR) LED blinks 2 times, then RS-232 pin #3 (DR) green LED is ON for approximately 10 s, then RS-232 pins #6, 8, and 20 (CTS) LEDs blink together 6 times and TD pin # 2, green LED, is ON during this sequence, then RS-232 pin #3 (DR) green LED is ON for approximately 5 s The above process is repeated for as long as the unit is in the wiring-tester mode.
8	If the sequence is not as stated above: Ensure that the cable is correctly installed at the I/O panel at the top of the cabinet. Verify the wiring between the MDF and the RILC. Check the wiring to the RJ-11 jack. Check the DB-25 connector wiring.

Figure 20
Breakout box—blinking sequence during 4-wire RJ-11 testing



Operation

The Meridian 1 views the RILC as four Meridian 1 telephones, when configured as stations in the Meridian 1 database. It responds to all system diagnostic messages in the same manner as a station set. Unlike the SL-1 telephone, the RILC does not have flexible keys and requires features to be assigned to specific keys.

The RILC can be configured as ADM trunks and all features available to such trunks are applicable to the card, including linear or round-robin hunting, trunk group restrictions, and Call Data Record (CDR).

Call disconnect

After the data call has been set up, it can be disconnected by different methods depending on the mode of operation:

— Call disconnection in modes 8, 9, 11, 12, 13, and 15

- Long break lasting 1.2 s or more
- Three short breaks, each lasting 100 ms or more and occurring within 2 s
- Dropping the DTR lead for 100 ms or more. Do this by turning the terminal power OFF. In some terminals, the ON LINE/OFF LINE switch may drop DTR (see the user guide for the terminal).
- Called-party disconnects first

— Call disconnection in Modes 10 and 14
In these modes, an established call can be disconnected by the long break, three short breaks, or when the called party disconnects first, as described above.

— Call disconnection in Modes 0, 1, 2, 3, 4, 5, 6, or 7
In these modes, an established call can be disconnected by the long break, three short breaks, or when the called party disconnects first, as described above. The call drops if either DSR or DCD leads toggle from ON to OFF.

Keyboard dialing (KBD)

The KBD feature provides the following capabilities. A call can be initiated with either keyboard dialing or the hotline.

— Autobaud and autoparity from 110 to 19200 bps. Parity includes mark, space, odd, and even (for seven-bit ASCII data only).

— call origination to local hosts

— call origination to remote hosts

— Ring again

— Auto-dial calling for calls to local hosts

— Speed-call

— Digit display

Database requirements

The database must meet these criteria:

— The primary and secondary DN must be single appearance DNs.

— For access to remote hosts, the class of service of the data DN for the RILC must allow external calls.

— The primary and secondary DN must be configured as an SL-1 telephone and, if desired, with the digit display (DDS) feature on it.

— The data DN and voice DN should be configured for Warning Tone Denied (WTD).

— The secondary DN and Call Transfer keys must be programmed if the RILC is to place calls to an outbound modem pool (not smart modem pool).

— The virtual keys of the SL-1 telephone are assigned as follows. Key 8 is reserved for future use and is left unassigned.

Feature key assignments	Key number
Data DN	0
Secondary data DN	1
Call transfer key	2
Auto-dial key	3
Ring again	4
Make busy key	5
Speed-call key	6
Display key	7
Release	9

Note: When the host option is selected (switch 3 in host position), DDS messages from the Meridian 1 to the external device are suppressed at the RILC. DDS can be programmed off in the database to reduce the possibility of Meridian 1 output buffer overflow conditions. In the host mode, it is more desirable to configure the RILC as ADM trunks.

Keyboard menu

KBD with the RILC is easy to use because the user-friendly prompts guide you through the operating steps. ENTER NUMBER OR H (FOR HELP) appears on the screen first after entering <CR>. If H is entered, the main menu, which follows, is used to determine the call or function type:

A—AUTO DIAL
S—SPEED CALL
C—CALL
M—MODIFY
D—DISPLAY

SELECT:

If M is entered from the main menu, the following submenu appears:

A—AUTO NUMBER
R—REMOTE LOOPBACK
S—SPEED NUMBER
Q—QUIT MODIFY

SELECT:

Some typical messages and prompts are shown in Table 14.

Table 14
Typical messages and prompts (Part 1 of 2)

No.	Message	Circumstance
1	ENTER NUMBER OR H (FOR HELP)	Immediately after autobaud/<CR> at the terminal
2	CALLING nnnn	Dialing the DN
3	CALL CONNECTED. SESSION STARTS (bell)	Remote data module answers
4	BUSY, RING AGAIN? (Y/N)	Called DN is busy but ring again may be placed
5	ENTER REMOTE NUMBER:	Dialing remote host outbound modem pool
6	MODEM RESERVED ENTER REMOTE NUMBER:	Accessed modem reserved Dialing remote DTE
7	RING AGAIN PLACED	Ring again placed on Meridian 1
8	RELEASED	When call is released
9	DATA STATION NOW AVAILABLE. PLACE CALL? (Y/N) (bell)	Ring again available
10	ENTER ACCESS CODE:	Request for entry of speed-call access number
11	SERVICE UNAVAILABLE RELEASED	Meridian 1 is not responding to requested service, modem time out, or ring no answer
12	NO SYSTEM RESPONSE REENTER:	RILC unit to Meridian 1 signaling is failing; check system status of unit
13	INCOMING CALL CONNECTED (bell)	Automatic answering
14	INCOMPATIBLE INCOMING CALL. RELEASED	Auto-answer not possible; module originating call was set to synchronous operation; the RILC cannot match the baud rate; or data bit/parity configuration not supported by the RILC

Table 14
Typical messages and prompts (Part 2 of 2)

No.	Message	Circumstance
15	REMOTE LOOPBACK (Y/N)	Prompt for loopback to be set on subsequent call
16	INVALID COMMAND/ENTRY REENTER:	
17	UNDER TEST	Auto-answer with calling party requesting loopback
18	BAUD RATE = nnnn. REMOTE LOOPBACK = Y or N. AUTO DIAL NO. = nnnnnnnnnnn	Displayed when user types D <CR> at the ENTER NUMBER OR H (FOR HELP) OR SELECT D<CR> from the main menu prompts

Procedure 3 provides the steps used when operating a terminal with KBD. Keyboard dialing is applicable only to ASCII, asynchronous start stop character mode devices not configured for hotline operation. Units configured for host operations (switch 3) do not receive prompts and indications. However, blind dialing is supported for these devices. Synchronous or block mode devices are not supported.

Procedure 3
Keyboard dialing with the RILC (Part 1 of 7)

Step	Action	Terminal echo	Prompt or indicator	Comment
	Start condition.			Data station idle. Terminal and RILC power on.
1	Enter <CR> or <CR> (.) <CR>		ENTER NUMBER OR H (FOR HELP)	Go to step 6 or 10 if the number is to be entered instead of H. If you are familiar with the menu, you may use the command (for example, C, <CR>, A, S) instead of H. Go to step 3, 4, or 5 if a “MENU” command is entered instead of H.
If autobaud has been selected by faceplate switches 6, 7, and 8, <CR> causes the RILC to autobaud. (.) <CR> causes the RILC to automatically select the correct parity for the KBD messages.				
2	Enter H <CR>	A – AUTO DIAL C – CALL D – DISPLAY SELECT:	S – SPEED CALL M – MODIFY	
3	Auto-dial active?			If yes, go to step 21. If not, continue.
4	Speed-call active?			If yes, go to step 22. If not, continue.
5	Enter C <CR>	C	ENTER NUMBER:	
CALL TO OTHER DEVICES USING DIGITAL CONNECTION				Go to step 10 for call to remote device in the same digital network.

Procedure 3
Keyboard dialing with the RILC (Part 2 of 7)

Step	Action	Terminal echo	Prompt or indicator	Comment
6	Enter number NNNN <CR>.	NNNN	CALLING NNNN	The number of digits dialed may vary with the local dialing plan. All numeric and alphanumeric input, #, and * are accepted. During call setup all legal user input appears on terminal screen. RILC sends digits to Meridian 1, which places call to host. Meridian 1 sends digits NNNN back to the RILC and terminal.
7	Called device answers (if busy, see steps 16 or 21).		CALL CONNECTED. SESSION STARTS	Data Modules perform handshake and data channel becomes transparent.
8	Follow login procedures.			Data session begins.
9	Proceed with data session.			KBD is complete. The answering device must provide all further messages or input echo. Go to step 34 for disconnect procedures.
CALLS VIA MODEM POOL				
10	Enter modem number NNNN <CR>.	All digits typed	Calling NNNN	
11	Modem answers.		MODEM RESERVED ENTER REMOTE NUMBER:	Modem is reserved.

Procedure 3
Keyboard dialing with the RILC (Part 3 of 7)

Step	Action	Terminal echo	Prompt or indicator	Comment
12	Enter remote number digits <CR>.	All digits typed.	CALLING NNNNNNN;	The Meridian 1 places a call to the remote number.
13	Remote modem answers.		CALL CONNECTED. SESSION STARTS.	The call is connected. (If busy, go to step 20.)
14	Follow login procedures.			Data session begins.
15	Proceed with data session.			KBD is complete. The answering device must provide all further messages or input echo. Go to step 34 for disconnect procedures.
CALLED DEVICE IS BUSY—RING AGAIN ACTIVE?				
16	Called device busy.	Number digits	CALLED NNNN BUSY, RING AGAIN? (Y/N)	
17	Enter Y <CR>	Y	RING AGAIN PLACED	The RILC uses the Meridian 1 Ring Again feature to retry the call.
18	Called device available for incoming call.		DATA STATION NOW AVAILABLE. RING AGAIN? (Y/N)	A bell character (CONTROL G) is sent to the local device in terminal operations.
19	Enter Y<CR>			Meridian 1 automatically places call (go to steps 7 or 13).

Procedure 3
Keyboard dialing with the RILC (Part 4 of 7)

Step	Action	Terminal echo	Prompt or indicator	Comment
CALLED DEVICE BUSY—NO RING AGAIN				
20	Called device is busy or not answering.		SERVICE UNAVAILABLE	
AUTO DIAL ACTIVE? (Note)				**LOCAL DEVICE ONLY**
21	Enter A <CR> at “Enter a number or H (for Help)”		CALLING NNNN	RILC sends DDN and auto-dial indication. Meridian 1 places the call to the predesignated number. Return to step 7.
SPEED CALLING ACTIVE? (Note)				All speed-call numbers must be programmed in database against the user DDN.
22	Enter S <CR> at “Enter a number or H (for Help)”	S	ENTER ACCESS CODE:	
23	Enter N <CR>	N	CALLING N>NNNNNNN	RILC sends DDN and speed-call index. Return to steps 7 or 13.
DISPLAY ACTIVE? (Note)				Used to display terminal parameters of the user DDN.

Procedure 3
Keyboard dialing with the RILC (Part 5 of 7)

Step	Action	Terminal echo	Prompt or indicator	Comment
24	Enter D <CR> at "Enter a number or H (for Help)."		BAUD RATE = NNNN REMOTE LOOPBACK = N AUTO DIAL NO = NNNN A - AUTO DIAL S - SPEED CALL C - CALL M - MODIFY D - DISPLAY SELECT:	

Note: To select these functions, the terminal must be at the prompt: "Enter Number or H (for Help)." When you enter H, the main menu allows you to select one of the following: A-Auto dial, D-Display, S-Speed call, M-Modify.

The baud rate must be manually reset at the DTE/DCE (see user guide):
— power down DTE/DCE (or enter break or drop DTR)
— change baud rate at DTE/DCE
— power up DTE/DCE
— enter <CR> to autobaud
It may be verified after resetting by autobauding again with <CR> and again using the D command. The other parameters are modified as shown in the following steps.

MODIFY ACTIVE? (see Note above)				Used to modify RILC unit features.
25	Enter M <CR> at "Enter a number or H (for Help)."	M	A—AUTO NUMBER S—SPEED NUMBER SELECT: R—REMOTE LOOPBACK Q—QUIT MODIFY	If you enter: A—go to step 26 S—go to step 28 R—go to step 31 Q—go to step 33

Procedure 3
Keyboard dialing with the RILC (Part 6 of 7)

Step	Action	Terminal echo	Prompt or indicator	Comment
MODIFY AUTO DIAL				
26	Enter A <CR>	A	AUTO DIAL NO =	
27	Enter new number <CR>	New number	A—AUTO NUMBER S—SPEED NUMBER SELECT: R—REMOTE LOOPBACK Q—QUIT MODIFY	Auto-dial number is changed. Select another feature or go to step 33.
MODIFY SPEED CALL				
28	Enter S<CR>	S	ENTER ACCESS CODE:	
29	Enter X <CR>	X	SPEED NUMBER:	
30	Enter new number <CR>	New number	A—AUTO NUMBER S—SPEED NUMBER SELECT: R—REMOTE LOOPBACK Q—QUIT MODIFY	New number is set. Select another feature or go on to step 33.
MODIFY REMOTE LOOPBACK				
31	Enter R <CR>	R	REMOTE LOOPBACK Y OR N <CR>	Used to verify transmitted data from test station to terminal with remote loopback 4. Read results at the test station.

Procedure 3
Keyboard dialing with the RILC (Part 7 of 7)

Step	Action	Terminal echo	Prompt or indicator	Comment
32	Enter Y or N <CR>	Y or N	A—AUTO NUMBER S—SPEED NUMBER SELECT: R—REMOTE LOOPBACK Q—QUIT MODIFY	Remote loopback is Y or N. Select another feature or go to step 33.
QUIT MODIFY (Note)				
33	Enter Q <CR>	Q	A—AUTO NUMBER C—CALL D—DISPLAY SELECT: S—SPEED CALL M—MODIFY	Try any other feature or place a Data Call
CALL DISCONNECT PROCEDURES				
34	Call disconnect is not a part of KBD; however, it returns the user to KBD procedures. Refer to paragraphs on call disconnects for more information.			
35	Call disconnected.		RELEASED	The user has been returned to KBD, ready for entry at step 1.

Note: Q <CR> must be entered before implementing feature changes.

Meridian 1

QPC723, RS-232 Interface Line Card

Description, installation, and operation

Information is subject to change without notice. Northern Telecom reserves the right to make changes in design or components as progress in engineering and manufacturing may warrant. This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC rules.
SL-1 and Meridian 1 are trademarks of Northern Telecom.
Publication number: 553-2731-106
Document release: Standard 4.0
Date: December 1994
Printed in the United States of America