Meridian 1

ISDN Primary Rate Interface
Installation

Document Number: 553-2901-200
Document Release: Standard 11.00
Date: August 1996

Revision history

August 1996

    Issue 11.00 released as Standard for Generic X11 Release 22.

December 1995

    Issue 10.00 released as Standard for Generic X11 Release 21B.

July 1995

    Issue 9.00 released as Standard for Generic X11 Release 21A.

December 1994

    Standard, Release 8.00.

October 31, 1993

    Standard, Release 7.00.

August 1, 1993

    Standard, Release 6.00.

April 1, 1993

    Standard, Release 5.00.

December 31, 1992

    Standard, Release 4.00.

December 1, 1991

    Standard, Release 3.00.

December 20, 1990

    Standard, Release 2.00.

December 20, 1989

    Standard, Release 1.00.

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Introduction

This document provides procedures to install, replace, or remove Primary Rate Interface (PRI) circuit cards, D-channel Interface (DCHI) cards, Multi-purpose Serial Data Link (MSDL) cards, Clock Controller cards, and ISDN Signaling Link (ISL) equipment.

Note 1: ISDN is an evolving product. To plan your system for future expansions, please consult with your Northern Telecom representative.

Note 2: Throughout this document, Meridian 1 refers to ST, STE, NT, RT, and XT as well as system options 21, 21E, 51, 51C, 61, 61C, 71, 81 and 81C unless otherwise noted.

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NTND27 (X11 release 18 and later)
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References

Refer to the following documents for additional information.

— *ISDN Primary Rate Interface description and administration* (553-2901-100)

— *Software conversion procedures* (553-2001-320)

— *Circuit card installation and testing* (553-3001-211)

— *Spares planning* (553-3001-153)

— *ISDN Primary Rate Interface maintenance* (553-2901-500)

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

Note to installers

Before beginning an installation, do the following:

— Consult the *Spares planning* (553-3001-153) document and follow the instructions.

— Bring spares of all cables and boards.

— Table 49, "Card slot positions for 21/ 21E, 51/51C, 61/61C, 71, and 81/81C," on page 179 and Table 50, "Card slot positions for ST, STE, RT, NT, XT," on page 180 illustrate acceptable positions for the QPC720, QPC414, QPC741, QPC775, QPC757, and NT6D80 cards. Use this chart to determine where you are placing your cards before you actually begin your installation.

— Refer to *ISDN Primary Rate Interface description and administration* (553-2901-100) and *X11 input/output guide* (553-3001-400) for database implementation.

Primary Rate Interface equipment: overview

The following machines support Primary Rate Interface (PRI):

— Beginning with X11 release 14, Meridian SL-1 ST, RT, NT, XT

— Beginning with X11 release 15, system options 21, 21A, 51, 61, and 71

— Beginning with X11 release 18, STE, 21E, and 81

— Beginning with X11 release 21, system options 51C, 71C, and 81C

This document describes the equipment and procedures needed to install the following ISDN PRI hardware on Meridian 1 systems.

— QPC757 D-channel Interface (DCHI)

— NT6D80 Multi-purpose Serial Data Link (MSDL)

— QPC720 Primary Rate Interface (PRI)

— NT5D12 dual-port 1.5 DTI/PRI card, and associated dual-port Downloadable D-Channel daughterboard (DDCH, NTBK51AA), that is used with the NT5D12 DDP in system hardware configurations as an alternative to an MSDL or a DCHI card

Note: Specific information pertaining to the NT5D12 and NTBK51AA can be found in the separate section "NT5D12 dual-port DTI/PRI card description and installation."

— QPC471 or QPC775 Clock Controller

The QPC775 Clock Controller is currently not available for U.S. markets. The QPC471 and QPC775 Clock Controllers cannot be mixed in one system. Vintages A through G of the QPC471 Clock Controller can be used in one system; vintage H of QPC471 Clock Controllers cannot be mixed with Clock Controllers of other vintages.

See Figure 1 for a representation of the basic PRI system hardware.

Note: This illustration shows the basic configuration, without the dual-port NT5D12 DTI/PRI card, nor the associated dual-port NTBK51AA Downloadable D-Channel daughterboard.

Figure 1
PRI hardware

Clock Controller
QPC471 or QPC775

PRI
QPC720

PRI
QPC720

REF2

REF1

T1

T1 interface to
external digital
carrier

Loop

Network card
QPC414

MSDL
NT6D80

DCHI
QPC757

553-1369
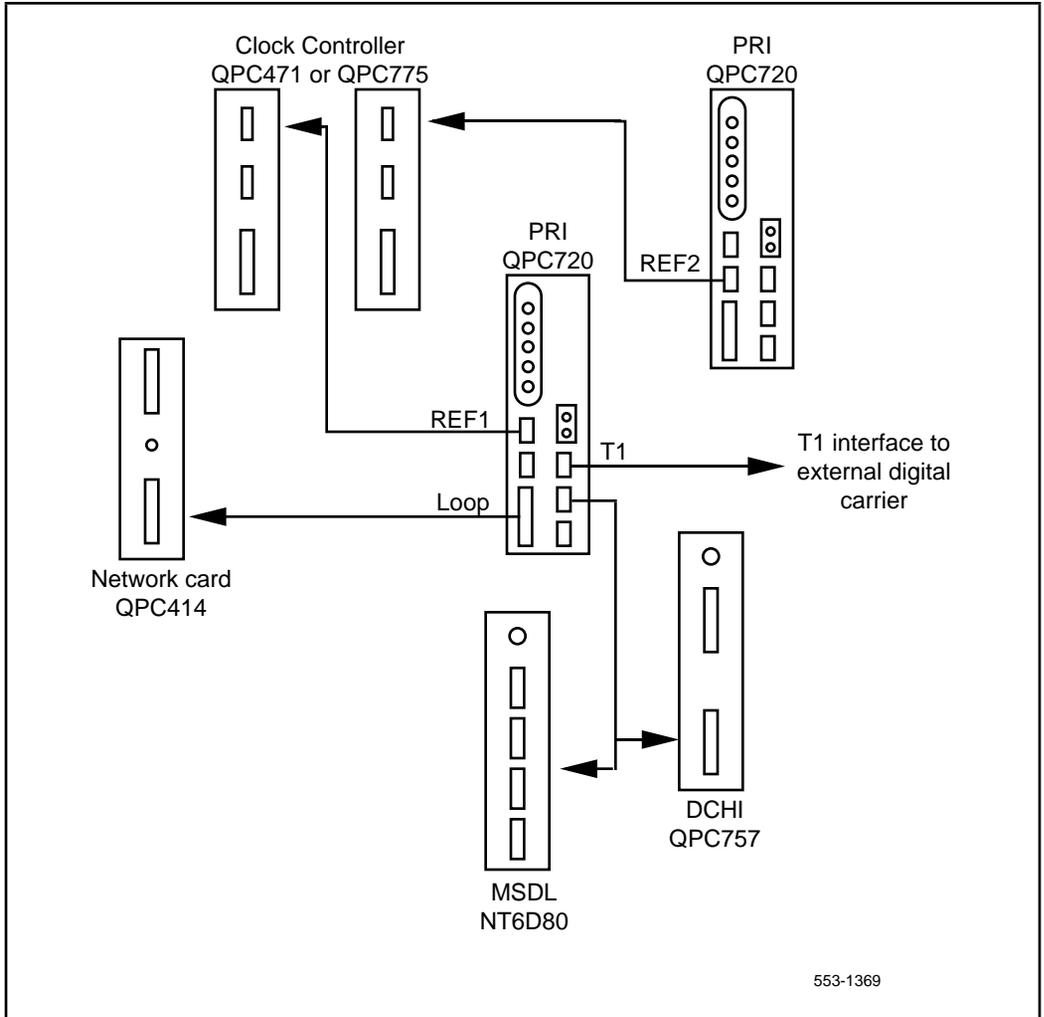
Refer to *ISDN Primary Rate Interface description and administration* (553-2901-100) for hardware vintage requirements and compatibilities, as well as packaging information.

Note: Either the QPC757 DCHI, the NT6D80 MSDL, or the QPC720 PRI can be installed first. However, PRI loops must be configured in software before defining DCHI links.

The following hardware is required for PRI capability and applications:

— QPC414 network card

Refer to *Circuit card installation and testing* (553-3001-211)

— Channel Service Unit (CSU)

Refer to information received from manufacturer

— ROM and memory, as shown in Table 1,

See also *Software conversion procedures* (553-2001-320)

The NT and RT can use one QPC583A board while the XT can use up to three QPC583A boards. X11 release 15 and later software requires at least two QPC583A boards in XT machines. Systems with less than 420K data storage require an additional memory board.

Table 1
Minimum ROM requirements by machine type and X11 release

X11 release	ST, 21	STE, 21E	RT	NT, 51, 61	XT, 71	81	51C	61C	81C
14	QPC717D or QPC937	N/A	QPC602	QPC602	QPC602	N/A			
15/16/17	QPC940	N/A	QPC939A	QPC939	QPC939	N/A			
18	N/A	NTND31	NTND08	NTND08	NTND08				
21									

ISDN Signaling Link hardware

Equipment required for shared mode.

— QPC757 DCHI or NT6D80 MSDL

— QPC720 PRI

— QPC471 or QPC775 Clock Controller

A Clock Controller is not needed for analog applications. Both QPC471 and QPC775 Clock Controllers cannot be in one system.

Equipment required for dedicated mode using leased lines.

— QPC757 DCHI or NT6D80 MSDL

— Modem set in synchronous mode

This equipment is required for dedicated mode using a DTI.

— QPC757 DCHI or NT6D80 MSDL

— QMT11 Asynchronous/Synchronous Interface Module (ASIM)

— QMT21 High Speed Data Module (HSDM)

— Meridian Communications Unit (X11 release 18 and later)

— Data line card

— QPC472 DTI

Equipment required for dedicated mode using a dial-up modem.

— QPC757 DCHI or NT6D80 MSDL

— Modem with auto-dial capability

Note: This configuration is the least reliable because of lockup problems inherent in smart modems from power splices and noisy lines. To increase the reliability on this configuration, use a constant power source when powering the modems. Also, verify that tie lines meet data grade specifications. Northern Telecom takes no responsibility for ISL D-channel outages due to modem lockup.

The following equipment is recommended for modem connections:

Hayes Smartmodem 2400
Concord Data System CDS 224 Trispeed Series II
Anderson Jacobson AJ 2441-1
Racal-Vadic 2400 PA

QPC720 PRI

The QPC720 PRI card is required for PRI operation in all machine types.

Power requirements

The QPC720 PRI uses power and ground from the backplane. This card does not require an intelligent bus. Power requirements are

+5 volts at 6 amperes

+12 volts at 50 milliamperes

–12 volts at 50 milliamperes

QPC720 faceplate

Table 2 gives information about the external connectors located on the QPC720 PRI faceplate.

The QPC720 PRI contains five LEDs and six external connectors. Figure 2 shows the faceplate layout.

Table 2
QPC720 PRI: external connectors

Faceplate destination	Type
J1	9-pin female, D-connector
J2	9-pin female, D-connector
J3	36-pin connector
J4	15-pin male, D-connector
J5	15-pin male, D-connector
J6	15-pin female, D-connector
RCV MON	Miniature bantam jack
XMT MON	Miniature bantam jack

Cable requirements

Table 3 lists the types of cable used and the lengths required for external QPC720 PRI connections.

Note: No additional cabling is required for nB+D configurations. Multiple PRIs and the D-channel are associated through software in LD 17, prompt PRI.

Figure 2
QPC720 PRI faceplate layout

```
Q
P
C
7
2
0
```

DIS: Card is disabled

ACT: Card is enabled

RED: Red alarm (local alarm)—card or transmission fault

YEL: Yellow alarm (remote alarm)—far end fault

LBK: Loop-back test—see PRI tests

J1

RCV

XMT

RCV MON: Access point to regenerated DS-1 signal from the external network

XMT MON: Access point to DS-1 signal being transmitted

J1   Recovered reference clocks derived from and
J2   received (RCV) DS-1 signal

J2   J4

J4   T1 interface to the external digital carrier

J5

J3

J5   D-channel interface DCHI cable connection to QPC757 or MSDL card

J3   Network loop cable connector to QPC414 Network Card

J6

J6   RS-232 interface to echo canceller (satellite transmission only)

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Carrier interface

The QPC720 PRI provides an interface to the DS-1 Channel either directly, through an office repeater, or through an Echo Canceller.

The T1 Channel Service Units listed below are compatible with the QPC720 PRI card and the 64K Clear Data feature as well as with PRI connection parameters such as the Superframe format, the Extended superframe format, and the B7 and B8ZS Alternate Mark Inversion (AMI) line coding. See *ISDN Primary Rate Interface description and administration* (553-2901-100) for more information about the connection parameters.

— Digital Link 551A

— Digital Link 551C

— Digital Link 551E

— Tellabs Model 441

— Verilink Model 551V ST

In the U.S.A., FCC Part 68 regulations require Network Channel Terminating Equipment (for example, the NT QRY551 Channel Service Unit) installed at of the point of connection between a system and a registered common carrier trunk.

Echo Canceller interface

Echo Cancellers are required only with satellite transmission. The Echo Canceller detects the length of the loop, then cancels reflected transmission (callers do not hear their own voices echoed).

The QPC720 PRI provides both a T1 line interface and a control interface to link to a signal format compatible with EIA standard RS-232-C. Both the PRI and the Echo Canceller act as Data Terminal Equipment (DTE). The Echo Canceller's control protocol must conform to that of the Tellabs Model 251.

64 T-link version 2 protocol

The QPC720 card supports the 64 T-link version 2 protocol. The QPC720 together with the QMT21 High Speed Data Module supports the 64K Clear Data feature. The QPC720 card provides a trunk that ties two switches together. This trunk allows 64K Clear Data to pass from the Meridian 1 to an outside network. The QMT21 module allows Data Terminal Equipment (DTE) to send and receive 64K Clear Data. See *ISDN Primary Rate Interface description and administration* (553-2901-100) for more information about the 64K Clear Data feature.

Table 3
QPC720 PRI: cables and cable lengths

Cable type	From	To	Maximum length (feet)	Maximum length (meters)
QCAD130	QPC720	QPC471/QPC775 (CC-0)	7	2.13
QCAD130	QPC720	QPC471/QPC775 (CC-1)	7	2.13
QCAD328A	QPC720	QPC757 DCHI	6	1.8
QCAD328B	QPC720	QPC757 DCHI	18	5.5
QCAD328C	QPC720	QPC757 DCHI	35	10.67
QCAD328D	QPC720	QPC757 DCHI	50	15.24
QCAD124	QPC720	QPC414 Network	50	15.24
QCAD128	QPC720	Bulkhead I/O panel	25	7.62
RS-232	QPC720	Echo Canceller	50	15.24
NTND26AA	QPC720	NT6D80 MSDL	6	1.8
NTND26AB	QPC720	NT6D80 MSDL	18	5.5
NTND26AC	QPC720	NT6D80 MSDL	35	10.67
NTND26AD	QPC720	NT6D80 MSDL	50	15.24
NTND98	QPC720	Input/output panel	6	1.8
22AWG ABAM	Echo Canceller	DSX-1	655	199.64

Note: The QPC775 Clock Controller is currently available in Canada only. There can be no mixing of QPC775 and QPC471 in one system.

QPC757 DCHI/NT6D80 MSDL

The QPC757 DCHI or NT6D80 MSDL card is required in all machine types.

Power requirements

The QPC757 DCHI/NT6D80 MSDL power requirements

+5 volts at 3 amperes
+12 volts at 50 milliamperes
–12 volts at 50 milliamperes

Interface to PRI

The QPC757 DCHI connects to the QPC720 PRI via a RS-422 cable. The following signals are transmitted across the interface:

RCV DATA
RCV CLOCK
XMIT CLOCK
XMIT READY
PRI READY
DCHI READY

PRI READY and DCHI READY are handshake signals.

QPC757/NT6D80 faceplate

The QPC757 DCHI, as shown in Figure 3, has one light emitting diode (LED) to indicate an active or inactive state and two external connectors as follows:

1   Port J1 is a standard asynchronous port in LD 48

Note: This connection does not support an Add-on Data Module (ADM) terminal.

2   Port J2 is the D-channel Interface port.

Note: X11 release 14 requires QPC757 vintage B or higher. A QPC757 vintage C is required if the ISL Revert to Conventional Signaling feature is configured. X11 release 15 requires a QPC757 vintage C or later. The QPC757 vintage D is recommended for combination ISL/PRI networks using NACD or Network Message Services and ISL networks using modems.

Figure 3
QPC757 DCHI faceplate layout

Q
P
C
7
5
7
C

Status LED

The DCHI LED indicates the status
of both ports on the DCHI card.

If both ports are configured, the LED
is lit only when both ports are disabled.

J1

Asynchronous port

This port is used for non-PRI applications.

Port J1 is always an even number
(0, 2, 4, ...14).

J2

D-channel interface

This port is connected to port J5 on
a PRI card. The D-channel is
always channel 24 on a PRI.

Port J2 is always an odd number
(1, 3, 5 … 15).

553-1373

NT6D80 MSDL

The NT6D80 MSDL card can be used in all machines supporting X11 release 18. It can be used in conjunction with, or independently from, the QPC757 card.

Power requirements

The NT6D80 MSDL power requirements are

Voltage (VAC)	Current (Amps)	Power (Watts)	Heat (BTUs)
+5	3.20	16.00	55.36
+12	0.10	1.20	4.15
−12	0.10	1.20	4.15

MSDL/PRI interface

MSDL can connect to PRI trunks through RS-422 or RS-232 interfaces. The interfaces are switch configurable.

MSDL faceplate

The NT6D80 MSDL as shown in Figure 4 has one light emitting diode (LED) that indicates its state (active or inactive) and four external connectors.

Each port can be RS-422 or RS-232 connectors, with either DCE or DTE interfaces.

Figure 4
NT6D80 MSDL faceplate layout

LED Indicator

I/O Port 0

I/O Port 1

I/O Port 2

I/O Port 3

Monitor Port

REL XX

NT6D80AA

553-5438
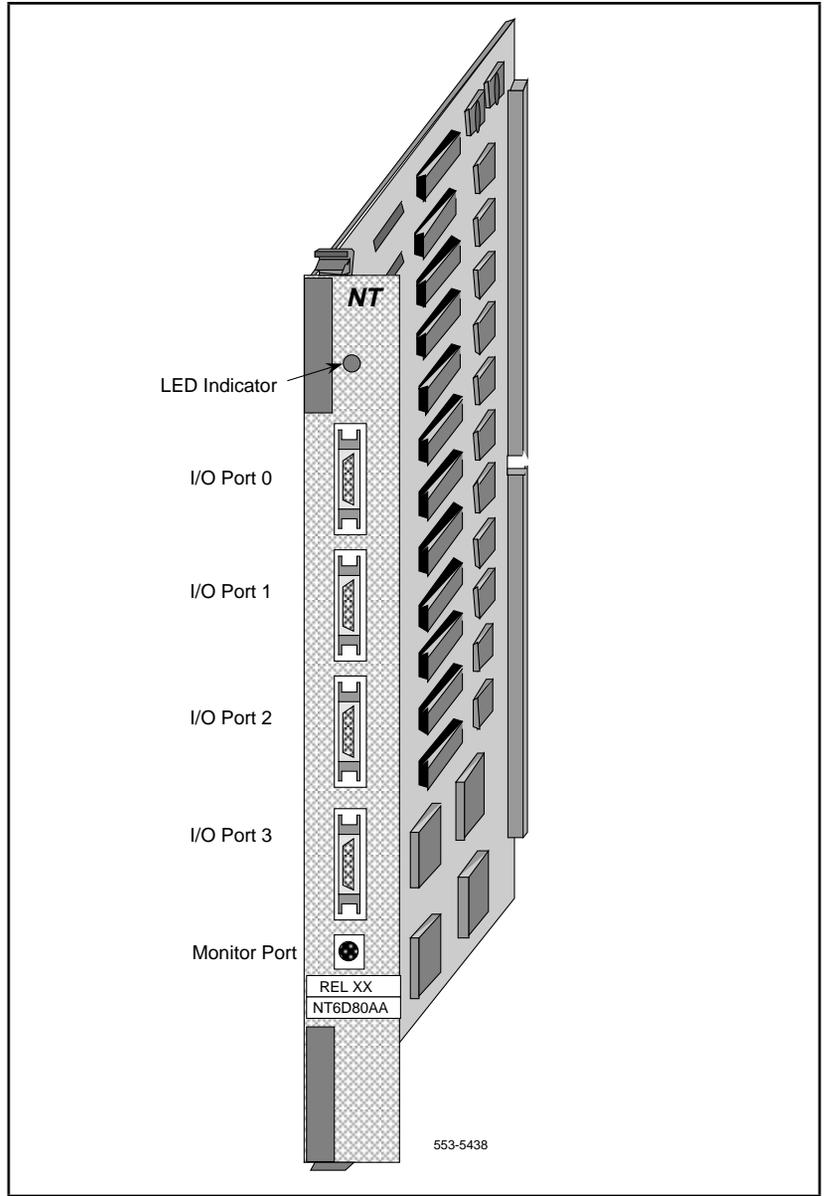
Clock operation

There are three types of clock operation: tracking mode, free run mode, and holdover mode.

Tracking mode

In tracking mode, the PRI loop supplies an external clock reference to a Clock Controller. Two PRI loops can operate in tracking mode, with one defined as the primary reference source for clock synchronization, the other defined as the secondary reference source. The secondary reference acts as a back-up to the primary reference. Both the primary and secondary references are assigned in LD 73. Each should have its own clocking source.

As shown in Figure 5, a Meridian 1 system with dual CPUs can have two Clock Controllers (CC-0 and CC-1). One Clock Controller acts as a back-up to the other. The Clock Controllers should be completely locked to the reference clock.

Free run (non-tracking) mode

The clock synchronization for a PRI loop can operate in free run mode if the following conditions are true:

— The loop is not defined as the primary or secondary clock reference.

— The primary and secondary references are disabled.

— The primary and secondary references are in red alarm (local alarm).

Holdover mode

Holdover mode, available for vintages G and H, saves clock references, remembering the last position and retaining it if system operation is interrupted. Holdover mode maximizes synchronization accuracy.

Reference clock errors

Meridian 1 software checks every 15 minutes to see if a Clock Controller or reference clock error has occurred.

In tracking mode, at any one time, there is one active Clock Controller, which is tracking on one reference clock. If a Clock Controller error is detected, the system switches to the back-up Clock Controller without affecting which reference clock is being tracked.

A reference clock error occurs when there is a problem with the clock driver or with the reference system clock at the far end. If the Clock Controller detects a reference clock error, the reference clocks are switched.

Figure 5
Clock controller primary and secondary tracking
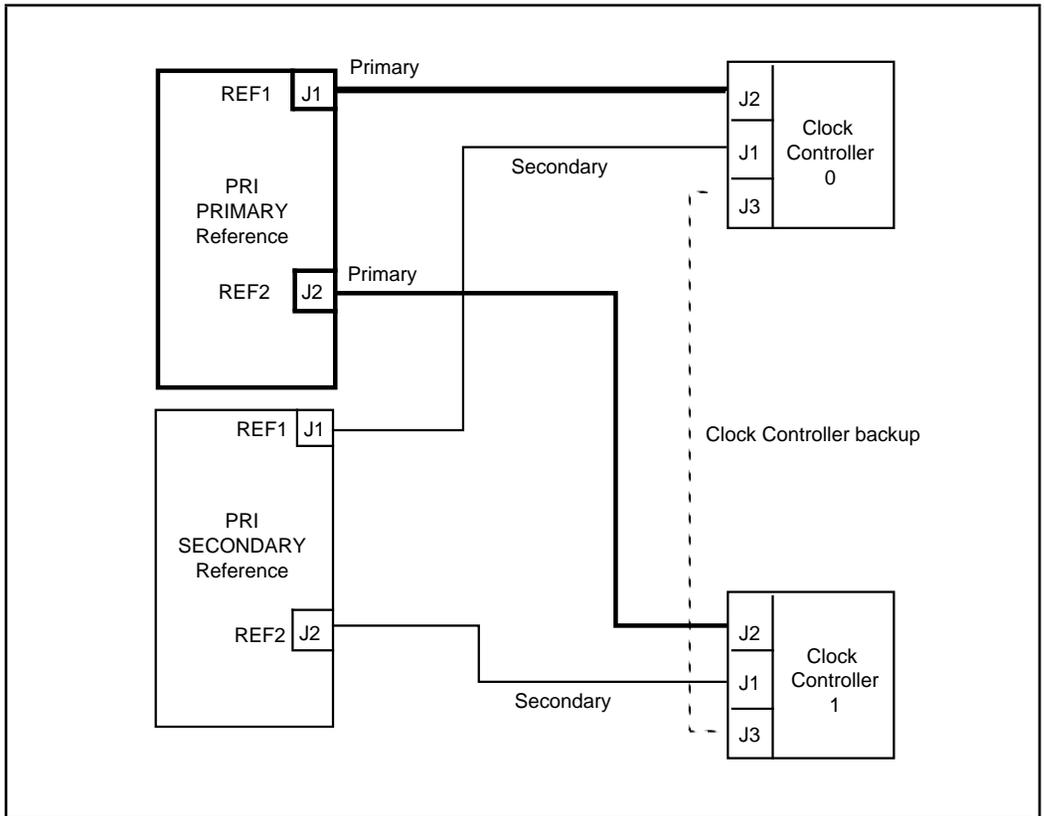
Automatic clock recovery

Automatic clock recovery provides for the clocking devices, down because of a PRI loop problem, to return to operation as soon as the PRI loop recovers.

With X11 release 14, you must enable the Auto recovery in LD 60 with the command EREF as well as in LD 70 with AUTO = YES. With X11 release 15 and later, enable it in LD 73 with AUTO = YES. LD 60 is not required.

A PRI loop is disabled when it enters a red alarm (local alarm) condition. If the red alarm is cleared, the loop is enabled automatically. When the loop is enabled, clock tracking is restored under the following conditions:

1   If the loop is assigned as the primary reference clock but the Clock Controller is tracking on the secondary reference or in free run mode, it is restored to tracking on primary.

2   If the loop is assigned as the secondary reference clock but the Clock Controller is in free run mode, it is restored to tracking on secondary.

If the 15-minute clock check indicates the system is in free run mode:

1   Tracking is restored to the primary reference clock (if defined).

2   If the primary reference is disabled or in red alarm (local alarm), tracking is restored to the secondary reference clock if defined.

If the system was put into free run mode intentionally by the craftsperson, it resumes tracking on a reference clock at this time unless the clock-switching option has been disabled (LD 60, command MREF), or the reference clock has been undefined in the database.

Automatic clock switching

Tracking on the primary or secondary reference clock is automatically switched in the following manner, when clock recovery is enabled.

1   If software is unable to track on the assigned primary reference clock, it switches to the secondary reference clock.

2   If software is unable to track on the assigned secondary reference clock, it switches to free run.

DTI to PRI conversion

The QPC720 PRI circuit card can be used in Digital Trunk Interface (DTI) mode. If the circuit card is switched from DTI mode to PRI mode, use Procedure 1.

Procedure 1
DTI to PRI conversion

1   Disable the QPC720 PRI using LD 60, prompt DISL x.

2   Change option switch settings on the PRI circuit card as required. Refer to Figure 6 and Table 4.

3   If the PRI links the D-channel, connect J5 to QPC757 DCHI J2 with a QCAD328A cable. You can also connect the PRI to an MSDL card with the cables noted in Table 3 (with X11 release 18 and later).

If this PRI does not supply the D-channel (it is one of multiple PRIs in an nB+D configuration), no additional cabling is required. The D-channel is associated through software in LD 17, prompt PRI.

The LEDs flash three times to indicate the QPC720 is operable.

4   Configure your database. Refer to *ISDN Primary Rate Interface description and administration* (553-2901-100) and *X11 input/output guide* (553-3001-400) for database implementation.

Figure 6
PRI circuit card (QPC720) option settings

SW2

7-pole
(See transmission
equalization
switch settings)

SW3

8-pole
(All OFF except for PRI mode,
see transmission equalization
switch settings)

553-1503
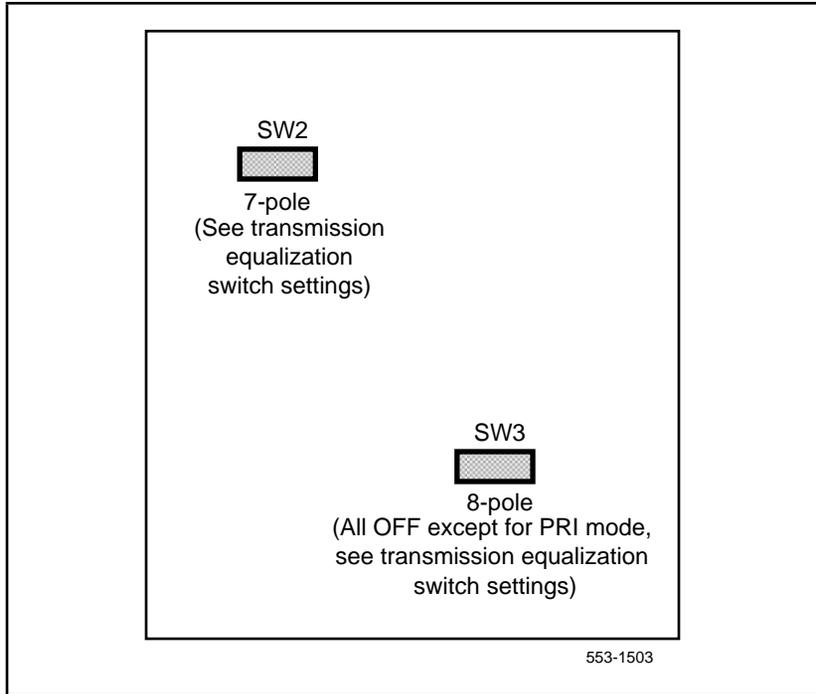
Use the same SW2 settings in the table below for transmission equalization with QPC720 in Primary Rate Interface (PRI) mode or Digital Trunk Interface (DTI) mode.

Table 4
Transmission equalization switch settings for QPC720 PRI/DTI mode

Switch S2 settings	To repeated facility	To cross-connect point
5 on	0–45 m (0–150 ft)	0–30 m (0–100 ft)
2, 4, 6 on	46–135 m (151–450 ft)	31–100 m (101–355 ft)
1, 3, 7 on	136–225 m (451–750 ft)	101–200 m (356–655 ft)
Switch 3 option for DTI with ESF		
SW3–1 on = extended superframe format (ESP) off = superframe format (SF)		

Note 1: All positions on S2 (location B22) are OFF except as shown under the column labeled "Switch S2 settings."

Note 2: The switch 3 option for DTI with ESF applies to only X11 release 16, 17, and 18. All other positions on the 8-pole SW3 (location E37) should be OFF.

Note 3: Prior to X11 release 19 (releases 16, 17, and 18), you must set the framing format as ESF with the DLOP prompt in LD 17 before you set SW3–1 on the card for the DTI with ESF option.

Note 4: Beginning with X11 release 19, framing format, line encoding, and method of yellow alarm are selectable for both DTI and PRI in LD 17 with the DLOP, LCMT, and YALM prompts. All SW3 switch positions should be OFF.

PRI installation: ST, STE, 21, 21E

X11 release 18 requires ST and 21 upgrade to STE or 21E. This chapter includes the PRI installation procedure for all four systems.

PRI circuit card locations

Each PRI circuit card requires two adjacent slots on a shelf. PRI cards can be placed in the following slots:

— for ST/STE, slots in Common Equipment (CE) shelf and DTI Expansion Tier

— for 21/21E, slots in NT8D11 Common/Peripheral Equipment Module

Cable requirements

Shielded 22 AWG (0.644 mm) cable is recommended for connecting the PRI to the cross-connect point. This cable consists of two shielded twisted-pair conductors and two shields.

The transmit and the receive pairs must be individually shielded and enclosed in a polyvinyl jacket. This type of cable is commonly referred to as "6-conductor" cable. T1 cable shielding should be grounded at the cross-connect point.

To manufacture cables of different lengths than the standard cables provided, refer to "PRI cabling information" on page 169.

See Figures 7 and 8 for cabling arrangements with and without an Echo Canceller.

The recommended order of PRI connections for the Universal I/O Panel (P0715058) for NT8D11 CE/PE Module (system option 21) follows:

— with Echo Canceller, J4 and J12 for the T1, J8 for the Echo Canceller

— without Echo Canceller, J4, J8, and J12 for the T1s

Installing the QPC720 PRI

This procedure describes how to install the QPC720 PRI card in an ST, STE, 21, or 21E.

Procedure 2
Installing the QPC720 PRI in an ST, STE, 21, 21E

1   Determine the cabinet and shelf location of the circuit card to be installed. The following slots can be used if they are not required for other cards see Table 5.

Table 5
Shelf and slot location of QPC720 in ST and option 21

System	Shelf	Slot
ST	CE	5–13 Note 1
	DTI Exp Tier	2–10 Note 2
	QSD81 ST Upgrade	5–15 Note 2
21	NT8D11 CE Cube	4–9 Note 2
	NT8D35 DTI Exp Cube	2–3 Note 2
		5–14 Note 2
	NT8D47 RPE Cube	1, 11, 12

Note 1: If a DTI/PRI pack is installed in slot 13, then PE slot 1 cannot be used.

Note 2: DTI/PRI packs require two slots. The slot indicated is the maximum slot that the pack resides in. For example, the slot 14 pack uses slots 13 and 14.

2   Unpack and inspect circuit cards.

3   Set option switches on the PRI circuit card. See Figure 9 and Table 6.

4   Install PRI circuit card in the assigned shelf and slot.

5   Install network circuit card (if no network loop connection is available).

6   If required, install I/O adapters in I/O panel.

7	Run and connect PRI cables. Figures 7 and 8 show ST, STE, 21, 21E PRI cabling. Refer also to Table 7.	
8	If required, install connecting blocks at MDF or wall-mounted cross-connect terminal.	
9	If required, designate connecting blocks at MDF or wall-mounted cross-connect terminal.	
10	If required, install CSU or Echo Canceller.	
11	Cross-connect PRI circuits.	
12	Add related office data into system memory. Refer to the work order.	
13	Run PRI verification tests.	

Table 6
Transmission equalization switch settings for PRI

Switch S2 settings	To repeated facility	To cross-connect point
5 ON	0–45 m (0–150 ft)	0–30 m (0–100 ft)
2, 4, 6 ON	46–135 m (151–450 ft)	31–100 m (101–355 ft)
1, 3, 7 ON	136–225 m (451–750 ft)	101–200 m (356–655 ft)
Switch 3 options for PRI/DTI with ESF		
SW3-1 ON = extended superframe format (ESF) OFF = superframe format (SF)		
SW3-2 ON = B8ZS line encoding (required for 64K clear option) OFF = AM1 line encoding		
SW3-3 ON = facility data link (FDL) yellow alarm method (cannot be used in Canada) OFF = Digit 2 yellow alarm method		
Note 1: All switch positions for S2 (location B22) are OFF except as shown under the column labeled "Switch S2 settings." The 8-pole SW3 (location E37) switch positions are OFF except as shown for "Switch 3 options for PRI/DTI with ESF."		
Note 2: For D2, D3, or D4 framing formats (superframe formats), set all SW3 options to OFF.		

Table 7
Cable connections and destinations for ST, STE, 21, 21E

Cable	From	Con	To	Des	Con	Comments
QCAD130 NT8D79xx	QPC720	J1	QPC471/ QPC775	CC-0	J2	Only when primary clock source.
QCAD130 NT8D79xx	QPC720	J1	QPC471/ QPC775	CC-0	J1	Only when secondary clock source.
NTND26	QPC720	J5	MSDL (NT6D80)			X11 release 18 and later.
QCAD124 NT8D85xx	QPC720	J3	Network			Run directly to network card.
QCAD328A	QPC720	J5	DCHI		J2	Run directly to DCHI card.
QCAD133 NT8D83xx	I/O Panel		Patch panel			Run via cabinet I/O panel to CSU, Echo Canceller, or cross-connect terminal.
QCAD129 NT8D93xx	QPC720	J6	I/O Panel			Echo Canceller.
RS-232 NT8D89Ax	I/O Panel		Echo canceller			
RS-232	QPC720	J6	Echo canceller			
QCAD133 NT8D83xx	QPC720	J4	Patch panel			Run via cabinet I/O panel to cross-connect terminal or Echo Canceller from non-shielded system.

Note: No additional cabling is required for multiple PRIs. The D-channel is associated through software in LD 17, prompt PRI.

Figure 7
ST, STE, 21, 21E cabling without Echo Canceller

QPC720
PRI Card
(Primary reference)

QCAD130 or NT8D79xx to
PRI Card—Secondary Reference

REF1 J1 —— QCAD130 or NT8D79xx —— J2 QPC471
Clock
Controller 0
J1
J3

REF2 J2 ◀— No connection

D-CH J5 —— QCAD328A or NTND26 —— J2 QPC757 or NT6D80

LOOP J3 —— QCAD124 or NT8D85xx —— QPC414 Note 3

T1 J4 —— QCAD128 or QCAD133 or NT8D83xx —— Cabinet I/O Panel Note 1 —— QCAD133 or NT8D97Ax —— DS-1 Cross-Connect —— LD-1 Note 2

RS232 J6 ◀— No connection

Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 655 ft.
Note 2: Maximum cable distance from PRI card to LD-1 is 750 ft.
Note 3: QPC720 does not interface with NT8D04 Superloop Network Card.   553-1389

Figure 8
ST, STE, 21, 21E cabling with Echo Canceller

Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 655 ft.
Note 2: Maximum cable distance from PRI card to LD-1 is 750 ft.
Note 3: QPC720 does not interface with NT8D04 Superloop Network Card.

553-1390
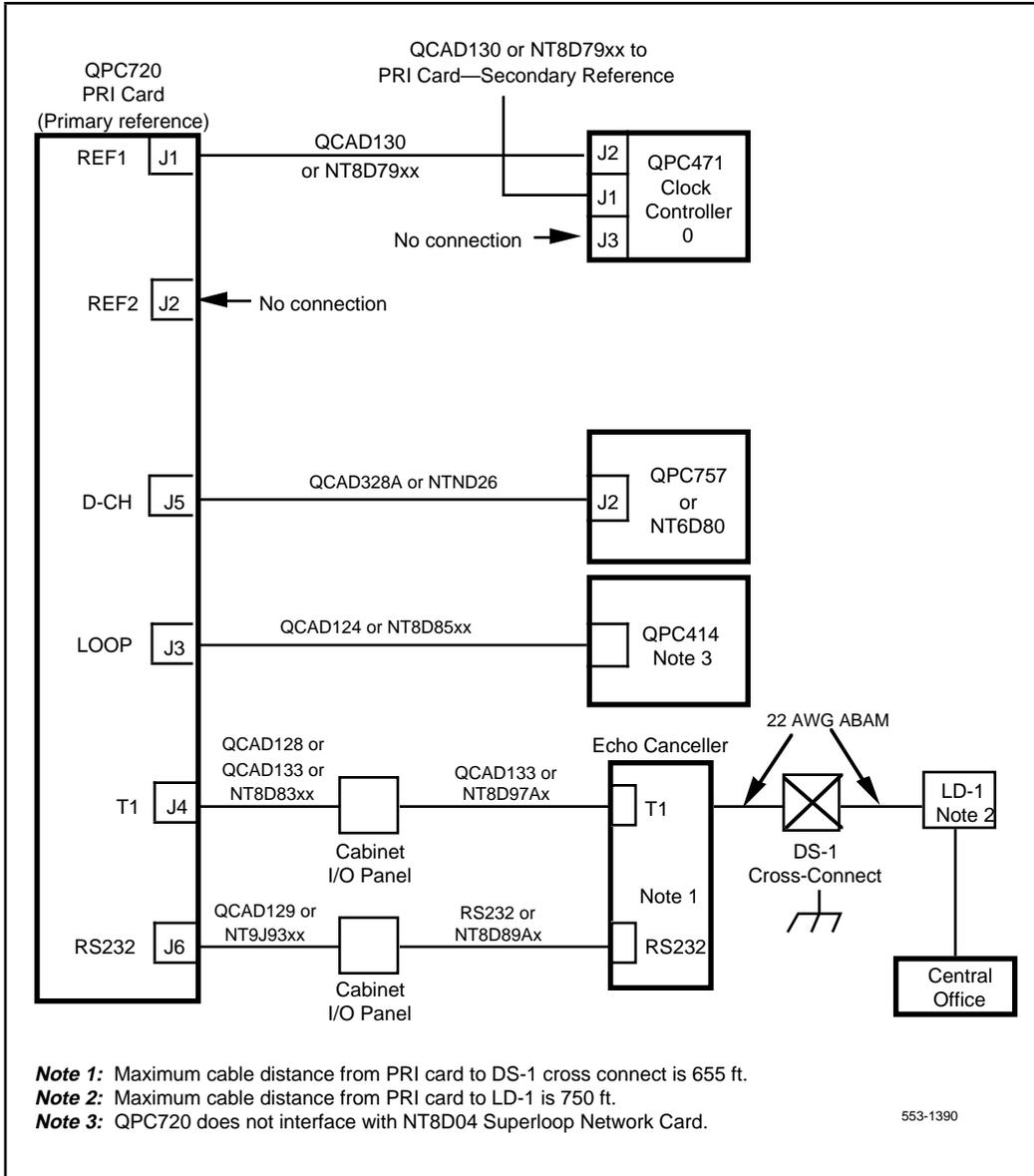
Figure 9
PRI card (QPC720) switch settings
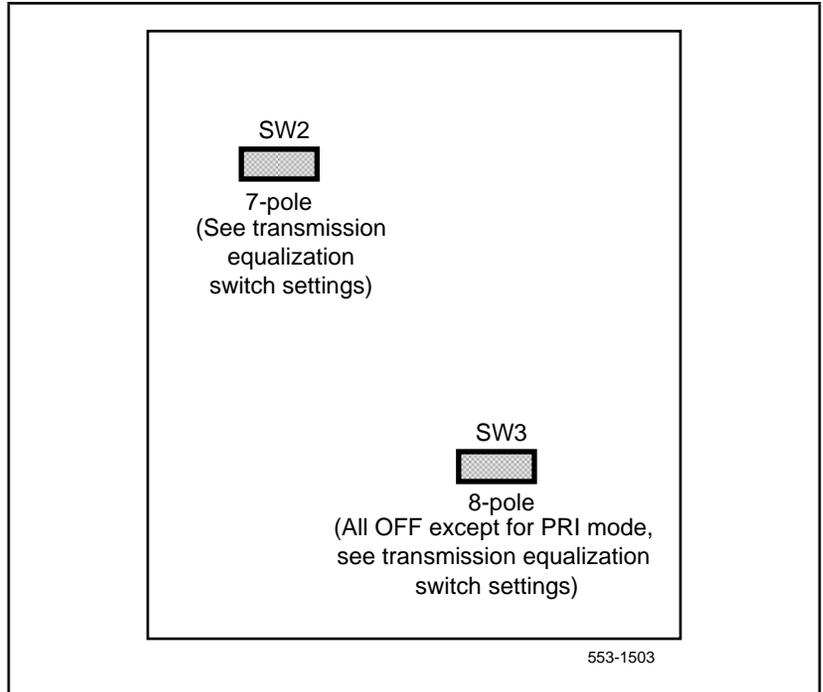
SW2

7-pole
(See transmission
equalization
switch settings)

SW3

8-pole
(All OFF except for PRI mode,
see transmission equalization
switch settings)

553-1503

Removing the QPC720 PRI

The following procedure describes how to remove the QPC720 PRI card from the ST, STE, 21, 21E.

Procedure 3
Removing the QPC720 PRI from the ST, STE, 21, 21E

1   Disable the D-channel in LD 96.

2   Disable Network Loop using LD 60. The command is DISL x.

3   If the circuit card is being completely removed, not replaced, remove data from memory. See *ISDN Primary Rate Interface description and administration* (553-2901-100).

4   Determine the location of the circuit cards to be removed.

5   Remove cross connections at MDF to wall-mounted cross-connect terminal.

6   Disconnect PRI cables at Echo Canceller and at carrier interface (for example, Office Repeater and NCTE equipment).

7   Tag and disconnect cables from card. Rearrange Clock Controller card cables if required. This will affect call processing on DTI/PRI loops.

8   Remove PRI and network circuit cards. If the other circuit of a dual network card is in use, DO NOT remove the network card.

9   Pack and store circuit card.

PRI installation: RT

PRI circuit card locations

Each PRI circuit card requires two adjacent slots on a shelf. As many as five circuit cards can be plugged into an empty network shelf, along with the power converter card, depending on the shelf type. See Tables 49 and 50 for card slot positions.

Cable requirements

Shielded 22 AWG (0.644 mm) cable is recommended for connecting the PRI to the cross-connect point. This cable consists of two shielded twisted-pair conductors and two shields.

The transmit and the receive pairs must be individually shielded and enclosed in a polyvinyl jacket. This type of cable is commonly referred to as "6-conductor" cable. T1 cable shielding should be grounded at the cross-connect point.

To manufacture cables of different lengths than the standard cables provided, refer to "PRI cabling information" on page 169.

See Figures 10 and 11 for cabling arrangements with and without an Echo Canceller.

The recommended order of PRI connections for the Universal I/O Panel (P0715058) for NT8D11 CE/PE Module (system option 21) follows:

— with Echo Canceller, J4 and J12 for the T1, J8 for the Echo Canceller

— without Echo Canceller, J4, J8, and J12 for the T1s

Installing the QPC720 PRI

This procedure describes how to install the QPC720 PRI card in an RT.

Procedure 4
Installing the QPC720 PRI in an RT

1   Determine the cabinet and shelf location of the circuit card to be installed. The following slots can be used if they are not required for other cards.

Table 8
Shelf and slot location of QPC720 in RT

Shelf	Slot
Network	5–10
DTI Expansion tier	2–9

2   Unpack and inspect circuit cards.

3   Set option switches on the PRI circuit card. See Figure 12 and Table 9.

4   Install PRI QPC720 card in the assigned shelf and slot.

5   Install network QPC414 card (if no network loop connection is available).

6   If required, install I/O adapters in I/O panel.

7   Run and connect the PRI cables. Figures 10 and 11 show the RT PRI cabling. Refer also to Table 10.

8   If required, install connecting blocks at MDF or wall-mounted cross-connect terminal.

9   If required, designate connecting blocks at MDF or wall-mounted cross-connect terminal.

10   If required, install CSU or Echo Canceller.

11   Cross-connect PRI cables.

12   Add related configuration data into Meridian 1 system memory. Refer to the work order.

13   Run PRI verification tests.

Table 9
Transmission equalization switch settings for PRI

Switch S2 settings	To repeated facility	To cross-connect point
5 on	0–45 m (0–150 ft)	0–30 m (0–100 ft)
2, 4, 6 on	46–135 m (151–450 ft)	31–100 m (101–355 ft)
1, 3, 7 on	136–225 m (451–750 ft)	101–200 m (356–655 ft)
Switch 3 option for DTI with ESF		
SW3–1 on = extended superframe format (ESP) off = superframe format (SF)		

Note 1: All positions on S2 (location B22) are OFF except as shown under the column labeled "Switch S2 settings."

Note 2: The switch 3 option for DTI with ESF applies to only X11 release 16, 17, and 18. All other positions on the 8-pole SW3 (location E37) should be OFF.

Note 3: Prior to X11 release 19 (releases 16, 17, and 18), you must set the framing format as ESF with the DLOP prompt in LD 17 before you set SW3–1 on the card for the DTI with ESF option.

Note 4: Beginning with X11 release 19, framing format, line encoding, and method of yellow alarm are selectable for both DTI and PRI in LD 17 with the DLOP, LCMT, and YALM prompts. All SW3 switch positions should be OFF.

Table 10
Cable connections and destinations for RT

Cable	From	Con	To	Des	Con	Comments
QCAD130 NT8D79xx	QPC720	J1	QPC471/ QPC775	CC-0	J2	Only when primary clock source.
QCAD130 NT8D79xx	QPC720	J1	QPC471/ QPC775	CC-0	J1	Only when secondary clock source.
NTND26	QPC720	J5	MSDL (NT6D80)			X11 release 18 and later.
QCAD124 NT8D85xx	QPC720	J3	Network			Run directly to network card.
QCAD328A	QPC720	J5	DCHI		J2	Run directly to DCHI card.
QCAD133 NT8D83xx	I/O Panel		Patch panel			Run via cabinet I/O panel to CSU, Echo Canceller, or cross-connect terminal.
QCAD129 NT8D93xx	QPC720	J6	I/O Panel			Echo Canceller.
RS-232 NT8D89Ax	I/O Panel		Echo canceller			
RS-232	QPC720	J6	Echo canceller			
QCAD133 NT8D83xx	QPC720	J4	Patch panel			Run via cabinet I/O panel to cross-connect terminal or Echo Canceller from non-shielded system.

Note: No additional cabling is required for multiple PRIs. The D-channel is associated through software in LD 17, prompt PRI.

Figure 10
RT cabling without Echo Canceller

Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 655 ft.
Note 2: Maximum cable distance from PRI card to LD-1 is 750 ft.
Note 3: QPC720 does not interface with NT8D04 Superloop Network Card.

553-1389
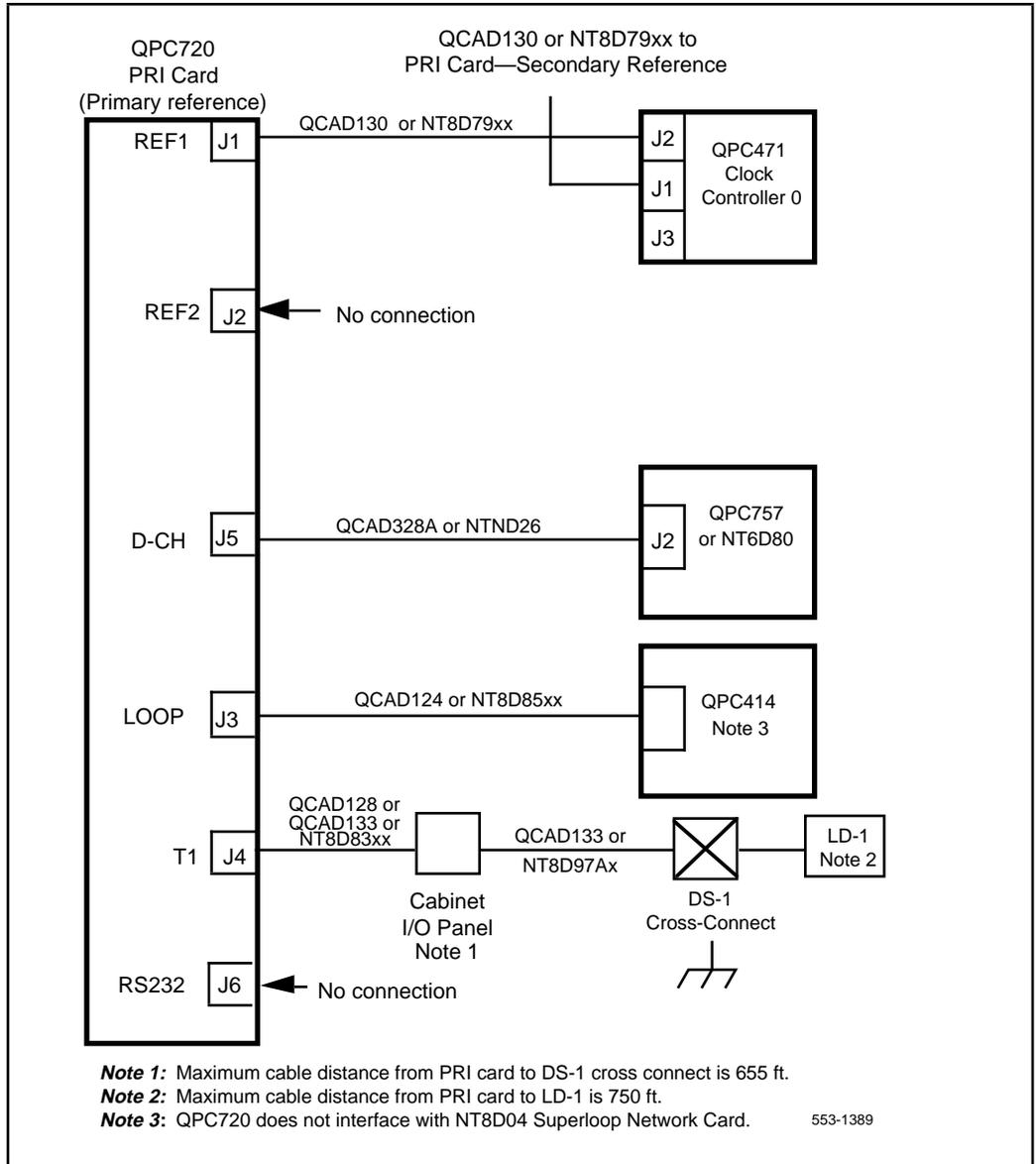
Figure 11
RT cabling with Echo Canceller

QCAD130 or NT8D79xx to
PRI Card—Secondary Reference

QPC720
PRI Card
(Primary reference)

REF1 J1 ——— QCAD130 or NT8D79xx ——— J2 QPC471 Clock Controller 0

J1

No connection → J3

REF2 J2 ← No connection

D-CH J5 ——— QCAD328A or NTND26 ——— J2 QPC757 or NT6D80

LOOP J3 ——— QCAD124 or NT8D85xx ——— QPC414 Note 3

T1 J4 ——— QCAD128 or QCAD133 or NT8D83xx ——— Cabinet I/O Panel ——— QCAD133 or NT8D97Ax ——— T1 Echo Canceller

22 AWG ABAM

DS-1 Cross-Connect

LD-1 Note 2

Note 1

RS232 J6 ——— QCAD129 or NT9J93xx ——— Cabinet I/O Panel ——— RS232 or NT8D89Ax ——— RS232

Central Office

Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 655 ft.
Note 2: Maximum cable distance from PRI card to LD-1 is 750 ft.
Note 3: QPC720 does not interface with NT8D04 Superloop Network Card.

553-1390

Figure 12
PRI card (QPC720) switch settings
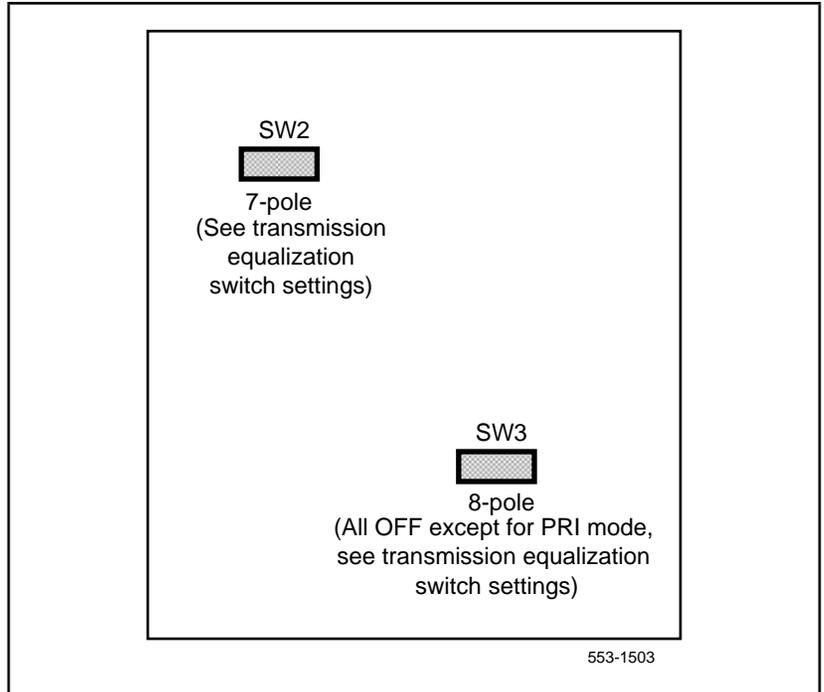
SW2

7-pole
(See transmission
equalization
switch settings)

SW3

8-pole
(All OFF except for PRI mode,
see transmission equalization
switch settings)

553-1503

Removing the QPC720 PRI

The following procedure describes how to remove the QPC720 PRI card from the RT.

Procedure 5
Removing the QPC720 PRI from the RT

1   Disable the D-channel in LD 96.

2   Disable Network Loop using LD 60. The command is DISL x.

3   If the circuit card is being completely removed, not replaced, remove data from memory. See *ISDN Primary Rate Interface description and administration* (553-2901-100).

4   Determine the location of the circuit cards to be removed.

5   Remove cross connections at MDF to wall-mounted cross-connect terminal.

6   Disconnect PRI cables at Echo Canceller and at carrier interface (for example, Office Repeater and NCTE equipment).

7   Tag and disconnect cables from card. Rearrange Clock Controller card cables if required. This will affect call processing on DTI/PRI loops.

8   Remove PRI and network circuit cards. If the other circuit of a dual network card is in use, DO NOT remove the network card.

9   Pack and store circuit card.

PRI installation: NT, 51/51C, 61/61C

PRI circuit card locations

Each PRI circuit card requires two adjacent slots on a shelf. As many as five circuit cards can be plugged into any empty network shelf, along with the power converter card, depending on the shelf type. See Tables 49 and 50 for card slot positions.

If additional network shelves are required, use the NT8D35 Network Module. See *Meridian 1 system installation procedures* (553-3001-210).

Cable requirements

Shielded 22 AWG (0.644 mm) cable is recommended for connecting the PRI to the cross connect point. This cable consists of two shielded twisted-pair conductors and two shields.

The transmit and the receive pairs must be individually shielded and enclosed in a polyvinyl jacket. This type of cable is commonly referred to as "6-conductor" cable. T1 cable shielding should be grounded at the cross-connect point.

To manufacture cables of different lengths than the standard cables provided, see "PRI cabling information" on page 169.

The recommended order of PRI connections for the Universal I/O Panel (P0715058) for the NT6D39 CE/Network Module (system option 51/61) is as follows:

— with Echo Canceller, J4, J12, and J24 for the T1 and J8, J20, and J28 for the Echo Canceller

— without Echo Canceller, J8, J12, J20, J24, and J28 for the T1s

Installing the QPC720 PRI

This procedure describes how to install the QPC720 PRI card in an NT, 51/51C, or 61/61C.

Procedure 6
Installing the QPC720 PRI in NT, 51/51C, 61/61C

1   Determine the cabinet and shelf location of the circuit card to be installed. The following slots can be used if they are not required for other cards.

Table 11
Shelf and slot location of QPC720 in NT or option 61

System	Shelf	Slot
NT	QSD39 Network (LH)	5–10 Note 1
	QSD40 Network (RH)	5–10 Notes 1, 2
	QSD39 DTI/PRI only	2–10 Notes 1, 4 12–14
	QSD40 DTI/PRI only	2–3 Note 1 5–13
61/61C	NT6D39 CPU/NET	3–8 Note 1 18 Note 3
	NT8D35 DTI Exp Cube	2–3 Note 1 5–14 Note 1
	NT8D47 RPE Cube	1, 11, 12

Note 1: DTI/PRI packs require two slots. The slot indicated is the maximum slot that the pack resides in. For example, the slot 14 pack uses slots 13 and 14.

Note 2: The DTI/PRI pack cannot be installed in slot 11. The pack would come in contact with the BTU installed between slots 11 and 12.

Note 3: Slot 18 is only available on CPU shelf, which has no MDU/FDU.

Note 4: DTI/PRI pack could reside in slots 10 and 11, but cannot reside in slots 11 and 12 because of powering restrictions.

2   Unpack and inspect circuit cards.

3   Set option switches on the PRI circuit card. See Figure 17 and Table 12.

4   Install PRI circuit card in the assigned shelf and slot.

5   Install network circuit card (if no network loop connection is available).

6   If required, install I/O adapters in I/O panel.

7   Run and connect the PRI cables. See Figures 13 and 14. Figures 15 and 16 show the NT, 51/51C, 61/61C PRI cabling. Refer also to Table 13.

8   If required, install connecting blocks at MDF or wall-mounted cross-connect terminal.

9   If required, designate connecting blocks at MDF or wall-mounted cross-connect terminal.

10   If required, install CSU or Echo Canceller.

11   Cross-connect PRI circuits.

12   Add related office data into system memory. Refer to the work order.

13   Run PRI verification tests.

Removing the QPC720 PRI

The following procedure describes how to remove the QPC720 PRI card from the NT, 51/51C, 61/61C.

Procedure 7
Removing the QPC720 PRI in the NT, 51/51C, 61/61C

1   Disable the D-channel in LD 96.

2   Disable Network Loop using LD 60. The command is DISL x.

3   If the circuit card is being completely removed, not replaced, remove data from memory. See *ISDN Primary Rate Interface description and administration* (553-2901-100).

4   Determine the location of the circuit cards to be removed.

5   Remove cross connections at MDF to wall-mounted cross-connect terminal.

6   Disconnect PRI cables at Echo Canceller and at carrier interface (for example, Office Repeater and NCTE equipment).

7   Tag and disconnect cables from card. Rearrange Clock Controller card cables if required. This will affect call processing on DTI/PRI loops.

8   Remove PRI and network circuit cards. If the other circuit of a dual network card is in use, DO NOT remove the network card.

9   Pack and store circuit card.

Note: No additional cabling is required for multiple PRIs. The D-channel is associated through software in LD 17, prompt PRI.

Table 12
Transmission equalization switch settings for PRI

Switch S2 settings	To repeated facility	To cross-connect point
5 ON	0–45 m (0–150 ft)	0–30 m (0–100 ft)
2, 4, 6 ON	46–135 m (151–450 ft)	31–100 m (101–355 ft)
1, 3, 7 ON	136–225 m (451–750 ft)	101–200 m (356–655 ft)
Switch 3 options for PRI/DTI with ESF		
SW3-1 ON = extended superframe format (ESF) OFF = superframe format (SF)		
SW3-2 ON = B8ZS line encoding (required for 64K clear option) OFF = AM1 line encoding		
SW3-3 ON = facility data link (FDL) yellow alarm method (cannot be used in Canada) OFF = Digit 2 yellow alarm method		

Note 1: All switch positions for S2 (location B22) are OFF except as shown under the column labeled "Switch S2 settings." The 8-pole SW3 (location E37) switch positions are OFF except as shown for "Switch 3 options for PRI/DTI with ESF."

Note 2: For D2, D3, or D4 framing formats (superframe formats), set all SW3 options to OFF.

Table 13
Cable connections and destinations for NT, 51/51C, 61/61C

Cable	From	Des.	Con.	To	Des.	Con.	Comments
For half group only							
QCAD130 NT8D79xx	QPC720		J1	QPC471/ QPC775	CC-0	J2	Only when primary clock source.
QCAD130 NT8D79xx	QPC720		J1	QPC471/ QPC775	CC-0	J1	Only when secondary clock source.
NTND26	QPC720		J5	NT6D80			X11 release 18 and later.
For single group only							
QCAD130 NT8D79xx	QPC720		J2	QPC471/ QPC775	CC-1	J2	Only when primary clock source.
QCAD130 NT8D79xx	QPC720		J2	QPC471/ QPC775	CC-1	J1	Only when secondary clock source.
QCAD125 NT8D75xx	QPC471/ QPC775	CC-0	J3	QPC471/ QPC775	CC-1	J3	Clock controller back-up.
QCAD124 NT8D85xx	QPC720		J3	Network			Run directly to network card.
QCAD328A	QPC720		J5	QPC757		J2	Run directly to DCHI card.
NTND26	QPC720		J5	NT6D80			X11 release 18 and later.
QCAD133	I/O Panel			Patch panel			Run via cabinet I/O panel to CSU, Echo Canceller, or cross-connect terminal.
QCAD129	QPC720		J6	I/O Panel			
RS-232	I/O Panel			Echo Canceller			
RS-232	QPC720		J6	Echo Canceller			
QCAD133 NT8D83xx	QPC720		J4	Patch panel			Run via cabinet I/O panel to cross-connect terminal or Echo Canceller from non-shielded system.

Figure 13
Half group cabling without Echo Canceller

Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 655 ft.
Note 2: Maximum cable distance from PRI card to LD-1 is 750 ft.
Note 3: QPC720 does not interface with NT8D04 Superloop Network Card.

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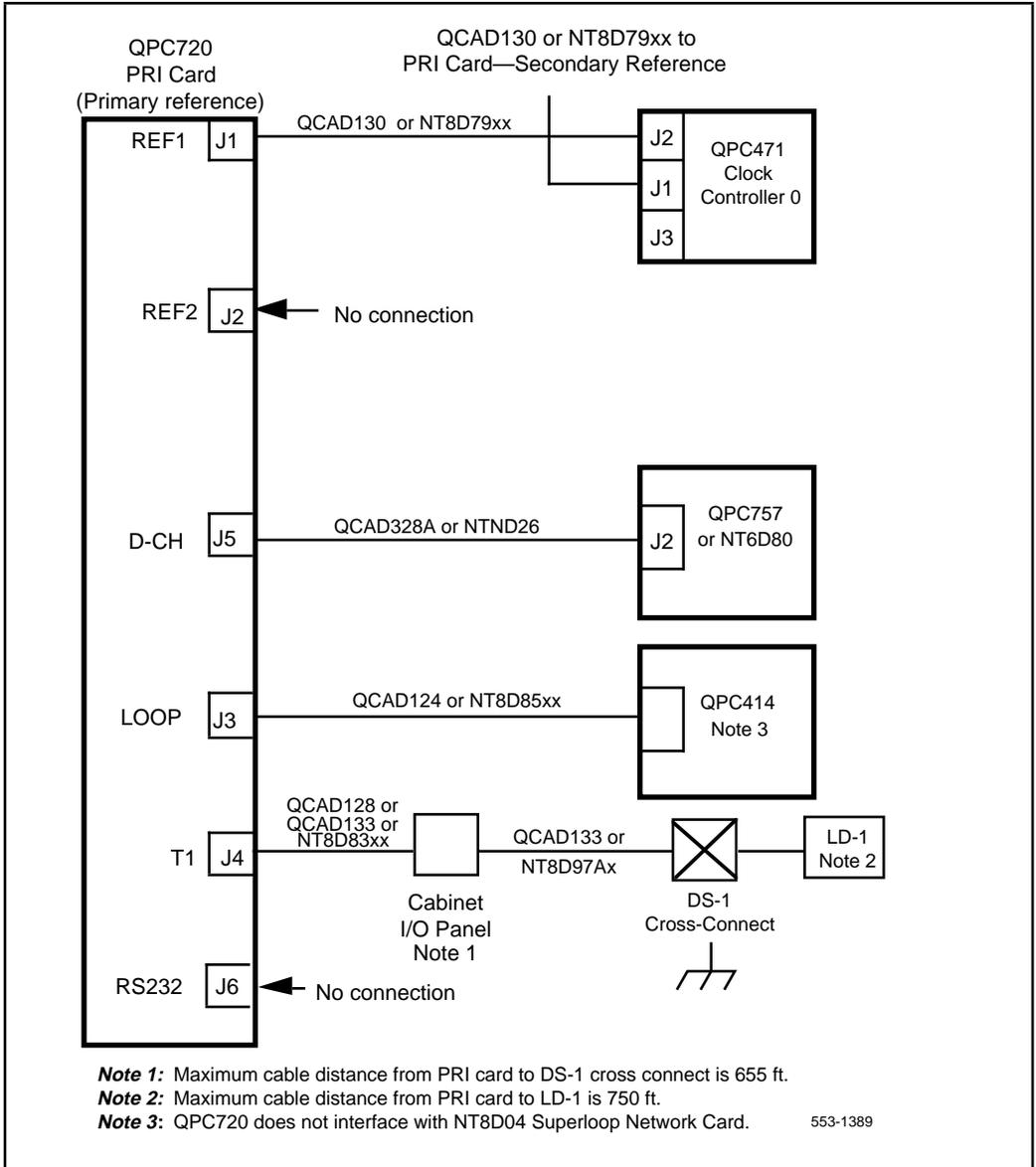
Figure 14
Half group cabling with Echo Canceller

Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 655 ft.
Note 2: Maximum cable distance from PRI card to LD-1 is 750 ft.
Note 3: QPC720 does not interface with NT8D04 Superloop Network Card.

553-1390
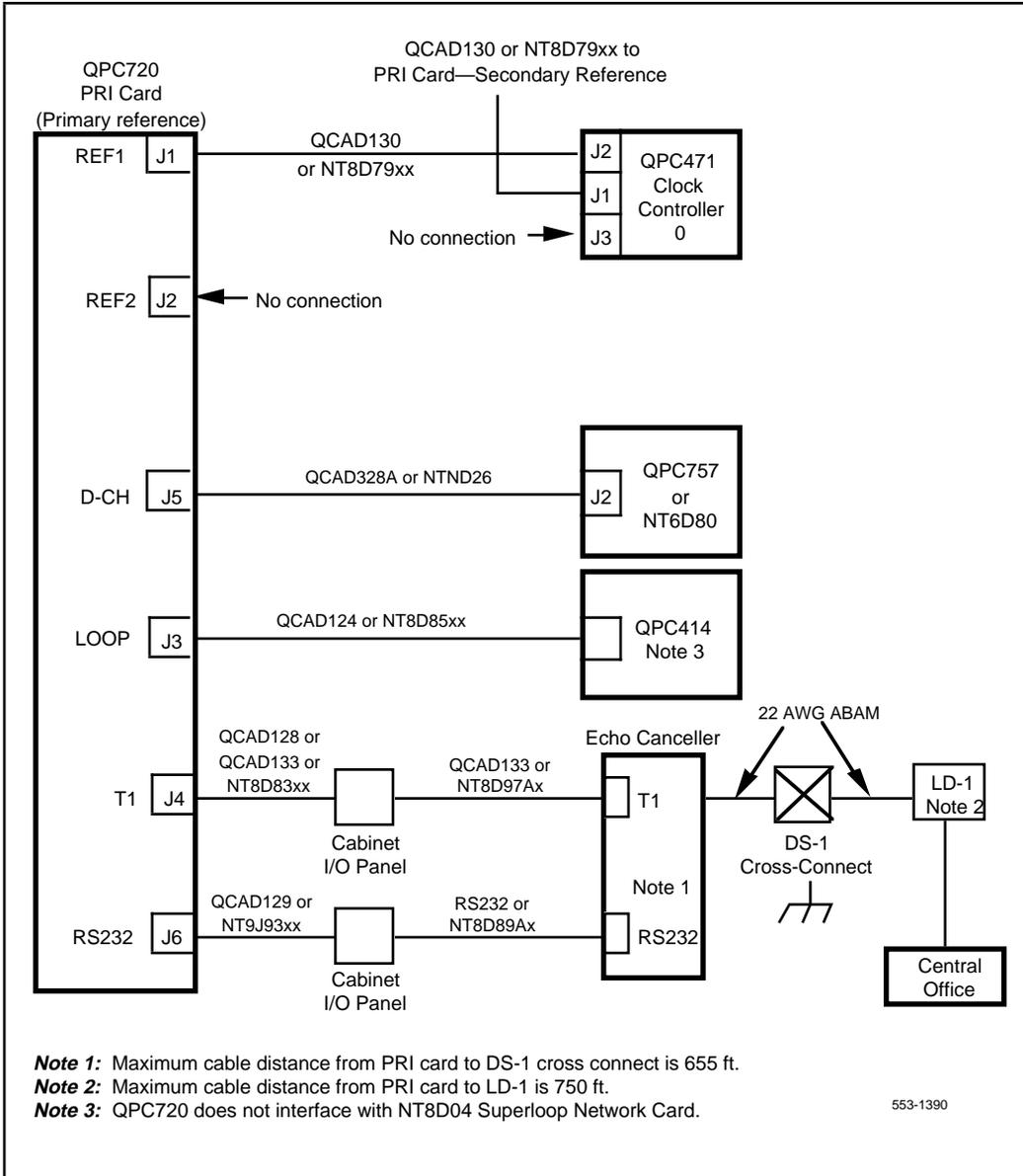
Figure 15
Single group cabling without Echo Canceller (NT, 61/61C)

QCAD130 to PRI or NT8D83xx
to PRI Card
(Secondary reference)

QPC720
PRI Card
(Primary reference)

REF1 J1   QCAD130 to PRI
            or NT8D79xx

J2
QPC471
J1   Clock
      Controller
J3   0

REF2 J2   QCAD130 to PRI
            or NT8D79xx

J2
QPC471
J1   Clock
      Controller
J3   1

QCAD125 or
NT8D75xx

D-Channel J5   QCAD328A
                 or
                 NTND26

J2   QPC757
      or
      NT6D80

LOOP J3   QCAD124 or
            NT8D85xx

QPC414
Note 3

QCAD128
or
QCAD133

T1 J4   or
          NT8D83xx

Cabinet
I/O Panel
Note 1

QCAD133 or
NT8D97Ax

DS-1
Cross-Connect

LD-1
Note 2

Central
Office

RS232 J6 ◄— No connection

Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 655 ft.
Note 2: Maximum cable distance from PRI card to LD-1 is 750 ft.
Note 3: QPC720 does not interface with NT8D04 Superloop Network Card.

553-1391

Figure 16
Single group cabling with Echo Canceller (NT, 61/61C)

Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 655 ft.
Note 2: Maximum cable distance from PRI card to LD-1 is 750 ft.
Note 3: QPC720 does not interface with NT8D04 Superloop Network Card.

553-1392
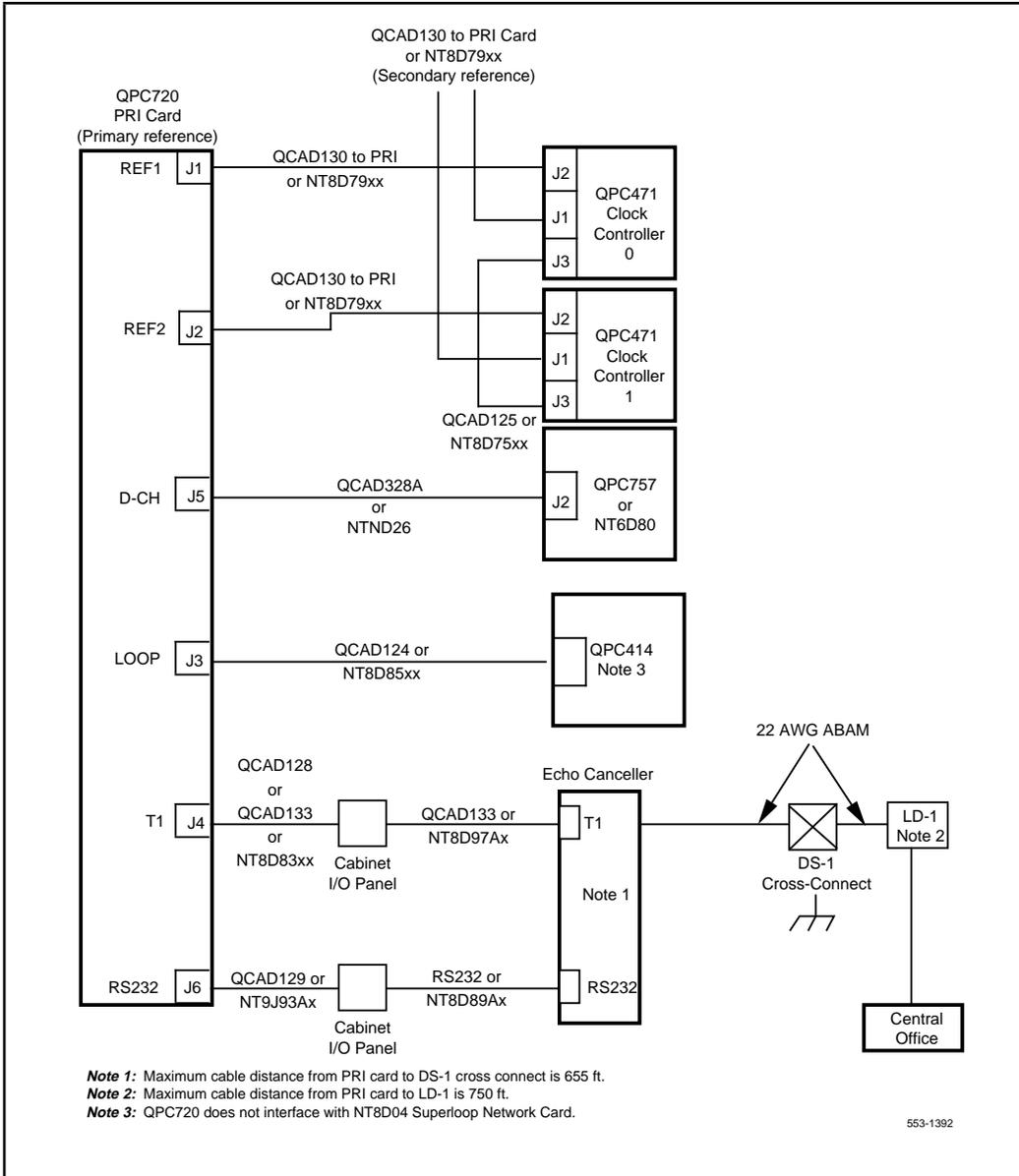
Figure 17
PRI card (QPC720) switch settings

SW2

7-pole
(See transmission
equalization
switch settings)

SW3

8-pole
(All OFF except for PRI mode,
see transmission equalization
switch settings)

553-1503
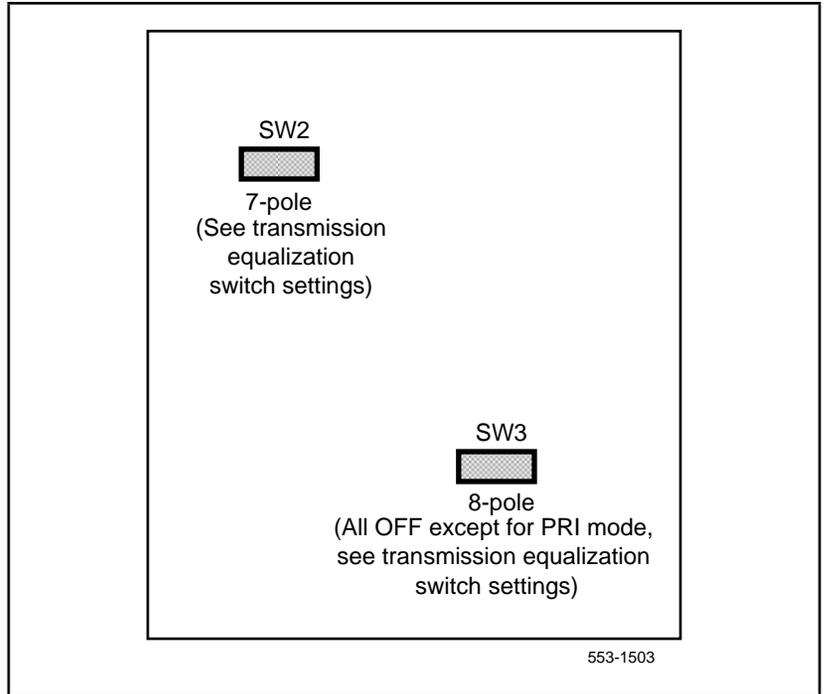
PRI installation: XT, 71

PRI circuit card locations

Each PRI circuit card requires two adjacent slots on a shelf. As many as five circuit cards can be plugged into an empty network shelf, along with the power converter card, depending on the shelf type. See Tables 49 and 50 for card slot positions.

Cable requirements

Shielded 22 AWG (0.644 mm) cable is recommended for connecting the PRI to the cross-connect point. This cable consists of two shielded twisted-pair conductors and two shields.

The transmit and the receive pairs must be individually shielded and enclosed in a polyvinyl jacket. This type of cable is commonly referred to as "6-conductor" cable. T1 cable shielding should be grounded at the cross-connect point.

To manufacture cables of different lengths than the standard cables provided, refer to "PRI cabling information" on page 169.

See Figures 18 and 19 for cabling arrangements with and without an Echo Canceller.

Installing the QPC720 PRI

This procedure describes how to install the QPC720 PRI card in an XT, 71.

Procedure 8
Installing the QPC720 PRI in an XT, 71

1   Determine the cabinet and shelf location of the circuit card to be installed. The following slots can be used if they are not required for other cards.

Table 14
Shelf and slot location of QPC720 in XN, XT, and option 71

System	Shelf	Slot
XN/XT	QSD39 Network (LH) QSD40 Network (RH)	5–10 Note 1 5–10 Notes 1, 2
	QSD39 DTI/PRI only	2–10 Notes 1, 3 12–14
	QSD40 DTI/PRI only	2–3 Note 1 5–13
	NT7D44 Mass Storage QCA 55/58 CAB	2–8 Notes 1, 4
	NT7D45 Mass Storage QCA 23/24 CAB	5–10 Notes 1, 4
71	NT8D35 CPU/NET	5–10 Note 1 13–14
	NT8D35 DTI Exp Cube	2–3 Note 1 5–14
	NT8D47 RPE Cube	1, 11, 12

Note 1: DTI/PRI packs require two slots. The slot indicated is the maximum slot that the pack resides in. For example, in slot 14, the pack uses slots 13 and 14.

Note 2: A DTI/PRI pack cannot be installed in slot 11. The pack would come in contact with the BTU installed between slots 11 and 12.

Note 3: A DTI/PRI pack could reside in slots 10 and 11, but cannot reside in slots 11 and 12 because of powering restrictions.

Note 4: The power regulator (NT6D81AA) can be substituted by the DTI/PRI packs, provided the balance of equipment in card slots 1 through 8 are already equipped.

2   Unpack and inspect circuit cards.

3   Set option switches on the PRI circuit card. See Figure 20 and Table 15.

4   Install PRI circuit card in the assigned shelf and slot.

5   Install network circuit card (if no network loop connection is available).

6   If required, install I/O adapters in I/O panel.

7   Run and connect the PRI cables. Figures 18 and 19 show the XT, 71 PRI cabling. Refer also to Table 16.

       Note: No additional cabling is required for multiple PRIs. The D-channel is associated through software in LD 17, prompt PRI.

8   If required, install connecting blocks at MDF or wall-mounted cross-connect terminal.

9   If required, designate connecting blocks at MDF or wall-mounted cross-connect terminal.

10   If required, install CSU or Echo Canceller.

11   Cross-connect PRI circuits.

12   Add related office data into system memory. Refer to the work order.

13   Run PRI verification tests

Figure 18
XT, 71 cabling without Echo Canceller

QCAD130 or
NT8D79xx to PRI Card
(Secondary reference)

PRI Card
(Primary reference)

QCAD130 or
NT8D79xx

REF1 J1

J2
J1
J3

QPC471
Clock
Controller
0

SCG0

QCAD110

QPC417
Junctor

QCAD110

SCG1

REF2 J2

QCAD130 or
NT8D79xx

J2
J1
J3

QPC471
Clock
Controller
1

D-CH J5

QCAD328A to DCHI or NTND26 to MSDL

DCHI

J2

LOOP J3

QCAD124 or NT8D85xx

Network
QPC414
Note 3

T1 J4

QCAD128
or
QCAD133
or
NT8D83xx

Cabinet
I/O Panel
Note 1

QCAD133 or NT8D97Ax

DS-1
Cross-Connect

LD-1
Note

Central
Office

RS232 J6   ◄─ No connection

Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 655 ft.

Note 2: Maximum cable distance from PRI card to LD-1 is 750 ft.

Note 3: PRI does not interface with NT8D04 Superloop Network Card.

553-1393.200.71/XT

Figure 19
XT, 71 cabling with Echo Canceller

Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 655 ft.

Note 2: Maximum cable distance from PRI card to LD-1 is 750 ft.

Note 3: PRI does not interface with Superloop Network Card.

553-1394.200.71/XT
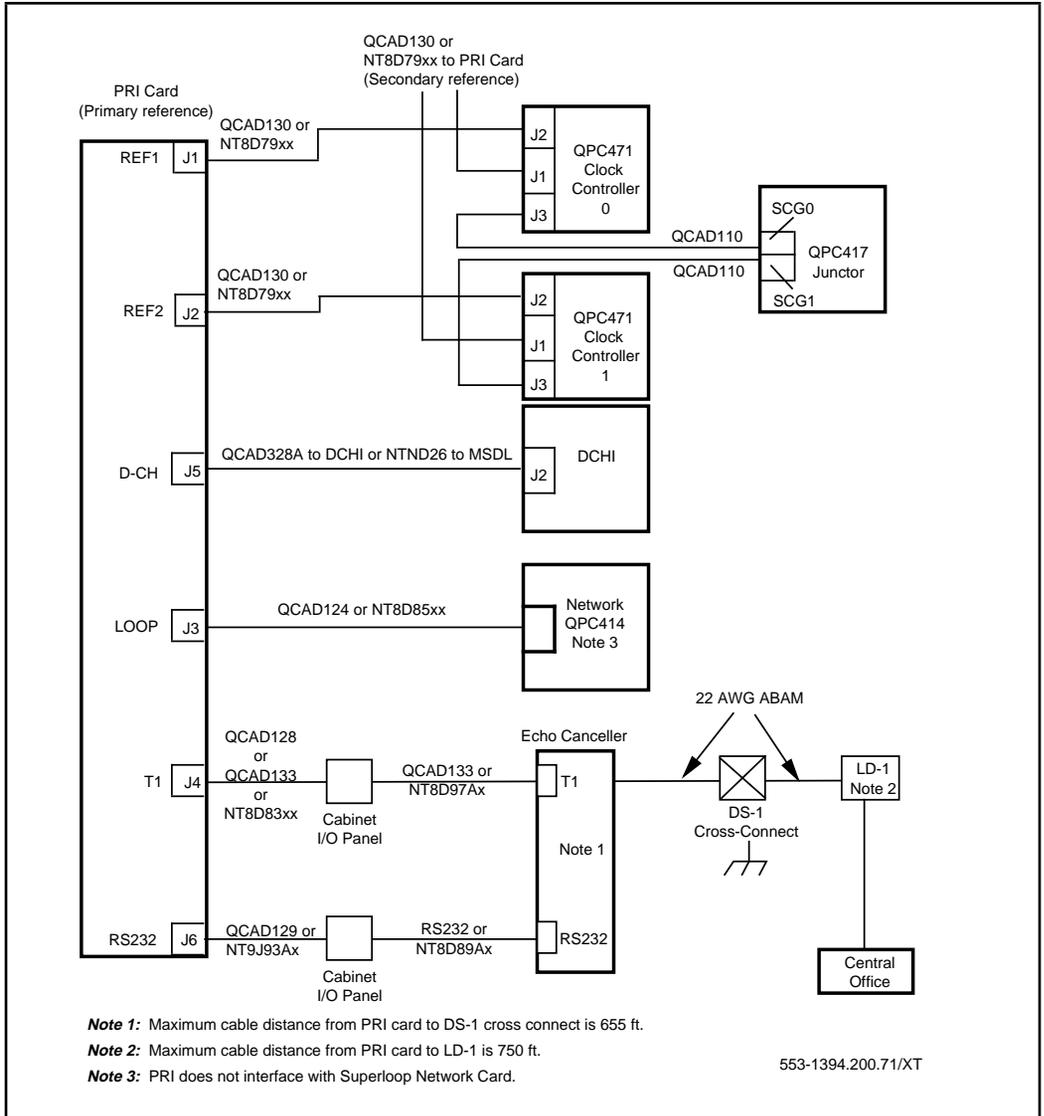
Figure 20
Option switch settings for PRI circuit card

SW2

7-pole
(See transmission
equalization
switch settings)

SW3

8-pole
(All OFF except for PRI mode,
see transmission equalization
switch settings)

553-1503
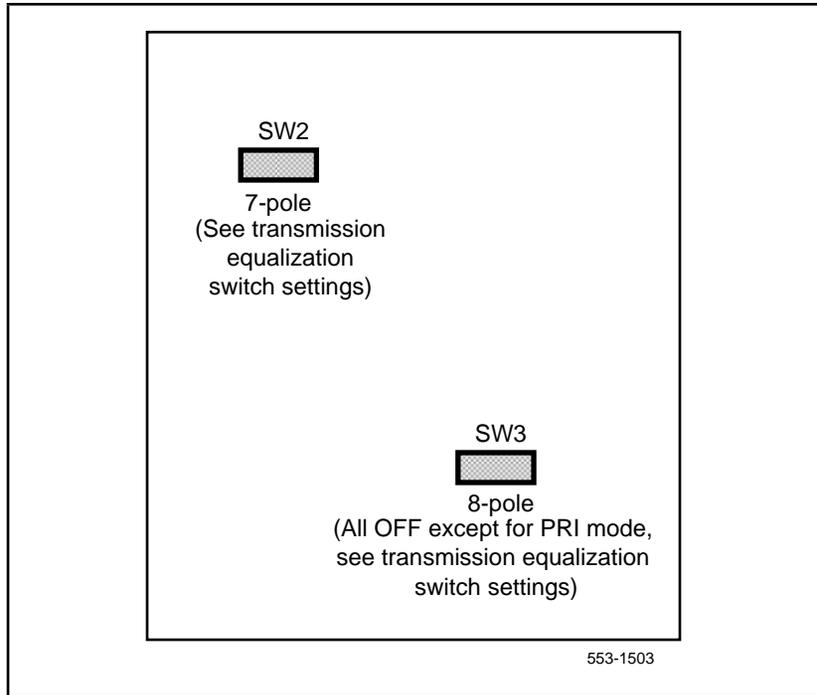
Table 15
Transmission equalization switch settings for PRI

Switch S2 settings	To repeated facility	To cross-connect point
5 on	0–45 m (0–150 ft)	0–30 m (0–100 ft)
2, 4, 6 on	46–135 m (151–450 ft)	31–100 m (101–355 ft)
1, 3, 7 on	136–225 m (451–750 ft)	101–200 m (356–655 ft)
Switch 3 option for DTI with ESF		
SW3–1 on = extended superframe format (ESP) off = superframe format (SF)		

Note 1: All positions on S2 (location B22) are OFF except as shown under the column labeled "Switch S2 settings."

Note 2: The switch 3 option for DTI with ESF applies to only X11 release 16, 17, and 18. All other positions on the 8-pole SW3 (location E37) should be OFF.

Note 3: Prior to X11 release 19 (releases 16, 17, and 18), you must set the framing format as ESF with the DLOP prompt in LD 17 before you set SW3–1 on the card for the DTI with ESF option.

Note 4: Beginning with X11 release 19, framing format, line encoding, and method of yellow alarm are selectable for both DTI and PRI in LD 17 with the DLOP, LCMT, and YALM prompts. All SW3 switch positions should be OFF.

Table 16
Cable connections and destinations for XT, 71 (Part 1 of 2)

Cable	From	Des.	Con.	To	Des.	Con.	Notes
QCAD130 NT8D79xx	QPC720			J1	QPC471QC P775	CC-0	1
QCAD130 NT8D79xx	QPC720			J1	QPC471 QCP775	CC-0	2
QCAD130 NT8D79xx	QPC720			J2	QPC471 QCP775	CC-1	1
QCAD130 NT8D79xx	QPC720			J2	QPC471 QCP775	CC-1	2
QCAD110 NT8D74xx	QPC471 QCP775	CC-0	J3	QPC417	JCTR	J11	3
QCAD110 NT8D74xx	QPC471 QCP775	CC-1	J3	QPC417	JCTR	J12	
QCAD124 NT8D85xx	QPC720		J3	Network			4
QCAD328A	QPC720		J5	QPC757		J2	5
NTND26	QPC720		J5	NT6D80			X11 release 18 and later
QCAD128 NT8D83xx	QPC720		J4	I/O Panel			6
QCAD133 NT8D97Ax	I/O Panel			Patch Panel			6
QCAD129 NT9J93xx	QPC720		J6	I/O Panel			6

Table 16
Cable connections and destinations for XT, 71 (Part 2 of 2)

Cable	From	Des.	Con.	To	Des.	Con.	Notes
RS-232	I/O Panel			Echo Canceller			
RS-232	QPC720		J6	Echo Canceller			7
QCAD133 NT8D83xx	QPC720		J4	Patch Panel			7
RS-232	QPC720		J6	Echo Canceller			7

Note 1: Only when primary clock source.

Note 2: Only when secondary clock source.

Note 3: Multi-group junctor board connection.

Note 4: Run to connector on network pack.

Note 5: Run directly to DCHI card.

Note 6: Run by means of cabinet I/O panel to CSU, Echo Canceller, or cross-connect terminal.

Note 7: Run by means of cabinet I/O panel to cross-connect terminal or Echo Canceller from non-shielded system.

Removing the QPC720 PRI

The following procedure explains how to remove the PRI card from the XT, 71.

Procedure 9
Removing the QPC720 PRI from XT, 71

1   Disable the D-channel in LD 96.

2   Disable Network Loop using LD 60. The command is DISL x.

3   If the circuit card is being completely removed, not replaced, remove data from memory. See *ISDN Primary Rate Interface description and administration* (553-2901-100).

4   Determine the location of the circuit cards to be removed.

5   Remove cross connections at MDF to wall-mounted cross-connect terminal.

6   Disconnect PRI cables at Echo Canceller and at carrier interface (for example, Office Repeater and NCTE equipment).

7   Tag and disconnect cables from card. Rearrange Clock Controller card cables if required. This will affect call processing on DTI/PRI loops.

8   Remove PRI and network circuit cards. If the other circuit of a dual network card is in use, DO NOT remove the network card.

9   Pack and store circuit card.

PRI installation: 81/ 81C

PRI circuit card locations

Each PRI circuit card requires two adjacent slots on a shelf. As many as five circuit cards can be plugged into an empty network shelf, along with the power converter card, depending on the shelf type.

Cable requirements

Shielded 22 AWG (0.644 mm) cable is recommended for connecting the PRI to the cross-connect point. This cable consists of two shielded twisted-pair conductors and two shields.

The transmit and the receive pairs must be individually shielded and enclosed in a polyvinyl jacket. This type of cable is commonly referred to as "6-conductor" cable. T1 cable shielding should be grounded at the cross-connect point.

To manufacture cables of different lengths than the standard cables provided, refer to .

Installing the QPC720 PRI

This procedure describes how to install the QPC720 PRI card in an 81/81C.

Procedure 10
Installing the QPC720 PRI in an 81/81C

1   Determine the location of the circuit card to be installed. The following slots can be used if they are not required for other cards.

Table 17
Shelf and slot location of QPC720 in 81

System	Shelf	Slot
81/81C	Core	0-3
	Network Module	5–10, 13–14
	RPE	1, 11, 12

2   Unpack and inspect circuit cards.

3   Set option switches on the PRI circuit card. (Figure 23 and Table 18.)

4   Install PRI QPC720 card in the assigned shelf and slot.

5   Install network QPC414 card (if no network loop connection is available).

6   If required, install I/O adapters in I/O panel.

7   Run and connect the PRI cables. Figures 21 and 22 show the 81/81C PRI cabling. Refer also to Table 19.

8   If required, install connecting blocks at MDF or wall-mounted cross-connect terminal.

9   If required, designate connecting blocks at MDF or wall-mounted cross-connect terminal.

10   If required, install CSU or Echo Canceller.

11   Cross-connect PRI cables.

12   Add related configuration data into Meridian 1 system memory. Refer to the work order.

13   Run PRI verification tests.

Figure 21
Option 81/81C cabling without Echo Canceller

QCAD130 or
NT8D79xx to PRI Card
(Secondary reference)

PRI Card
(Primary reference)

REF1   J1

QCAD130 or
NT8D79xx

J2
J1
J3

QPC471
Clock
Controller
0

SCG0

QCAD110

QPC417
Junctor

QCAD110

SCG1

REF2   J2

QCAD130 or
NT8D79xx

J2
J1
J3

QPC471
Clock
Controller
1

D-CH   J5

QCAD328A to DCHI or NTND26 to MSDL

DCHI

J2

LOOP   J3

QCAD124 or NT8D85xx

Network
QPC414
Note 3

T1   J4

QCAD128
or
QCAD133
or
NT8D83xx

Cabinet
I/O Panel
Note 1

QCAD133 or NT8D97Ax

DS-1
Cross-Connect

LD-1
Note

Central
Office

RS232   J6   ← No connection

Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 655 ft.

Note 2: Maximum cable distance from PRI card to LD-1 is 750 ft.

Note 3: PRI does not interface with NT8D04 Superloop Network Card.

553-1393.200.81C

Figure 22
81/81C cabling with Echo Canceller

Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 655 ft.
Note 2: Maximum cable distance from PRI card to LD-1 is 750 ft.
Note 3: PRI does not interface with Superloop Network Card.

553-1394.200.81
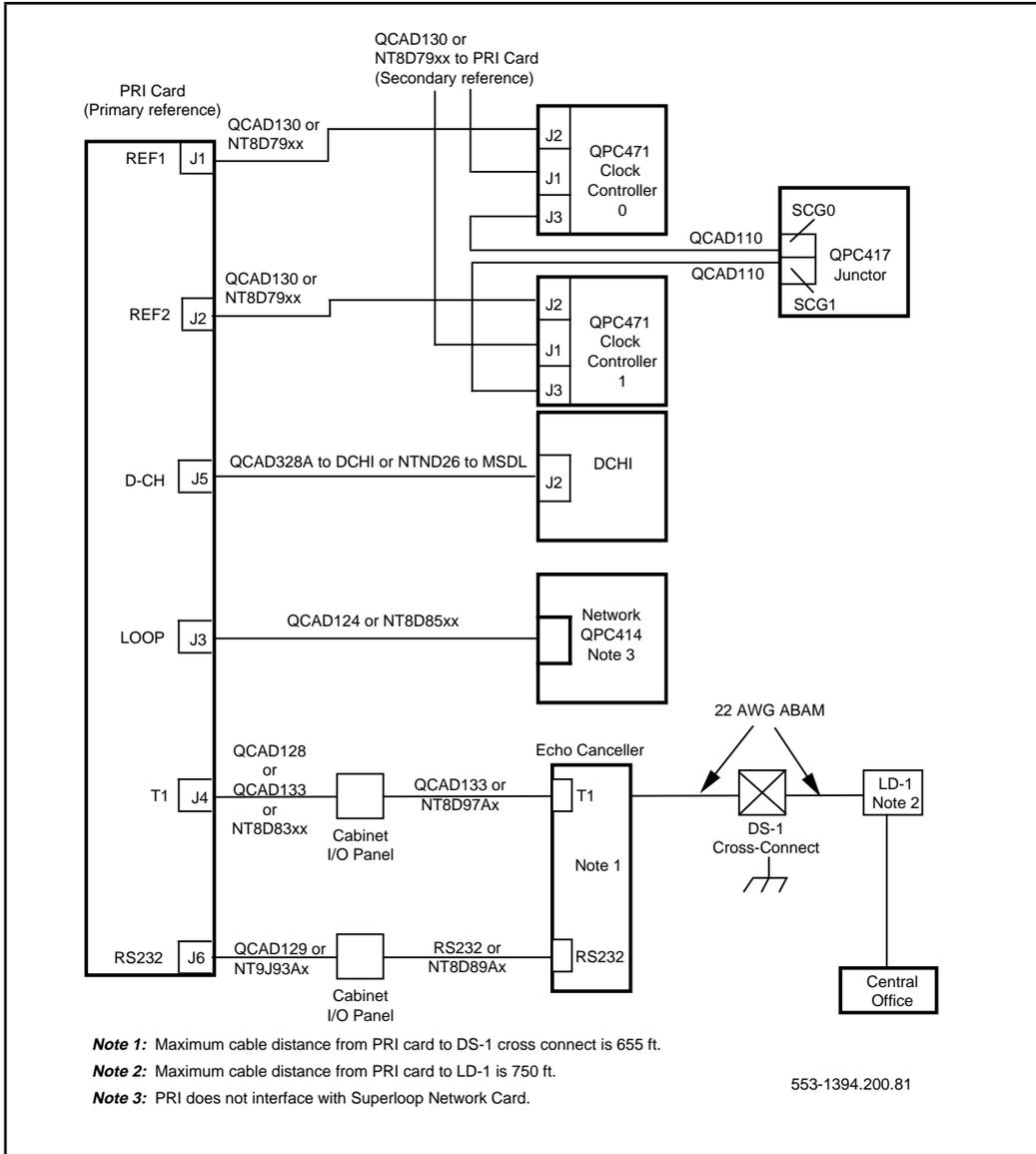
Figure 23
Option switch settings for PRI circuit card

SW2

7-pole
(See transmission
equalization
switch settings)

SW3

8-pole
(All OFF except for PRI mode,
see transmission equalization
switch settings)

553-1503
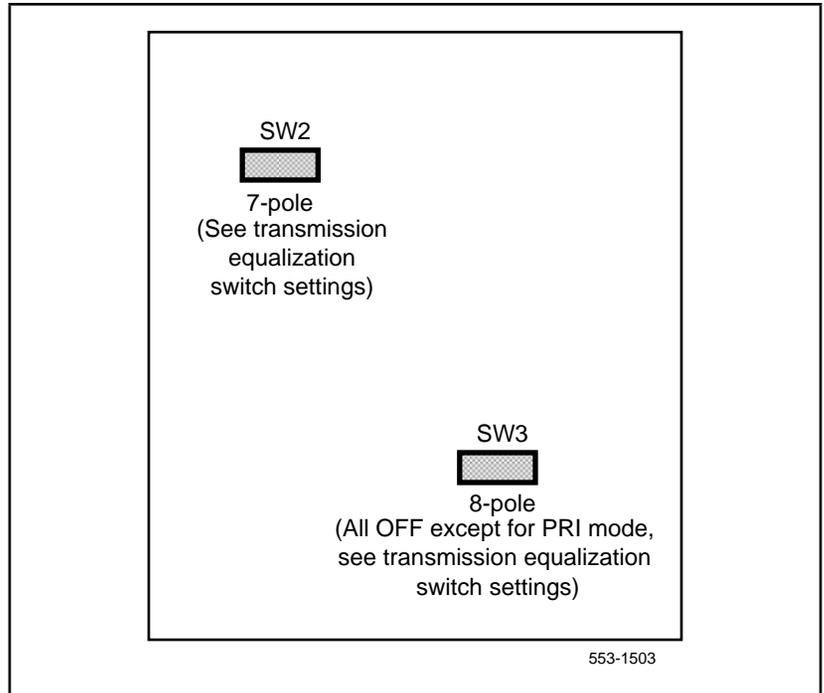
Table 18
Transmission equalization switch settings for PRI

Switch S2 settings	To repeated facility	To cross-connect point
5 on	0–45 m (0–150 ft)	0–30 m (0–100 ft)
2, 4, 6 on	46–135 m (151–450 ft)	31–100 m (101–355 ft)
1, 3, 7 on	136–225 m (451–750 ft)	101–200 m (356–655 ft)
Switch 3 option for DTI with ESF		
SW3–1 on = extended superframe format (ESP) off = superframe format (SF)		

Note 1: All positions on S2 (location B22) are OFF except as shown under the column labeled "Switch S2 settings."

Note 2: The switch 3 option for DTI with ESF applies to only X11 release 16, 17, and 18. All other positions on the 8-pole SW3 (location E37) should be OFF.

Note 3: Prior to X11 release 19 (releases 16, 17, and 18), you must set the framing format as ESF with the DLOP prompt in LD 17 before you set SW3–1 on the card for the DTI with ESF option.

Note 4: Beginning with X11 release 19, framing format, line encoding, and method of yellow alarm are selectable for both DTI and PRI in LD 17 with the DLOP, LCMT, and YALM prompts. All SW3 switch positions should be OFF.

Table 19
Cable connections and destinations for 81/81C (Part 1 of 2)

Cable	From	Des.	Con.	To	Des.	Con.	Notes
QCAD130 NT8D79xx	QPC720			J1	QPC471 QCP775	CC-0	Only when primary clock source
QCAD130 NT8D79xx	QPC720			J1	QPC471 QCP775	CC-0	Only when secondary clock source
QCAD130 NT8D79xx	QPC720			J2	QPC471 QCP775	CC-1	Only when primary clock source
QCAD130 NT8D79xx	QPC720			J2	QPC471 QCP775	CC-1	Only when secondary clock source
QCAD110 NT8D74xx	QPC471 QCP775	CC-0	J3	QPC417	JCTR	J11	Multi-group junctor board connection
QCAD110 NT8D74xx	QPC471 QCP775	CC-1	J3	QPC417	JCTR	J12	
QCAD124 NT8D85xx	QPC720		J3	Network			Run to connector on network pack
QCAD328	QPC720		J5	QPC757		J2	Run directly to DCHI card
NTND26	QPC720		J5	NT6D80			X11 release 18 and later
QCAD128 NT8D83xx	QPC720		J4	I/O Panel			Run via cabinet I/O panel to CSU, Echo Canceller, or cross-connect terminal

Table 19
Cable connections and destinations for 81/81C (Part 2 of 2)

Cable	From	Des.	Con.	To	Des.	Con.	Notes
QCAD133 NT8D83xx	I/O Panel			Patch Panel			Run via cabinet I/O panel to CSU, Echo Canceller, or cross-connect terminal
QCAD129 NT9J93xx	QPC720		J6	I/O Panel			Run via cabinet I/O panel to CSU, Echo Canceller, or cross-connect terminal
RS-232	I/O Panel			Echo Canceller			
RS-232	QPC720		J6	Echo Canceller			Run via cabinet I/O panel to Echo Canceller or cross-connect terminal from non-shielded system
QCAD133 NT8D83xx	QPC720		J4	Patch Panel			Run via cabinet I/O panel to Echo Canceller or cross-connect terminal from non-shielded system
RS-232	QPC720		J6	Echo Canceller			Run via cabinet I/O panel to Echo Canceller or cross-connect terminal from non-shielded system

Removing the QPC720 PRI

The following procedure explains how to remove the PRI card from the 81/81C.

Procedure 11
Removing the QPC720 PRI from 81/81C

1   Disable the D-channel in LD 96.

2   Disable Network Loop using LD 60. The command is DISL x.

3   If the circuit card is being completely removed, not replaced, remove data from memory. See *ISDN Primary Rate Interface description and administration* (553-2901-100).

4   Determine the location of the circuit cards to be removed.

5   Remove cross connections at MDF to wall-mounted cross-connect terminal.

6   Disconnect PRI cables at Echo Canceller and at carrier interface (for example, Office Repeater and NCTE equipment).

7   Tag and disconnect cables from card. Rearrange Clock Controller card cables if required. This will affect call processing on DTI/PRI loops.

8   Remove PRI and network circuit cards. If the other circuit of a dual network card is in use, DO NOT remove the network card.

9   Pack and store circuit card.

Clock Controller Installation

There are three steps to installing a Clock Controller:

1 Determining the location of the Clock Controller card (shelf and slot).

2 Setting the switches on the card.

3 Inserting the card and connecting the cables. This step may also entail removing an old card.

This chapter describes the details of this process.

CAUTION

Do not deviate from the procedures described in this section, as deviation stops call processing.

Determining slots and shelves

The Clock Controller card installation site varies from system to system. Table 20 shows the systems, the shelves used, and the available slot or slots.

Table 20
Clock Controller shelves and slots

System	Shelf	Slot(s)
ST, STE	CE	5-12
RT	network	13
NT, 51/ 51C	QSD39 network (LH) QSD40 network (RH)	13 2
XN	QSD17 CPU	14
XT	QSD62	15
21, 21E	NT8D11 CE	4-7
61/ 61C	NT6D39 CPU/NET	9
71	NT8D34 CE CPU/MEM	14
81/ 81C	CORE/NET	9

Before installing a Clock Controller, set the switches as shown in Tables 21, 22, 23, and 24. The first three tables display the settings for different vintages of the QPC471. Table 24 shows the settings for the QPC775.

Table 21
Clock Controller switch settings for QPC471 vintage A

System	Switch	Setting
NT, RT	SW2	ON
XN, XT	SW2	OFF
Vintage A applies only to these systems		

Table 22
Clock Controller switch settings for QPC471 vintages B through G

System	Switch	Setting
ST, STE, 21, 21A, 21E	SW1	ON
	SW2	OFF
	Jumper Plug J1	TP8-9
	Jumper Plug J2	TP11-TP12
NT, RT, 51, 61	SW1	ON
	SW2	OFF
	Jumper Plug J1	TP8-TP9
	Jumper Plug J2	TP11-TP12
XN, XT, 71	SW1	OFF
	SW2	OFF
	Jumper Plug J1	TP8-TP9
	Jumper Plug J2	TP11-TP12

Table 23
Clock Controller switch settings for QPC471 vintage H

System	SW1				SW2				SW4			
ST, STE, 21A, 21, 21E	on	on	on	on	off	off	off	off	off	off	off	off
SN	on	on	on	on	on	on	on	on	off	off	off	off
RT, NT, 51/51C, 61/61C	on	on	on	on	off	off	off	off	off	on	*	*
XN, XT, 71, 81/81C	off	off	off	off	off	off	off	off	off	on	*	*

Cable length between the J3 faceplate connectors:												
0-4.3 m	(0-14 ft.)										off	off
4.6–6.1m	(15–50 ft.)										off	on
6.4–10.1m	(21–33 ft.)										on	off
10.4–15.2 m	(34–50 ft.)										on	on

• If there is only one Clock Controller card in the system, set to OFF. If there are two Clock Controller cards, set to match the cable length between the J3 faceplate connectors. Determine the total cable length (no single cable can exceed 25 ft.) between the J3 connectors. Both cards must have the same setting.

Table 24
Clock Controller switch settings for QPC775

System	SW2	SW3	SW4
NT, RT, ST, STE, 21, 21A, 21E, 51/51C, 61/61C	ON	OFF	ON
SN	ON	ON	OFF
XN, XT, 71, 81/81C	OFF	OFF	ON

Replacing a Clock Controller

Step 2 in Procedure 12 explains how to replace a card.

Do not disable an active clock or a clock associated with an active CPU.

Installing a Clock Controller

Be sure to inspect the Clock Controller card before installing it. Refer to the tables at the beginning of this chapter for shelf, slot, and switch setting information. Remember not to use both the QPC471 and the QPC775 on a single system. QPC471 vintage H cards cannot be mixed with cards of an earlier vintage.

Starting the Clock Controller

The Clock Controller, when first enabled, is in free run mode. It stays in this mode for several minutes before being switched to tracking mode. Manual mode setting is possible via LD 60.

For the earlier QPC471 vintages, up to 20 minutes may pass before the clock actually locks and tracks. The QPC471 vintage G and H cards begin tracking within 5 minutes.

Clock Controller commands

During the installation procedure you will use some of the Clock Controller commands available in LD 60. In the list of commands below, "x" refers to the Clock Controller number: 0 for the card associated with CPU 0, 1 for the card associated with CPU 1.

— DIS CC x: Disable system Clock Controller x

— DSCK loop: Disable clock for specified loop

— DSYL loop: Disable yellow alarm processing for loop

— ENCK loop: Enable clock for specified loop

— ENL CC x: Enable system Clock Controller x

— ENYL loop: Enable yellow alarm processing for loop

— EREF: Enable automatic switchover of system clocks

— SSCK x: Obtain status of system clock x

— SWCK: Switch system clock between active and standby

— TRCK aaa: Set Clock Controller track where aaa can be PCK (the primary DTI/PRI reference), SCLK (the secondary DTI/PRI reference), or FRUN (free running)

Procedure 12
Installing the Clock Controller in the ST, STE, 21, 21E, RT, 51/ 51C, and NT half group

> *Note:* Refer to the tables in this section to be sure you are using the correct vintage.

1   Set the ENL/DIS toggle switch to DIS (disable) on the new circuit card.

2   If replacing an existing card, do the following:

— Perform a status check on the clock with the SSCK command in LD 60. The new controller should have the same status.

— Disable the old card using LD 60.

> *Note:* ERR20 messages may be generated. These can usually be ignored. However, excessive clock switching should be avoided, especially when counters are near the maintenance or out-of-service thresholds. Excessive switching could generate threshold-exceeded messages or cause the PRI to be automatically disabled. Check the counters in LD 60. If necessary, reset the counters using the RCNT command.

— Set the old card's faceplate ENL/DIS switch to DIS.

— Disconnect cables from the old Clock Controller card and remove the card from the shelf.

> *Note:* The Clock Controller status display in this mode indicates NO UART (no universal async receiver transmitter). Do not perform a clock status check when receiving this code.

3   Install the new Clock Controller in the selected slot.

4   Connect the cables to the new card.

— Connect the primary reference to J2.

— If applicable, connect the secondary reference to J1.

5   Set the faceplate ENL/DIS switch to ENL (enable).

6   Enable the Clock Controller by entering ENL CCx in LD 60.

7   Set the error detection thresholds and clock synchronization control in LD 73. (Optional if replacing card; required with new installation.)

8   To track on a primary or secondary reference clock, use LD 60. Use the following command:

TRCK   PCK   (for primary)
       SCLK   (for secondary)
       FRUN   (for free-run)

9   Issue the SSCK command to check controller status.

Installing the Clock Controller in a single group

Procedure 13
Installing the Clock Controller in the NT, 61/ 61C

> *Note:* Refer to the tables in this section to be sure you are using the correct vintage.

Procedure 14

1   Set faceplate ENL/DIS switch to DIS (disable) on the new circuit card.

2   If replacing an existing card, do the following:

— Perform a status check on the clock with the SSCK command. The new card should have the same status.

— Disable the old card using LD 60. (Only a card in standby state associated with a standby CPU can be disabled using software.)

> *Note:* ERR20 messages may be generated. These can usually be ignored. However, excessive clock switching should be avoided, especially when counters are near the maintenance or out-of-service thresholds. Excessive switching could generate threshold-exceeded messages or cause the PRI to be automatically disabled. Check the counters in LD 60. If necessary, reset the counters using the RCNT command.

— Set the old card's faceplate ENL/DIS switch to DIS.

— Disconnect the cables from the old Clock Controller card and remove the card from the shelf.

> *Note:* The Clock Controller status display in this mode indicates NO UART (no universal async receiver transmitter). Do not perform a clock status check when receiving this code.

3   If the 3PE switches have not been modified to recognize the Clock Controller card, adjust them as follows:

QSD39 (left-hand side)   SW1 OFF (Option 61 shelf 0)
   SW2 ON
   SW4 OFF

QSD40 (right-hand side)   SW1 OFF (Option 61 shelf 1)
   SW2 ON
   SW4 OFF
   SW8 OFF

4   Set faceplate ENL/DIS switch to DIS.

5   Install Clock Controller in the selected slot.

6   Run and connect cables

— Connect the primary reference to J2.

— If available, connect the secondary reference to J1.

— Connect the cable between the two clocks to J3 on each controller card.

7   Set the faceplate ENL/DIS switch to ENL.

8   Enable the Clock Controller by entering ENL CC x in LD 60.

9   Set the error detection thresholds and clock synchronization controls in LD 73. (Optional with card replacement; required with new installation.)

10   To track on a primary or secondary reference clock, use LD 60. Use the following command:

TRCK   PCK   (for primary)
                SCLK   (for secondary)
                FRUN   (for free-run)

11   Issue the status check command, SSCK.

12   (Optional) Activate the new Clock Controller with the LD 60 SWCK command.

13   Repeat, if necessary, for the second Clock Controller.

Procedure 15
Installing the Clock Controller in the XN, XT, 71, and 81/ 81C

Note: Refer to the tables in this section to be sure you are using the correct vintage.

1   Set faceplate ENL/DIS switch to DIS on new Clock Controller card.

2   If replacing an existing Clock Controller card, do the following:

— Disable only a card in standby state that is not active and is associated with the standby CPU. Disable the card using the DIS CC X command in LD 60.

Note: ERR 020 messages may be generated—ignore them. To avoid exceeding maintenance or out-of-service thresholds, reset the error counters (LCNT) for PRIs providing a reference clock for the Clock Controller. Reset the counters using the RCNT command in LD 60.

— Set the old card's faceplate ENL/DIS switch to DIS.

— Disconnect the cables from the old Clock Controller card and remove it from the shelf.

3   Install the new Clock Controller in the selected slot.

4   Run and connect the cables

— Connect the primary reference to J2.

— If available, connect the secondary reference to J1.

— Connect the cable from J3 on each controller card to the junctor group connector, QPC417.

5   Set the faceplate ENL/DIS switch to ENL.

6   Execute the ENL CC X command in LD 60. The faceplate LED should go to the OFF state.

7   Enable the Clock Controller by entering ENL CC x in LD 60.

8   Set the error detection thresholds and clock synchronization controls in LD 73. (Optional if replacing card; required with new installation.)

9   To track on a primary or secondary reference clock, use LD 60. The command follows:

TRCK   PCK   (for primary)
SCLK   (for secondary)
FRUN   (for free-run)

10   Issue the status check command, SSCK.

11   (Optional) Activate the newly installed Clock Controller with the LD 60 SWCK command.

12   Repeat, if necessary, for the second Clock Controller.

DCHI installation for all systems

Installing the QPC757 DCHI

Installation instructions for the QPC757 DCHI are the same for the ST, STE, RT, NT, and XT, as well as the 21, 21E, 51/51C, 61/61C, 71, and 81/81C. See Figures 24 and 25 for option switch settings per port number of the DCHI card in Primary Rate Interface.

Refer to *X11 input/output guide* (553-3001-400) for administration and maintenance programs. The following procedures describe how to install the QPC757 DCHI card.

Procedure 16
Installing the QPC757 DCHI

1   Determine the cabinet and shelf location of the circuit card to be
     installed.

     The QPC757 DCHI card can be installed in any slot appropriate for an
     I/O port card on a network shelf. For single CPU systems only, the
     QPC757 DCHI card can be located on the Common Equipment (CE)
     shelf. Refer to Tables 49 and 50 for your system capabilities.

2   Unpack and inspect card.

3   Set option switches and jumper plugs on the DCHI card. For PRI
     capability, set port J2 to odd. For ISL capability, set port J2 for high
     speed or low speed programming.

4   Set faceplate toggle switch to DISABLE.

5   Install DCHI card into the assigned shelf or module and slot.

6   Run and connect DCHI cables: connect QPC757 J2 to QPC720 PRI
     J5 with a QCAD328A cable.

7   Set faceplate toggle switch to ENABLE.

8   Enable the loop in LD 60.

9   Coordinate start-up and verification of the DCHI with the start-up of the
     PRI. See *ISDN Primary Rate Interface description and administration*
     (553-2901-100). Enable the DCHI card using LD 96, command ENL
     DCH x.

Figure 24
QPC757 option and PRI/ISL high speed programming switch settings

QPC757C DCHI

1234
on [ ] on

jumper

Jumpers for port J1, the async port. The port is always the lower, even number.

DCE	RS-232
DTE	HS (RS-422)
DCE	RS-232
DTE	HS (RS-422)

Port address switch. See table below.

Jumpers for port J2, the D-channel port. The port is always the higher, odd number.

DCE	RS-232
DTE	HS (RS-422)
DCE	RS-232
DTE	HS (RS-422)

Place jumper plugs in sockets as shown. This selects the DTE and RS-422 options required for the D-channel.

Meridian 1 I/O port selection: Port address switch settings					
Port number		Switch 1	Switch 2	Switch 3	Switch 4
J1	J2				
0	1	Off	Off	Off	Off
2	3	Off	Off	On	Off
4	5	Off	On	Off	Off
6	7	Off	On	On	Off
8	9	On	Off	Off	Off
10	11	On	Off	On	Off
12	13	On	On	Off	Off
14	15	On	On	On	Off

553-1384

Figure 25
QPC757 option switch settings for PRI/ISL low speed programming

QPC757C DCHI

on 1234 on

jumper

Jumpers for port J1,
the async port.
The port is always the
lower, even number.

DCE ▩ ▩ RS-232
DTE ☐ ☐ HS (RS-422)
DCE ▩ ▩ RS-232
DTE ☐ ☐ HS (RS-422)

Jumpers for port J2,
the D-channel port.
The port is always the
higher, odd number.

DCE ☐ ▩ RS-232
DTE ▩ ☐ HS (RS-422)
DCE ☐ ▩ RS-232
DTE ▩ ☐ HS (RS-422)

Place jumper plugs in
sockets as shown.
This selects the DTE
and RS-232 options
required for the
D-channel.

Meridian SL-1 I/O Port Selection: Port Address Switch Settings					
Port Number		Switch 1	Switch 2	Switch 3	Switch 4
J1	J2				
0	1	Off	Off	Off	Off
2	3	Off	Off	On	Off
4	5	Off	On	Off	Off
6	7	Off	On	On	Off
8	9	On	Off	Off	Off
10	11	On	Off	On	Off
12	13	On	On	Off	Off
14	15	On	On	On	Off

553-1509

D-channel parameter downloading

Beginning with X11 release 14, system upgrades often contain changes to D-channel parameters. The Meridian 1 software automatically downloads the new parameters to each D-channel Interface (DCHI) circuit card upon SYSLOAD. When this occurs, the D-channel is temporarily disabled and then automatically reenabled.

Three situations require manual disabling and reenabling of each DCHI to ensure parameter downloading:

— Performing a parallel load and switching over to the second CPU

— Following an alarm condition for the T1 loop carrying the D-channel (but the D-channel is still operational)

— Following SYSLOAD when using ISDN Signaling Link (ISL)

Removing the QPC757 DCHI

The following procedure explains how to remove the QPC757 DCHI card.

CAUTION

The QPC757 DCHI must be software disabled before it is hardware disabled to prevent initialization.

**Procedure 17
Removing the QPC757 DCHI**

1   Disable the QPC757 DCHI using LD 96, command DIS DCH x.

2   Disable asynchronous port J1 in LD 48 to prevent initialization.

3   Disable loop in LD 60.

4   If the circuit card is being removed, not replaced, remove data from memory. See the *ISDN Primary Rate Interface description and administration* (553-2901-100) document.

5   Determine the cabinet and shelf location of the card to be removed.

6   Set faceplate toggle switch to DISABLE.

7   Disconnect QPC757 DCHI cables.

8   Remove QPC757 DCHI card.

9   Pack and store circuit card.

MSDL installation for all systems

Installing the MSDL

The MSDL card is installed the same way for the STE, NT, RT, XT 21E,
51/51C, 61/61C, 71, and 81/81C systems. See Figure 26 and Table 25 for the
port and interface switch settings.

The MSDL card can go into the following slots:

STE/21E	CE/PE Network Module slot 4–9
NT, 51/51C, 61/61C	CPU/Network Module slot 1–8, 13
XT, 71	Network Module slot 5–14
81/81C	Network Module slot 5–14

Refer to *X11 input/output guide* (553-3001-400) and *Multi-purpose Serial
Data Link description* (553-3001-195) for more information.

Procedure 18
Installing the MSDL card

1   Determine module and slot location for the MSDL card. Refer to the list
     on the previous page.

2   Unpack and inspect the MSDL card.

3   Set the MSDL switch settings to correspond to Table 25 and Figure 26.

4   Insert the MSDL card into the selected card slot of the module
     following the card guides.

5   Observe the red LED on the MSDL faceplate. If it turns on, flashes
     three times, and stays on continuously, the MSDL is operating
     correctly but is not yet enabled.

     If the LED turns on and stays on continuously without flashing three
     times, the card may be defective. Go to step 8.

6   Run and connect the cables: NT6D80 to QPC720 PRI J5 with a
     NTND26 cable.

7   Enable the MSDL card in LD 96.

     If the red LED has not flashed three times, follow these steps:

8   Unplug the MSDL card and reinsert it. If the red LED still does not flash
     three times, leave the card installed for approximately 10 minutes to
     allow the card to be initialized.

9   After 10 minutes unplug the card, reinsert it, and if the card still does
     not flash three times, the card is defective and must be replaced.
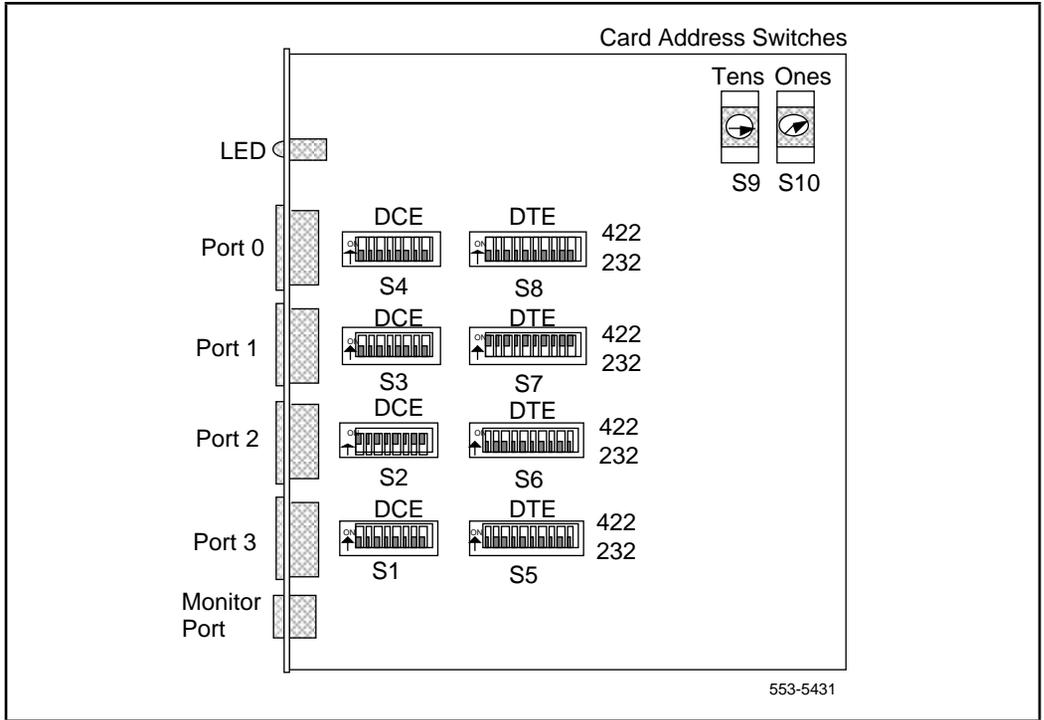
Figure 26
MSDL card layout

553-5431

Table 25
MSDL switch settings

	Port 0—SW4								Port 0—SW8									
RS-232-D	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off
RS-422-A DTE	off	off	off	off	off	off	off	off	on	on	on	on	on	on	on	on	on	on
RS-422-A DCE	on	on	on	on	on	on	on	on	off	off	off	off	off	off	off	off	off	off
	Port 1—SW3								Port 1—SW7									
RS-232-D	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off
RS-422-A DTE	off	off	off	off	off	off	off	off	on	on	on	on	on	on	on	on	on	on
RS-422-A DCE	on	on	on	on	on	on	on	on	off	off	off	off	off	off	off	off	off	off
	Port 2—SW2								Port 2—SW6									
RS-232-D	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off
RS-422-A DTE	off	off	off	off	off	off	off	off	on	on	on	on	on	on	on	on	on	on
RS-422-A DCE	on	on	on	on	on	on	on	on	off	off	off	off	off	off	off	off	off	off
	Port 3—SW1								Port 3—SW5									
RS-232-D	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off
RS-422-A DTE	off	off	off	off	off	off	off	off	on	on	on	on	on	on	on	on	on	on
RS-422-A DCE	on	on	on	on	on	on	on	on	off	off	off	off	off	off	off	off	off	off

Procedure 19
Replacing the MSDL card

1   Disable the MSDL card in LD 96.

2   Disconnect MSDL to PRI cables.

3   Remove the faulty MSDL card.

4   Unpack and inspect the new MSDL card.

5   Set the MSDL switch settings to correspond to Table 25 and Figure 26.

6   Insert the new MSDL card into the selected card slot of the module following the card guides.

7   Observe the red LED on the MSDL faceplate. If it turns on, flashes three times, and stays on continuously, the MSDL is operating correctly but is not yet enabled.

  If the LED turns on and stays on continuously without flashing three times, the card may be defective. Go to step 11.

8   Run and connect NT6D80 to QPC720 PRI J5 with a NTND26 cable.

9   Enable the MSDL card in LD 96.

10   Unplug the MSDL card and reinsert it. If the red LED still does not flash three times, leave the card installed for approximately 10 minutes to allow the card to be initialized.

11   After 10 minutes unplug the card, reinsert it, and if the card still does not flash three times, the card is defective and must be replaced.

NTD12 Dual-port DTI/PRI card description and installation

NT5D12 Dual-port DTI/PRI (DDP) card overview

The NT5D12 is a dual-port 1.5 DTI/PRI card (the DDP firmware functions in DTI or PRI mode) integrating the functionality of two QPC472 DTI/QPC720 PRI cards and one QPC414 ENET into one card. The NT5D12 occupies a single Network shelf slot and provides two DTI/PRI network connections, an optional connection to an external D-Channel Handler, the QPC757 D-Channel Handler Interface (DCHI) or NT6D80 Multi-purpose Serial Data Link (MSDL), and an optional plug-on NTBK51AA Downloadable D-Channel daughterboard (DDCH.)

The NT5D12 DDP card supports all features (except the echo canceller and protocol conversion) of the QPC720. In addition, it maintains the backward compatibility of QPC720.

The NT5D12 DDP card hardware design uses a B57 ASIC E1/T1 framer. The carrier specifications comply with the ANSI TI.403 specification. The NT5D12 provides an interface to the 1.5 Mbps external digital line either directly or through an office repeater, Line Terminating Unit (LTU), or Channel Service Unit (CSU).

Supported software releases

Table 26 shows the Generic X11 software releases that are supported on the NT5D12.

Table 26 - Supported software releases on the NT5D12

Software Release	Trunk Type & Signalling					
	DTI/Dual Pulse		DTI/DTMF	PRI/DCHI	PRI/MSDL	PRI/DDCH
	Out.	Inc.				
Release 17	Yes	Yes	Yes	Yes	No	No
Release 18/19	Yes	Yes	Yes	Yes	Yes	Yes
Release 20/21	Yes	Yes	Yes	Yes	Yes	Yes

Legend:

Yes - Supported Release of Software.

No - Not supported Release of Software

Note: The MSDL and NTBK51AA DDCH are compatible with Generic X11 Release 18 and later software.

NTBK51AA daughterboard

The optional dual-port Downloadable D-Channel daughterboard (DDCH, NTBK51AA) has been introduced to be used with the NT5D12 DDP in system hardware configurations as an alternative to an MSDL or a DCHI card (refer to for possible configurations.)

The NTBK51AA DDCH daughterboard is a two-port D-Channel Handler card supporting all the features of the existing four port MSDL (NT6D80). It eliminates the need for a D-Channel Handler or an MSDL card, and associated cables.

Note: Only one version, the NTBK51AA, can be used in DDP cards. The newer NTBK51BA version has only 30+30 pin connectors (instead of 40+30 pins in the AA version). The missing 10 pins in the BA version prohibits usage of port 0 on the DDP card.

The NTBK51AA can support a maximum of 32 (16*2) D-Channels per system (the MSDL can support a maximum of 64.)

Note 1: The software allocation for NTBK51AA DDCH is similar to the MSDL. It is both physical and logical, and supports D-Channel functionality only.

Note 2: Port 0 has to be an even loop on the DDP, and Port 1 has to be an odd loop. Port 2 and Port 3 should not be configured.

The connection between the DDP card and the DDCH daughterboard is made using two headers: one 30 pin and one 40 pin connector.

The NTBK51AA DDCH card consists of the following:

— 16 MHz MC68EC020 microprocessor;

— MC68901 Multi-function Peripheral Controller;

— Z16C35 Integrated Serial Communication Controller;

— One Mbyte of main memory;

— 512 KBytes of Flash EPROM.

The main functions of the card are:

— Dual-port Serial Communication Controller message handling with DMA for support of 2 D-channels;

— Sanity check and Self Tests;

— Program download from the Meridian 1 CPU;

— Serial maintenance port (for debugging purposes).

D-Channel and MSDL interface

The connection between the DDP card and the DCHI or MSDL is via a 26 pin female D type connector. The data signals conform to the electrical characteristics of the EIA standard RS-422.

Two control signals are used to communicate the D-Channel link status to the DCHI or MSDL. These are:

• Receiver Ready (RR), originating at the DDP card, to indicate to the DCHI or MSDL that the D-channel link is operational.

• Transmitter Ready (TR), originating at the DCHI or MSDL, to indicate to the DDP card that the DCHI or MSDL are ready to use the D-Channel link.

Table 27 indicates how the RR control signal operates with regard to the DDP status.

Table 27 - DCHI/MSDL Receiver Ready control signals

RR State	Condition
ON	D-Channel data rate selected at 64 Kbps or 56 Kbps or 64 Kbps inverted
	and
	PRI loop is enabled
	and
	PRI link is not in RED alarm mode state
	and
	PRI link is not transmitting a yellow alarm pattern
	and
	PRI link is not receiving a Remote Alarm Indication from the remote facility
	and
	PRI link is not in FA3 mode
	and
	Transmitter Ready (TR) control signal from the DCHI/MSDL is ON
OFF	All other conditions

DDP faceplate

Figure 27 and Figure 28 illustrate the faceplate layout for the DDP card. The faceplate contains an enable/disable switch; a DDCH status LED; 6 x 2 trunk port status LEDs; and six external connectors. Table 28 shows the name of each connector, its designation with respect to the faceplate and the name and description of the card it is connected to. Also shown are the names of the LEDs.

Figure 27 - NT5D12 faceplate - general view
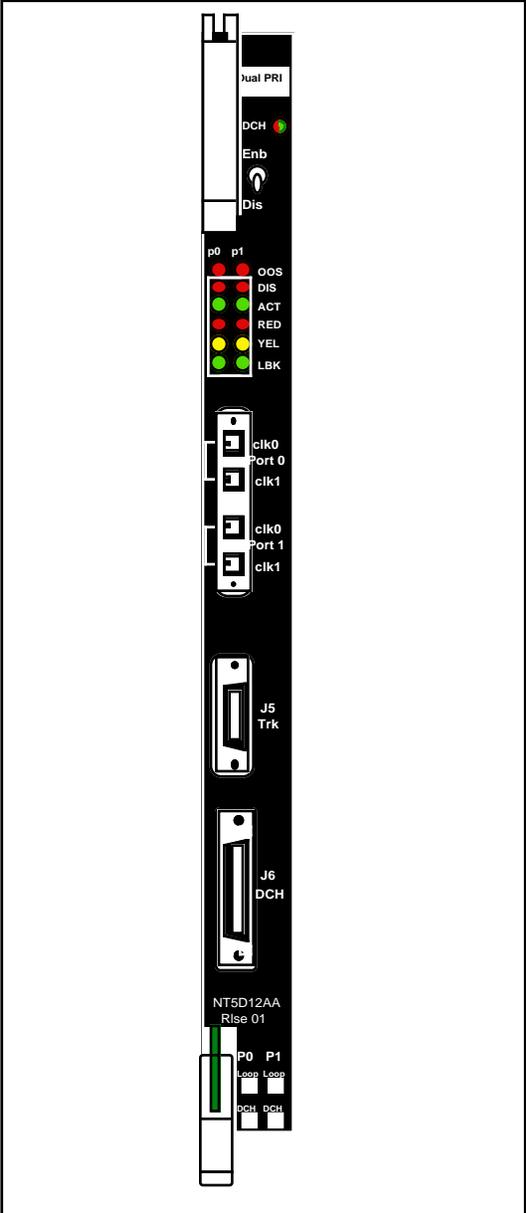
Figure 28 - DDP faceplate - detailed view

D-Channel LED

Card Enable / Disable Switch

Port Out Of Service LED
Trunk Port Disable LED
Trunk Port Active LED
Red Alarm LED
Yellow Alarm LED
Loop Back LED

Recovered Clock0 #1

Recovered Clock0 #2

Recovered Clock1 #1

Recovered Clock1 #2

Trunk0 / Trunk1

MSDL / DCHI

Blank, may be used
to label associated equipment

Dual PRI

DCH

ENB

DIS

P0   P1

OOS
DIS
ACT
RED
YEL
LBK

clk0
Port 0
clk1

clk0
Port 1
clk1

J5
TRK

J6
DCH

NT5D12
Ref.01

P0   P1
Loop   Loop
DCH   DCH

Table 28 - External connectors and LEDs

Function	Faceplate Designator	Type	Description
Switch	ENB/DIS	Plastic, ESD protected	Card Enable/disable switch
Connectors	Port 0 Clock 0	RJ11 Connector	Connects reference clock to Clock Controller card
	Port 0 Clock 1	RJ11 Connector	Connects reference clock to Clock Controller card
	Port 1 Clock 0	RJ11 Connector	Connects reference clock to Clock Controller card
	Port 1 Clock 1	RJ11 Connector	Connects reference clock to Clock Controller card
	J5 TRK	9 Pin Female D Connector	Two external DS-1 Trunk 0 and Trunk 1
	J6 DCH	26 Pin Female D Connector	Connects to DCHI or MSDL
LEDs	OOS	2 Red LEDs	ENET 0 or ENET 1 disabled
	DIS	2 Red LEDs	Trunk 0 or Trunk 1 disabled
	ACT	2 Green LEDs	Trunk 0 or Trunk 1 lines active
	RED	2 Red LEDs	Red Alarm on Trunk 0 or Trunk 1
	YEL	2 Yellow LEDs	Yellow Alarm on Trunk 0 or Trunk 1
	LBK	2 Green LEDs	Loop Back test being performed on Trunk 0 or Trunk 1
	DCH	Bicolor Red/Green LED	NTBK51AA status

The following is a brief description of each element on the faceplate:

Enable/Disable Switch

This switch is used to disable the card prior to insertion or removal from the network shelf; while this switch is in disable position the card will not respond to Meridian-1 CPU.

Port Out of Service LEDs

Two red LEDs which indicate if the "ENET0" and "ENET1" portion of the card are disabled. These LEDs are lit in the following cases:

- When the enable/disable switch is in state *disable* (lit by hardware).

- After power-up, before the card is enabled.

- When the ENET port on the card is disabled by software.

Trunk Port Disable LEDs

Two red LEDs which indicate if the "trunk port 0" and "trunk port 1" portion of the card are disabled. These LEDs are turned on in the following cases:

- When the enable/disable switch is in state *disable* (lit by hardware).

- After power-up, before the card is enabled.

- When digital trunk interface on the card is deactivated by software.

ACT LEDs

Two green LEDs which indicate if the "trunk port 0" and "trunk port 1" portion of the card is active.

RED LEDs

Two red LEDs which indicate if the near end detects absence of incoming signal or loss of synchronization in "trunk port 0" or "trunk port 1" respectively. The Near End Alarm causes a Far End Alarm signal to be transmitted to the far end.

YEL LEDs

Two yellow LEDs which indicate if Far End Alarm has been reported by the far end (usually in response to a Near End Alarm condition at the far end) on "trunk port 0" or "trunk port 1".

LBK LEDs

Two green LEDs which indicate if remote loopback test is being performed on trunk port 0 or trunk port 1. The loopback indication is active when the digital trunk is in remote loopback mode (T1 signals received from the far end are regenerated and transmitted to the far end.) Normal call processing is inhibited during remote loopback test.

DCH LED

Dual color red/green LED which indicates that the on-board DDCH is present but disabled (red), or is present and enabled (green). If a DDCH is not configured on the DDP card, this lamp will not be lit.

Port 0 Clk Connectors

Two RJ11 connectors for connecting:

— Digital trunk port 0 recovered clock to primary or secondary reference source on clock controller card 0.

— Digital trunk port 0 recovered clock to primary or secondary reference source on clock controller card 1.

Port 1 Clk Connectors

Two RJ11 connectors for connecting:

— Digital trunk port 1 recovered clock to primary or secondary reference source on clock controller card 0.

— Digital trunk port 1 recovered clock to primary or secondary reference source on clock controller card 1.

Connector J5 (TRK)

A 9 pin D-Type connector used to connect:

— Digital trunk port 0 receive and transmit Tip / Ring pairs.

— Digital trunk port 1 receive and transmit Tip / Ring pairs.

Connector J6 (DCH)

A 26 pin D-type connector, used to connect the DDP card to MSDL or QPC757 external D-channel handlers.

System capacity and performance

Physical capacity

Each DDP card occupies one slot on the network shelf. It supports two digital trunk circuits and two network loops. The total number of DDP cards per system is limited by the number of network loops, physical capacity of the shelf, number of DTI/PRI interfaces allowed by the software and the range of DCH addresses.

D-Channel capacity

The software configuration for the NTBK51AA DDCH is similar to the MSDL. It is both physical and logical, and supports D-Channel functionality only.

Meridian 1 has a total capacity of 16 addresses (Device Addresses or DNUM) that may be reserved for DCHI card, MSDL card or DDCH card. One exception is DNUM 0 which is commonly assigned to the System Monitor.

No two different D-Channel providers can share the same DNUM. Hence, the combined maximum number of DCHI, MSDL and DDCH cards in the system is 16.

The DCHI and DDCH have two D-Channel units, the MSDL has four. Therefore the total number of D-Channel in a Meridian 1 is derived by the following formula:

Total_Num_DCH-Units = Num_DCHIx2 + Num_DDCHx2 + Num_MSDLx4

Therefore, Total_Num_DCH-Units in any given system is between 0-63.

CPU capacity

Using a NT512 DDP card instead of DTI/PRI cards does not increase the load on the Meridian 1 CPU. The DDP replaces an ENET card and two DTI/PRI cards, it emulates the ENET card and the overall CPU capacity is not impacted by usage of DDP card instead of a DTI/PRI card.

Power requirements

Table 29 lists the power requirements for the DDP card.

Table 29 - DDP power requirements

Voltage	Source	Current	
		DDP (without NTBK51AA)	**DDP (with NTBK51AA)**
+5V	Backplane	3A	3.8A
+12V	Backplane	25mA	75mA
-12V	Backplane	25mA	75mA
Total Power (Maximum)		15.6W	20.8W

Testability and diagnostics

The DDP card supports all current QPC720 testing and maintenance functions through the following procedures:

- Selftest upon power up or reset;

- Signalling test performed in the OVL 30;

- Loopback tests, self tests, and continuity tests performed by OVL 60 and OVL 45;

- The D-Channel (MSDL, DCHI, DDCH) maintenance is supported by OVL 96.

Hardware required for DDP configuration

The following hardware is required when configuring the NT5D12 DDP on Meridian 1 Options 21/21E, 51/51C, 61/61C, 71, and 81/81C, and Meridian SL-1 STE, RT, XT, and NT systems.

Note: The NT5D12 DDP card hardware design uses a B57 ASIC E1/T1 framer. The carrier specifications comply with the ANSI TI.403 specification. The NT5D12 provides an interface to the 1.5 Mbps external digital line either directly or through an office repeater, Line Terminating Unit (LTU), or Channel Service Unit (CSU).

DTI/PRI

— one NT5D12 DDP

D-Channel Interface

Either of the following:

Note: Either the DCHI card, the MSDL, or the DDP card may be installed first. However, DDP loops must be configured in software before defining DCH links.

— one NT6D80 MSDL

or optionally, as a plug-on

— one NTBK51AA Downloadable D-Channel daughterboard

or optionally, an external DCHI card

— one QPC757 DCHI

Clock Controller

— QPC471/QPC775 Clock Controller(s)

Other hardware

Additional hardware may also required for PRI capability and applications. Installation instructions are given in other Northern Telecom publications or supplied by the manufacturer. This additional hardware may include:

— one Channel Service Unit (CSU) or Line Terminating Unit (LTU) per T1 span

— one Meridian Communications Unit (MCU) or Meridian Communications Adapter (MCA) per D-Channel port

— one office repeater per T1 span

— one QMT21C (or later vintage) High Speed Data Module (HSDM) per D-Channel port

Cabling

Cabling requirements are described in detail in the section that follows.

Cabling requirements

This section lists the types of cable used and the lengths required for internal and external NT5D12 DDP connections.

Note 1: No additional cabling is required for nB+D configurations. Multiple DDPs and the D-channel are associated through software in Overlay 17.

Note 2: A detailed discussion of each type of DDP cable listed below will follow.

New DDP cable assemblies include:

— Meridian 1 Trunk Tip/Ring Cables

  •   NT5D16AA

  •   NT5D17AA

  •   QCAD133

— DDP to QPC471/QPC775 Clock Controller Cables

  •   NTCG03AA

  •   NTCG03AB

  •   NTCG03AC

  •   NTCG03AD

— DDP to DCHI cables

  •   NTCK46AA

  •   NTCK46AB

  •   NTCK46AC

  •   NTCK46AD

— DDP to MSDL cables

  •   NTCK80AA

  •   NTCK80AB

  •   NTCK80AC

> • NTCK80AD

Trunk Tip/Ring cables

NT5D16AA

The NT5D16AA (8 ft) is a 100Ω cable for Meridian 1 and Meridian SL-1 systems equipped with an I/O filter panel, connecting the 9 pin D-type TRK port on the DDP faceplate to the I/O filter.

Note: On the I/O panel side, this cable is equipped with a monitor bantam plug and a 15 pin D-ty[e trunk connector mounted on a small PCB. There are no bantam plugs on the DDP faceplate.

Connector P5 - 9-pin, male, D-type (J5 on the DDP faceplate)
Connector P0: J2 - Monitor Bantam Plug, J3 - 15-pin, male, D-type
Connector P1; J2 - Monitor Bantam Plug, J3 - 15-pin, male D-type

Note:
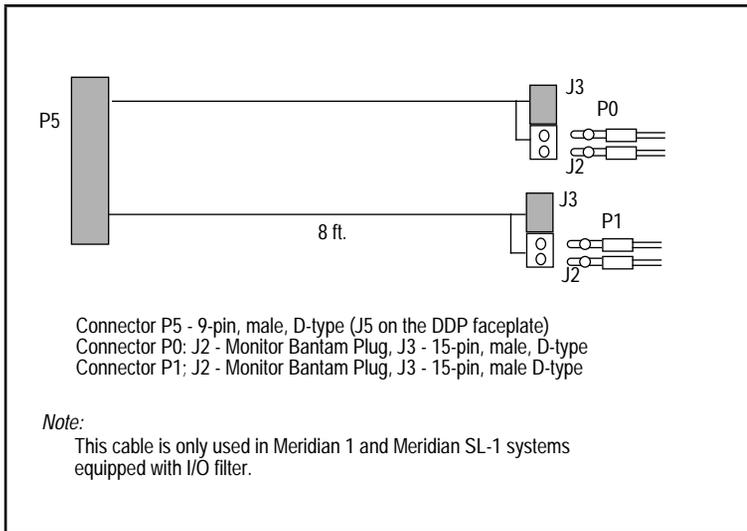This cable is only used in Meridian 1 and Meridian SL-1 systems equipped with I/O filter.

Table 30 which follows lists the pin attributes for the NT5D16AA cable.

Table 30- NT5D16AA cable pins

Cable	Name	Description	Color	DDP pins (J5)	I/O Panel pins (J2, J3)
0	T-PRI0TX	Trunk 0 Transmit Tip	Black	J5-1	P0J3-1 P0J2-3
0	R-PRI0TX	Trunk 0 Transmit Ring	Red	J5-2	P0J3-9 P0J2-9
0	T-PRI0RX	Trunk 0 Receive Tip	Black	J5-3	P0J3-3 P0J2-4
0	R-PRI0RX	Trunk 0 Receive Ring	White	J5-4	P0J3-11 P0J2-10
0		GND Shield Wire	Bare	N/C	Case P0
0		GND Shield Wire	Bare	N/C	Case P0
1	T-PRI1TX	Trunk 1 Transmit Tip	Black	J5-5	P1J3-1 P1J2-3
1	R-PRI1TX	Trunk 1 Transmit Ring	Red	J5-6	P1J3-9 P1J2-9
1	T-PRI1RX	Trunk 1 Receive Tip	Black	J5-7	P1J3-3 P1J2-4
1	R-PRI1RX	Trunk 1 Receive Ring	White	J5-8	P1J3-11 P1J2-10
1		GND Shield Wire	Bare	N/C	Case P1
1		GND Shield Wire	Bare	N/C	Case P1

NT5D17AA

The NT5D17AA (50 ft) is a 100Ω cable for Meridian SL-1 systems not equipped with an I/O filter panel, connecting the 9 pin D-type TRK port on the DDP faceplate directly to the Network Channel Terminating Equipment (NCTE).
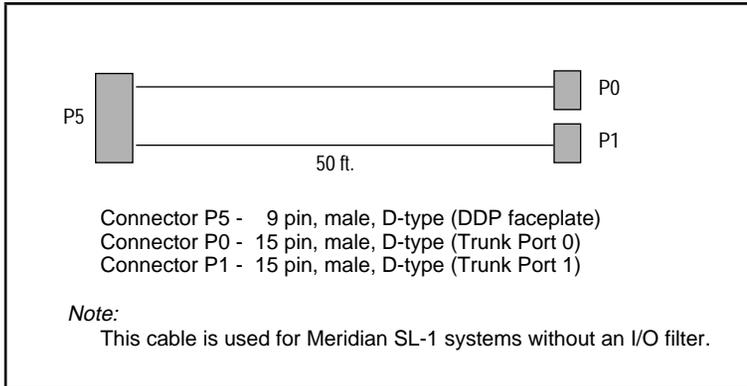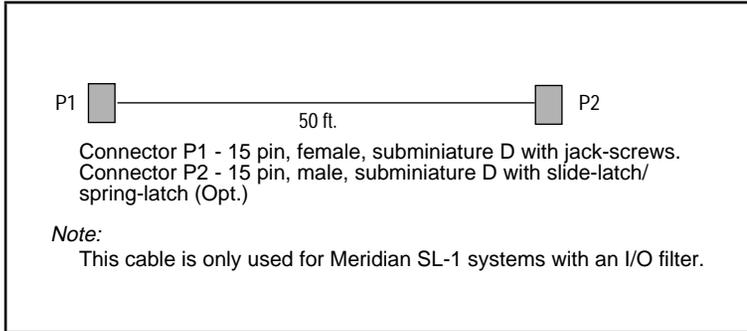

Connector P5 -   9 pin, male, D-type (DDP faceplate)
Connector P0 - 15 pin, male, D-type (Trunk Port 0)
Connector P1 - 15 pin, male, D-type (Trunk Port 1)

Note:
   This cable is used for Meridian SL-1 systems without an I/O filter.

Table 31 which follows lists the pin attributes for the NT5D17AA cable.

Table 31- NT5D17AA cable pins

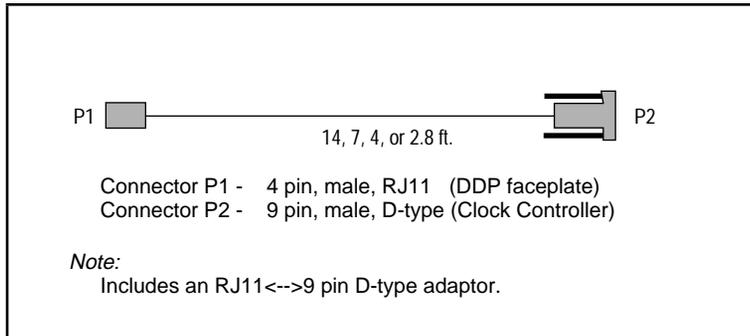| Cable	Name	Description	Color	DDP pins (J5)	NCTE pins (J3)
0	T-PRI0TX	Trunk 0 Transmit Tip	Black	J5-1	P01-1
0	R-PRI0TX	Trunk 0 Transmit Ring	Red	J5-2	P0-9
0	T-PRI0RX	Trunk 0 Receive Tip	Black	J5-3	P0-3
0	R-PRI0RX	Trunk 0 Receive Ring	White	J5-4	P0-11
0		GND Shield Wire	Bare	N/C	Case P0
0		GND Shield Wire	Bare	N/C	Case P0
1	T-PRI1TX	Trunk 1 Transmit Tip	Black	J5-5	P1-1
1	R-PRI1TX	Trunk 1 Transmit Ring	Red	J5-6	P1-9
1	T-PRI1RX	Trunk 1 Receive Tip	Black	J5-7	P1-3
1	R-PRI1RX	Trunk 1 Receive Ring	White	J5-8	P1-11
1		GND Shield Wire	Bare	N/C	Case P1
1		GND Shield Wire	Bare	N/C	Case P1

QCAD133

The QCAD133 (50 ft) is used for Meridian SL-1 systems equipped with an I/O filter panel, connecting the 15 pin I/O filter connector to the 15 pin NCTE connector.

P1 ▮━━━━━━━━━━━━━━━━━━━━━━▮ P2
50 ft.

Connector P1 - 15 pin, female, subminiature D with jack-screws.
Connector P2 - 15 pin, male, subminiature D with slide-latch/
spring-latch (Opt.)

Note:
This cable is only used for Meridian SL-1 systems with an I/O filter.

Reference clock cables

The NTCG03AA (14 ft), NTCG03AB (2.8 ft.), NTCG03AC (4.0 ft.), or NTCG03AD (7 ft.) is a DDP card to Clock Controller cable, connecting each of the CLK0 or CLK1 ports on the DDP faceplate to the primary or secondary source ports on Clock Controller card 0 or 1.
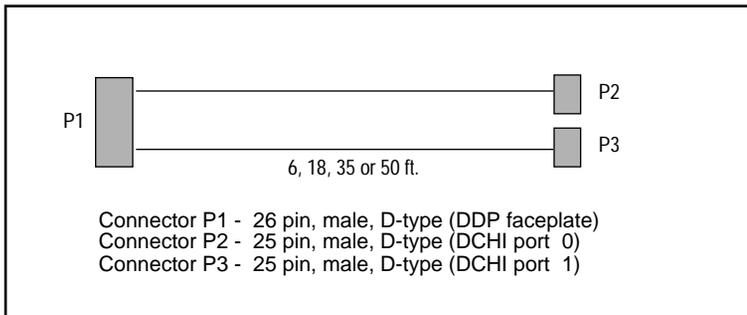
P1 and P2 connectors with cable labeled "14, 7, 4, or 2.8 ft."

Connector P1 -   4 pin, male, RJ11   (DDP faceplate)
Connector P2 -   9 pin, male, D-type (Clock Controller)

Note:
  Includes an RJ11<-->9 pin D-type adaptor.

MSDL/DCHI cables

External DCHI cable

The NTCK46 cable connects the DDP card to the QPC757 DCHI D-Channel Handler card. The cable is available in four different sizes:
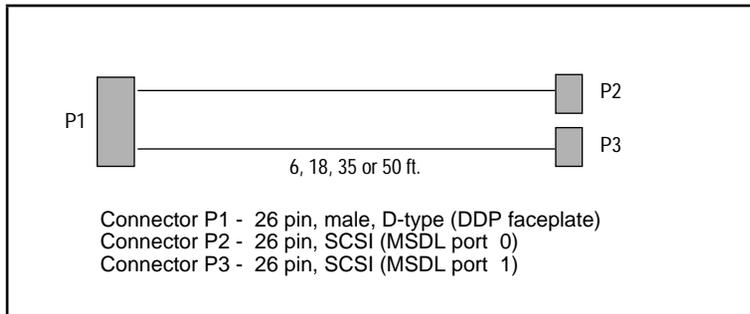
— NTCK46AA (6 ft) - DDP to DCHI cable

— NTCK46AB (18 ft) - DDP to DCHI cable

— NTCK46AC (35 ft) - DDP to DCHI cable

— NTCK46AD (50 ft) - DDP to DCHI cable

P1

P2

P3

6, 18, 35 or 50 ft.

Connector P1 - 26 pin, male, D-type (DDP faceplate)
Connector P2 - 25 pin, male, D-type (DCHI port 0)
Connector P3 - 25 pin, male, D-type (DCHI port 1)

External MSDL cable

The NTCK80 cable connects the DDP card to the NT6D80 MSDL card. The cable is available in four different sizes:

— NTCK80AA (6 ft) - DDP to MSDL cable

— NTCK80AB (18 ft) - DDP to MSDL cable

— NTCK80AC (35 ft) - DDP to MSDL cable

— NTCK80AD (50 ft) - DDP to MSDL cable

Connector P1 - 26 pin, male, D-type (DDP faceplate)
Connector P2 - 26 pin, SCSI (MSDL port 0)
Connector P3 - 26 pin, SCSI (MSDL port 1)

Cabling diagrams

Figure 29 and Figure 30 provide examples of typical cabling configurations for the DDP. Please note that these figures are representational only, and are not intended to show the relational card slot position of the various cards.

Figure 29 shows a typical DDP cabling for a Meridian 1 system Option with an I/O panel, with the connection between the I/O panel and a Network Channel Terminating Equipment (NCTE).

Figure 30 shows cabling for a Meridian SL-1 system without an I/O panel. Here, the DDP faceplate is cabled directly to the NCTE.

Note: Since there exists several clock cabling options, none has been represented in the diagrams. Please refer to "Clocking configurations" on page 130 for a description on each available option.

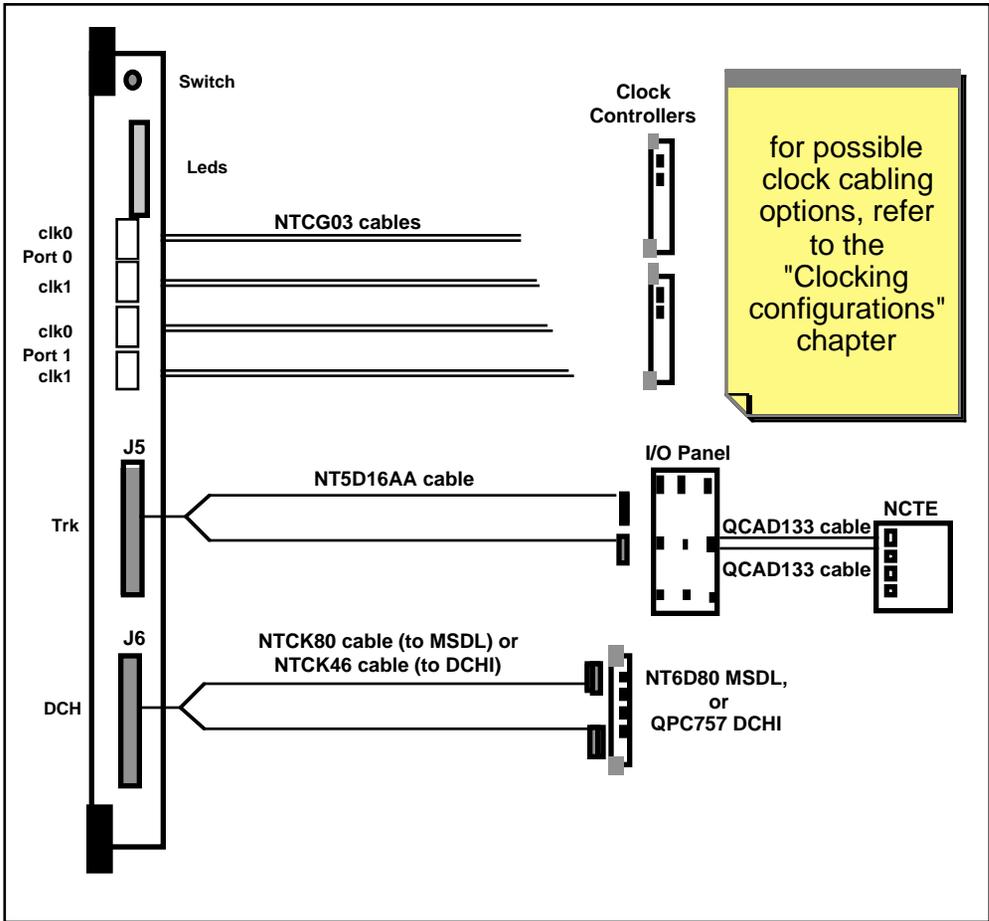**Figure 29 - DDP cabling for Meridian 1 and Meridian SL-1 systems with an I/O panel**
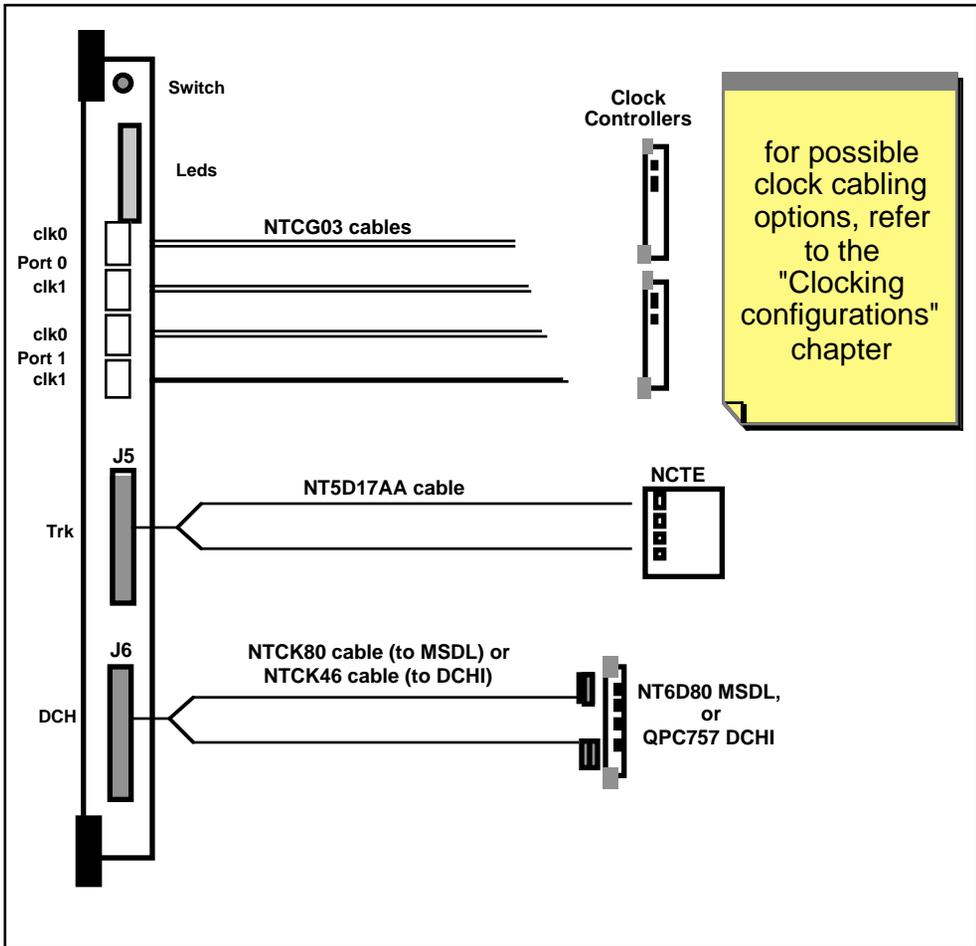
Figure 30 - DDP cabling for Meridian SL-1 systems without an I/O panel
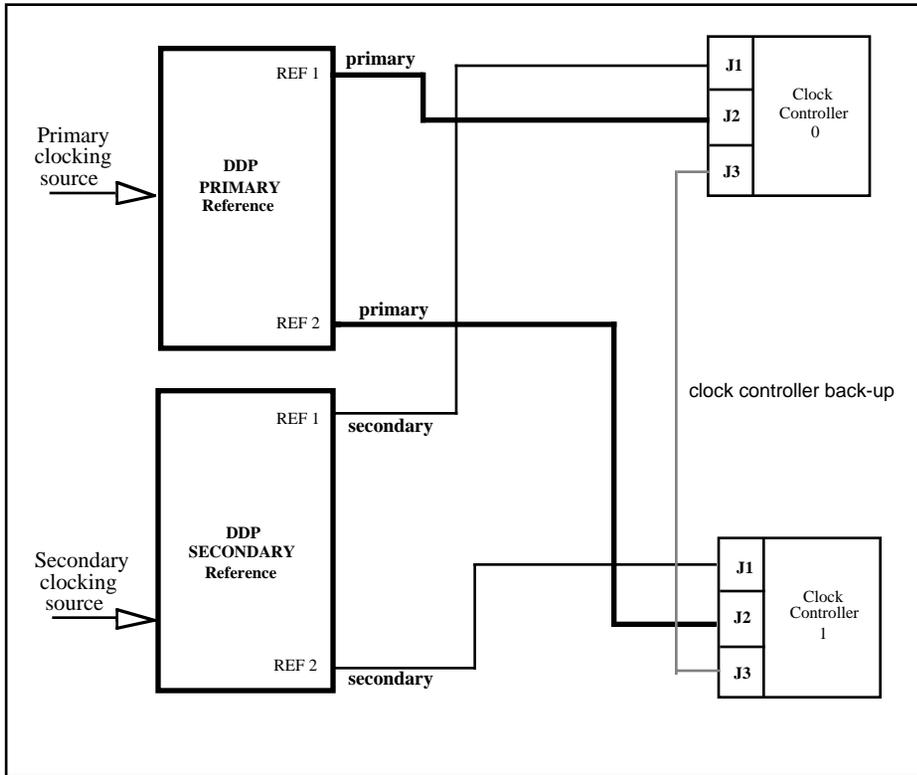
Clocking

Clock operation

There are two types of clock operation - tracking mode and free-run mode.

Tracking mode

In tracking mode, the DDP loop supplies an external clock reference to a clock controller. Two DDP loops can operate in tracking mode, with one defined as the primary reference source for clock synchronization, the other defined as the secondary reference source. The secondary reference acts as a back-up to the primary reference.

As shown in Figure 31, a Meridian 1 or Meridian SL-1 system with dual CPUs may have two clock controllers (CC-0 and CC-1). One clock controller acts as a back-up to the other. The clock controllers should be completely locked to the reference clock.

Figure 31 - Clock Controller primary and secondary tracking

Free run (non-tracking) mode

The clock synchronization of the Meridian 1 or Meridian SL-1 may operate in free-run mode if:

— no loop is defined as the primary or secondary clock reference,

— the primary and secondary references are disabled, or

— the primary and secondary references are in local (near end) alarm

Reference clock errors

Meridian 1 software checks at intervals of 1 to 15 minutes to see if a clock controller or reference-clock error has occurred. (The interval of this check can be configured in Overlay 73.)

In tracking mode, at any one time, there is one active clock controller which is tracking on one reference clock. If a clock controller error is detected, the Meridian 1 or Meridian SL-1 system switches to the back-up clock controller, without affecting which reference clock is being tracked.

A reference-clock error occurs when there is a problem with the clock driver or with the reference clock at the far end. If the clock controller detects a reference-clock error, the reference clocks are switched.

Automatic clock recovery

A command for automatic clock recovery can be selected in Overlay 60 with the command EREF.

A DDP loop is disabled when it enters a local-alarm condition. If the local alarm is cleared, the loop is enabled automatically. When the loop is enabled, clock tracking is restored in the following conditions:

— If the loop is assigned as the primary reference clock but the clock controller is tracking on the secondary reference or in free-run mode, it is restored to tracking on primary.

— If the loop is assigned as the secondary reference clock but the clock controller is in free-run mode, it is restored to tracking on secondary.

— If the clock check indicates the switch is in free-run mode:

  • Tracking is restored to the primary reference clock if defined.

  • If the primary reference is disabled or in local alarm, tracking is restored to the secondary reference clock if defined.

Note: If the Meridian 1 or Meridian SL-1 was put into free-run mode intentionally by the craftsperson, it will resume tracking on a reference clock unless the clock-switching option has been disabled (LD 60, command MREF), or the reference clock has been "undefined" in the database.

Automatic clock switching

If the EREF command is selected in Overlay 60, tracking on the primary or secondary reference clock is automatically switched in the following manner:

— If software is unable to track on the assigned primary reference clock, it switches to the secondary reference clock and sends appropriate DTC maintenance messages.

— If software is unable to track on the assigned secondary reference clock, it switches to free run.

Clocking configurations

Clock Controllers may be used in a single CPU system or a dual CPU system.

A single CPU system has one Clock Controller card. This card can receive references clocks from two sources referred to as the primary and secondary sources. These two sources can originate from a PRI, DTI, etc. PRI cards such as the QPC720 are capable of supplying two references of the same clock source. These are known as Ref1 (available at J1) and Ref2 (available at J2) on the QPC720.

The NT5D12 card is capable of supplying two references from each clock source, i.e., four references in total. NT5D12 can thus supply Clk0 and Clk1 from Port 0 and Clk0 and Clk1 from Port 1. Either Port 0 or Port 1 can originate primary source, as shown in Figure 32 through Figure 35.

There is one new Clock Controller cable required for the new DDP card, which is available in four sizes; this is the NTCG03AA/AB/AC/AD. Refer to "Reference clock cables" on page 121 for more information.

Table 32 summarizes the clocking options. Table 33 explains the options in more detail.

Table 32 - Clock Controller options- summary

CC Option	CPU Type	Notes
Option 1	Single	Ref from P0 on Clk0
		Ref from P1 on Clk0
Option 2	Dual	Ref from P0 on Clk0
		Ref from P0 on Clk1
Option 3	Dual	Ref from P1 on Clk0
		Ref from P1 on Clk1
Option 4	Dual	Ref from P0 on Clk0
		Ref from P0 on Clk1
		Ref from P1 on Clk0
		Ref from P1 on Clk1

Table 33 - Clock Controller options - description

| Clock Option	Notes
Option 1	This option provides a single CPU system with 2 clock sources derived from the 2 ports of the DDP.
	Connector Clk0 provides a clock source from Port 0.
	Connector Clk0 provides a clock source from Port 1.
	Refer to Figure 32 "- Clock Controller - Option 1"
Option 2	This option provides a Dual CPU system with 2 references of a clock source derived from port 0 of the DDP.
	Connector Clk0 provides a Ref 1 clock source from Port 0.
	Connector Clk1 provides a Ref 2 clock source from Port 0.
	Refer to Figure 33 "- Clock Controller - Option 2"
Option 3	This option provides a Dual CPU system with 2 references of a clock source derived from port 1 of the DDP.
	Connector Clk0 provides a Ref 1 clock source from Port 1.
	Connector Clk1 provides a Ref 2 clock source from Port 1.
	Refer to Figure 34 "- Clock Controller - Option 3"
Option 4	This option provides a Dual CPU system with 2 references from each clock source derived from the DDP.
	Connector Clk0 provides a Ref 1 clock source from Port 0.
	Connector Clk1 provides a Ref 2 clock source from Port 0.
	Connector Clk0 provides a Ref 1 clock source from Port 1.
	Connector Clk1 provides a Ref 2 clock source from Port 1.
	Refer to Figure 35 "- Clock Controller - Option 4"

Figure 32 - Clock Controller - Option 1
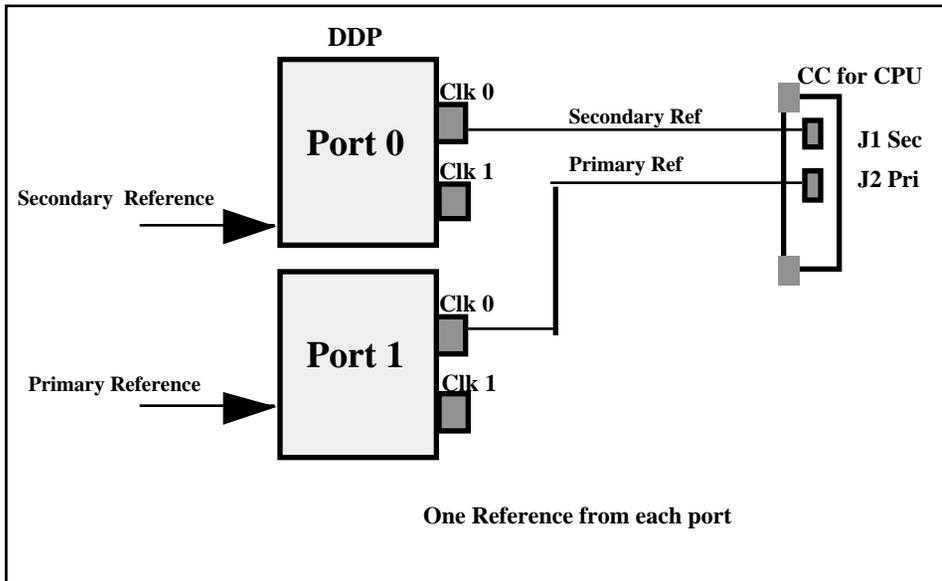
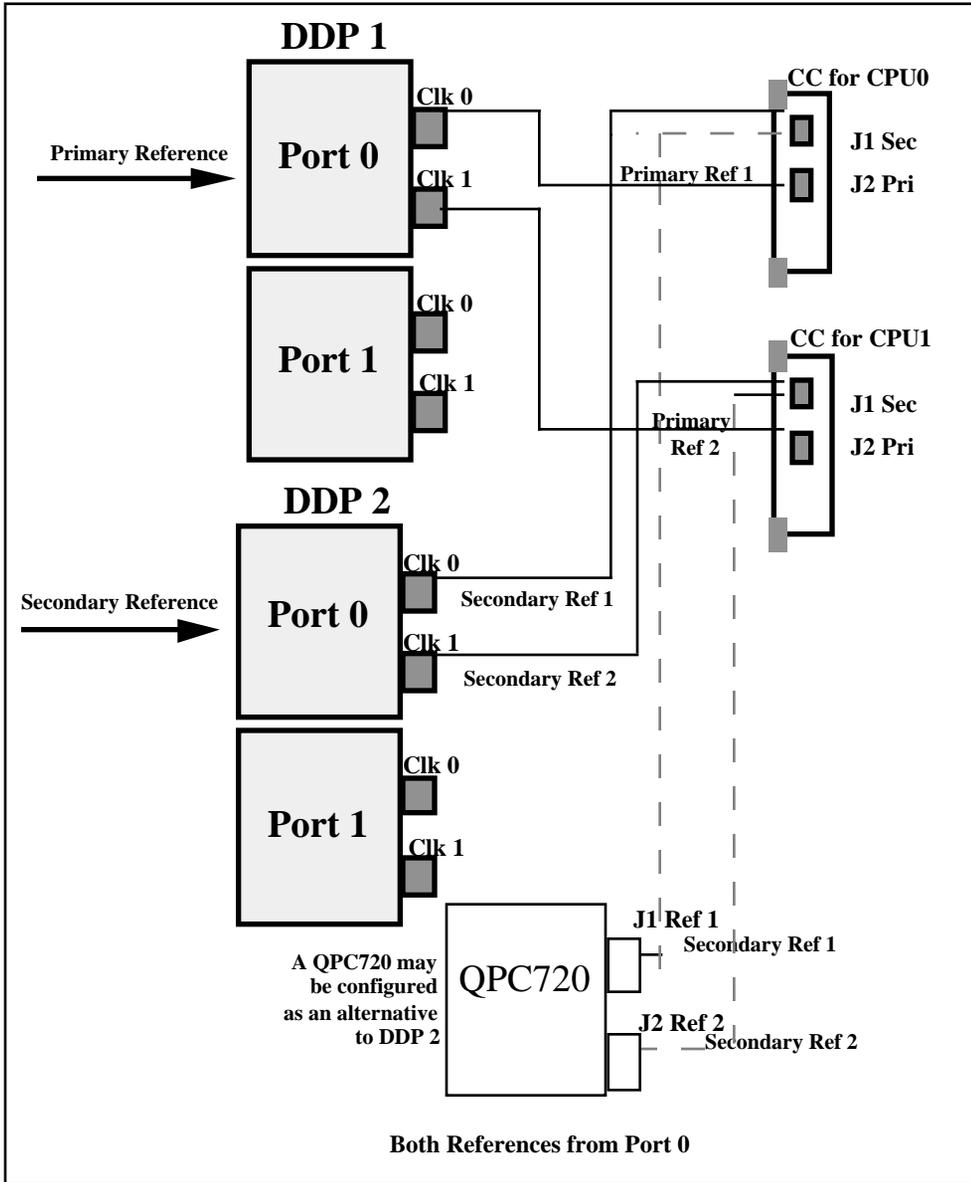**Figure 33 - Clock Controller - Option 2**
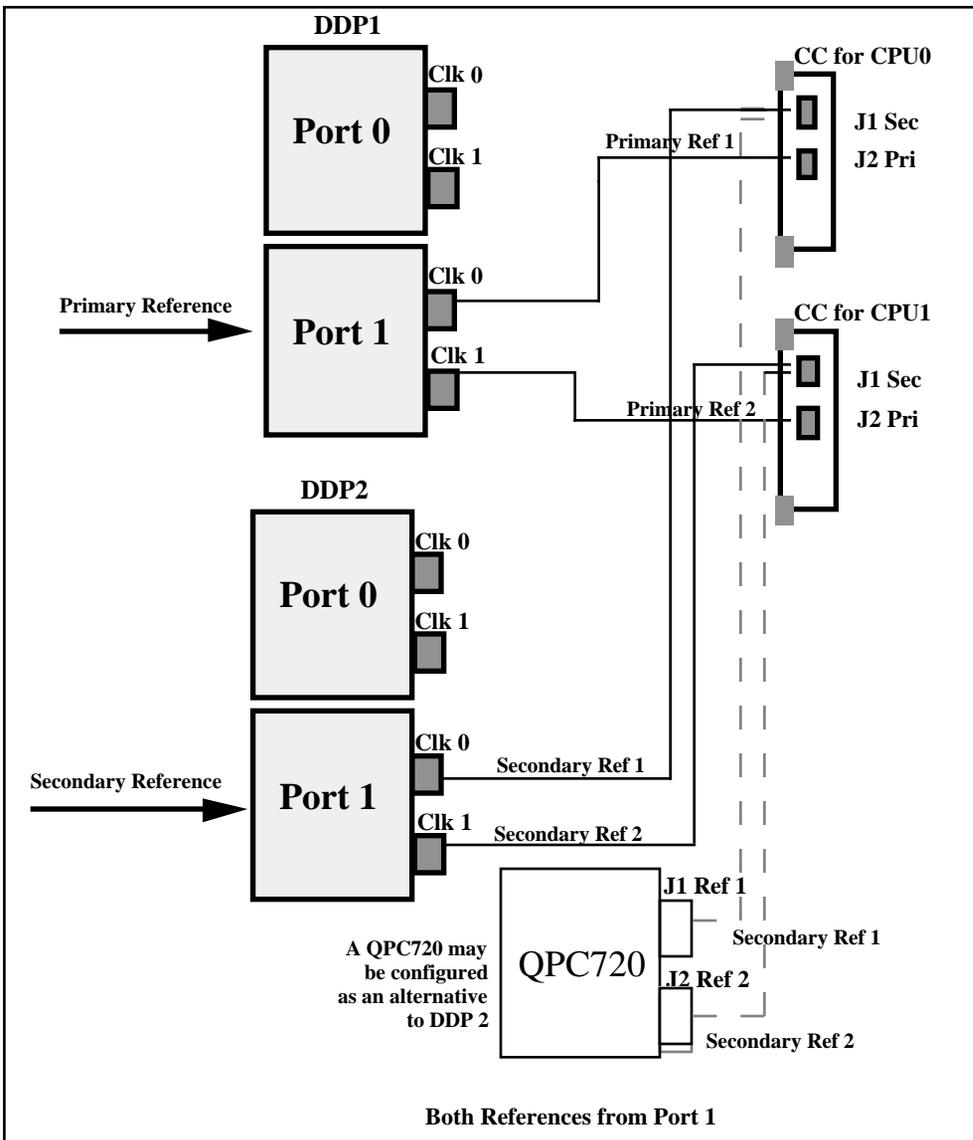
Figure 34 - Clock Controller - Option 3

Figure 35 - Clock Controller - Option 4
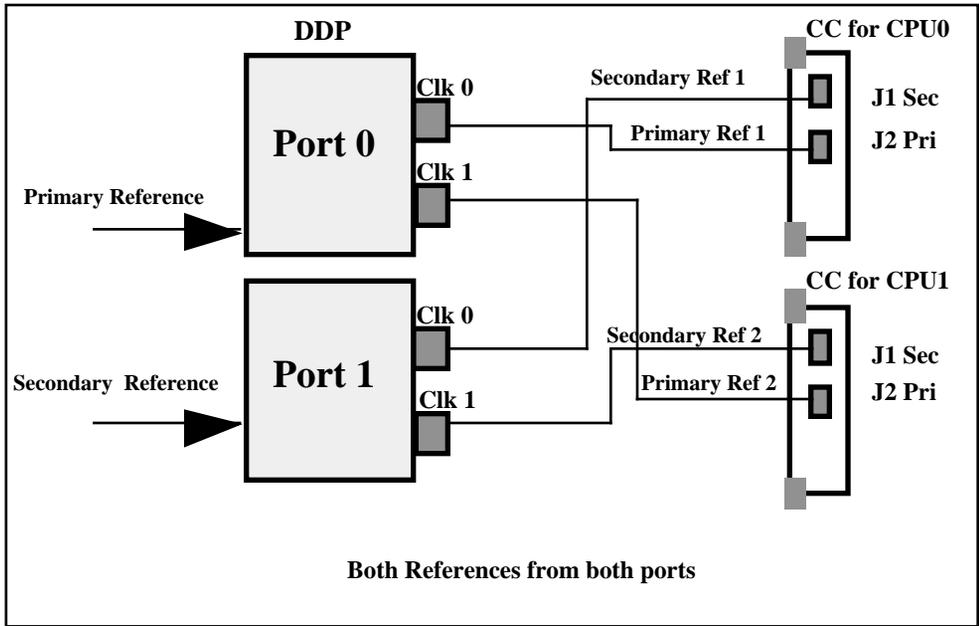
DDP installation and removal

DDP circuit card locations

Each DDP circuit card requires one slot on a shelf. DDP cards can be placed in any card slot in the network bus, subject to the cautionary note below.

CAUTION

Some installed-based systems may have a Bus Terminating Unit (BTU) already installed. This may interfere with a selected DDP card location. In such cases, the DDP should be installed in an alternate network bus card slot location.

Port definitions

Since the DDP card is dual-card, it equips two ports; these ports may be defined in the following combinations:

Port 0	Port 1
DTI	DTI or
DTI	PRI or
DTI	Unequipped or
PRI	PRI or
PRI	DTI or
PRI	Unequipped
Unequipped	DTI or
Unequipped	PRI

Replacement of a digital trunk (QPC720/QPC472) by a DDP card

The following discussion describes possible scenarios when replacing a digital trunk QPC720 PRI card or QPC472 DTI card configuration with a NT5D12 DDP card configuration.

Case 1 - The two ports of a QPC414 network card are connected to two digital trunks.

In this case, the QPC414 and the two digital trunks are replaced by a single DDP card, which is plugged into the CE shelf in the QPC414 slot.

Case 2 - One port of the QPC414 card is connected to a digital trunk, and the second is connected to a peripheral buffer. Both cards are in network loop location.

In this case, the QPC414 should not be removed. The digital trunk is removed and the DDP card is plugged into one of the two empty slots.

Case 3 - The CE shelf is full, one port of a QPC414 network card is connected to a digital trunk, and the second is connected to a peripheral buffer. This arrangement is repeated for another QPC414. The digital trunks are located in a shelf that provides only power.

In this case, the peripheral buffers will have to be re-assigned, so that each pair of buffers will use both ports of the same QPC414 card. The other QPC414 card may then be replaced by the NT5D12 DDP.

Note in all cases - If a QPC720 card is being replaced by a DDP card, the D-Channel Handler or MSDL may be either reconnected to the DDP card, or removed if an onboard NTBK51AA DDCH card is used.

DDP switch settings

The DDP card is equipped with 6x2 sets of DIP switches for trunk parameters settings for port0 and port1 respectively. Additionally, the DDP card is equipped with one set of four DIP switches for the Ring Ground setting and one set of eight DIP switches for the D-Channel Handler parameters setting.

The DIP switches are used for setting of default values of certain parameters. The general purpose switches are read by the firmware which sets the default values accordingly.

The following parameters are being set by the DIP switches. Factory setups are shown in bold.

General Purpose Switches

A per trunk set of four DIP switches provides the default setting for operational modes. Switch set S9 is used for Trunk 0. Switch set S15 is used for Trunk 1.

Table 34- General purpose switch settings

Switch	Description	S9/S15 Switch Setting
1	Framing Mode	**OFF - ESF** ON - SF
2	Yellow Alarm Method	**OFF - FDL** ON - Digit2
3	Zero Code Suppression Mode	**OFF - B8ZS** ON - AMI
4	Unused	**OFF**

Trunk interface switches

Transmission Mode

A per trunk switch provides selection for T1 transmission.

Table 35- Trunk interface transmission mode switch settings

Description	S4/S10 Switch Setting
For future use.	OFF
T1	**ON**

Line Build Out

A per trunk set of three switches provides selection between 0, 7.5 or 15 dB values.

Table 36- Trunk interface line build out switch settings

Description	Switch Setting		
	S5/S11	S6/S12	S7/S13
0 dB	**OFF**	**OFF**	**OFF**
7.5 dB	ON	ON	OFF
15 dB	ON	OFF	ON

Receiver Impedance

A per trunk set of four DIP switches provides selection between 75, 100 or 120 Ω values.

Table 37 - Trunk interface receiver impedance switch settings

Description	S8/S14 Switch Setting			
75 Ω	OFF	OFF	ON	OFF
100 Ω	**ON**	**OFF**	**OFF**	**ON**
120 Ω	OFF	OFF	OFF	ON

Ring ground switches

A set of four DIP switches selects which Ring lines are connected to ground.

Table 38- Ring ground switch settings

Switch	Description	S2 Switch Setting
1	Trunk 0 Transmit	**OFF - Ring line is not grounded** ON - Ring line is grounded
2	Trunk 0 Receive	**OFF - Ring line is not grounded** ON - Ring line is grounded
3	Trunk 1 Transmit	**OFF - Ring line is not grounded** ON - Ring line is grounded
4	Trunk 1 Receive	**OFF - Ring line is not grounded** ON - Ring line is grounded

DCH mode and address select switches

A set of eight DIP switches selects between an on-board NTBK51AA D-Channel daughterboard and an external MSDL/DCHI card. In case of an on-board NTBK51AA D-Channel daughterboard, four of the switches provide the daughterboard address.

Table 39 - DCH mode and address select switch settings

Switch	Description	S3 Switch Setting
1-4	D-Channel daughterboard Address	See Table 40
5-7	For future use.	OFF
8	External DCH or Onboard DDCH	**OFF - MSDL or DCHI card** ON - Onboard DDCH daughterboard

Table 40- NTBK51AA daughterboard address select switch settings

Device Address[1]	Switch Setting			
0[2]	OFF	OFF	OFF	OFF
1	**ON**	**OFF**	**OFF**	**OFF**
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON
Note 1: The maximum number of DCHI, MSDL, and DDCH devices in the system is 16.				
The Device Addresses are equivalent to the MSDL DNUM designations. For programming information on the MSDL, refer to NTPs 553-3001-195 and 553-3001-400.				
Note 2: Device address 0 is commonly assigned to the System Monitor.				

Figure 36 - Switches Functional Areas
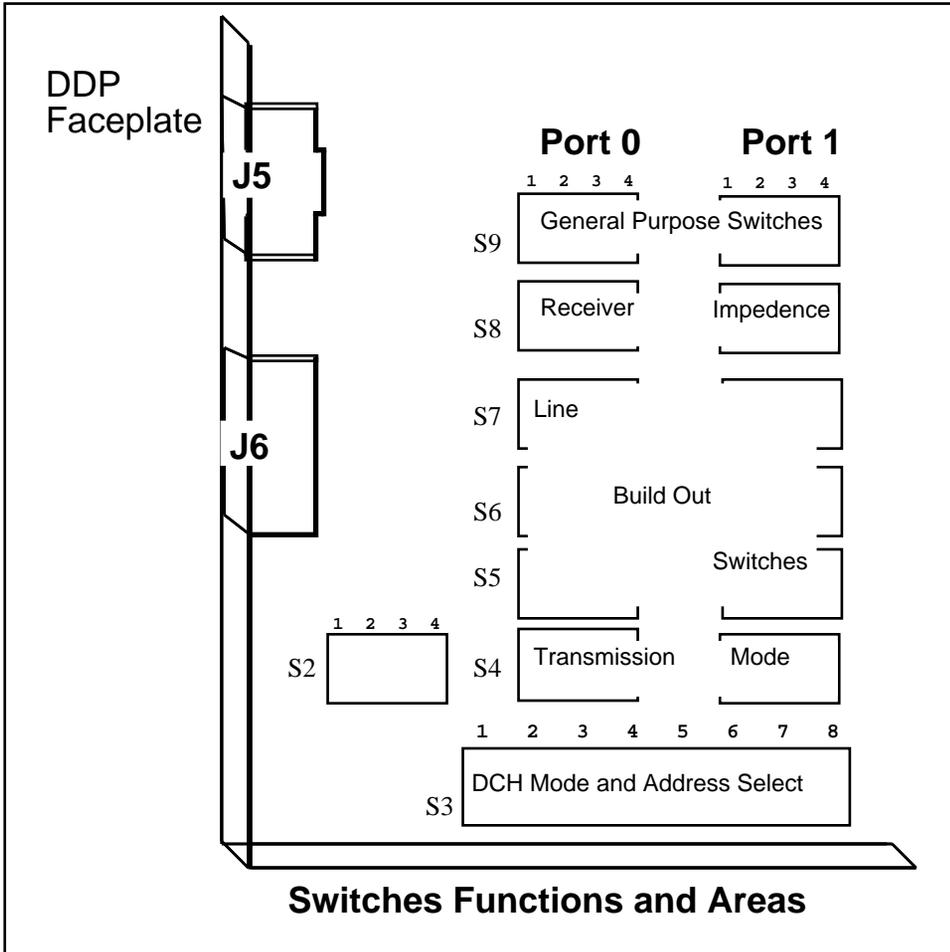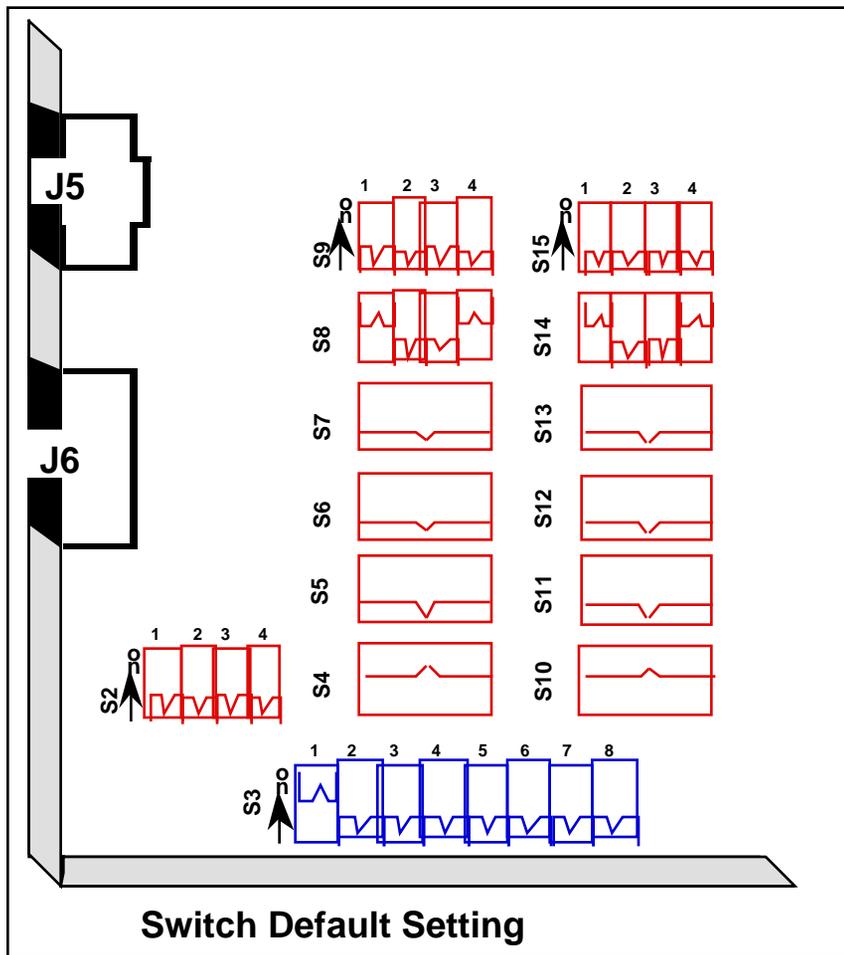
Figure 37 - Switch Default Settings

Switch Default Setting

Installing the NT5D12 DDP

CAUTION

The static discharge bracelet located inside the cabinet must be worn before handling circuit cards. Failure to wear the bracelet can result in damage to the circuit cards.

Procedure 20 - Installing the NT5D12 DDP

Step	Action
1	Determine the cabinet and shelf location where the DDP is to be installed. The DDP can be installed in any card slot in the Network bus, subject to the cautionary note below.

CAUTION

Some installed-based systems may have a Bus Terminating Unit (BTU) already installed. This may interfere with a selected DDP card location. In such cases, the DDP should be installed in an alternate network bus card slot location.

2	Unpack and inspect circuit cards and cables.
3	If DDCH is to be installed, refer to "DDCH installation for all systems" on page 150.
4	Set the option switches on the DDP circuit card before installation. Refer to "DDP switch settings" on page 139. S1 (faceplate switch) must be OFF (DIS) when installing the DDP. S1 on the DDP corresponds to the faceplate switch on the QPC414 Network card.
5	Install DDP circuit card in the assigned shelf and slot.
6	Add related office administration data into the system memory. Refer to the work order and the ISDN PRI Description and Administration NTP(553-2901-100).
7	If required, install the I/O adapters in the I/O panel.

8   Run and connect the DDP cables

Note: Refer to "Cabling requirements" on page 115 for cable lengths and attributes. For example, when connecting the DDP to the I/O panel, the NT5D16AA must be used. For a Monitor Jack connection, this cable is equipped with a bantam plug connector for each trunk port.)

CAUTION

Clock Controller cables connecting the Clock Controller and DDP card must **NOT** be routed through the center of the cabinet past the power harness. Instead they should be routed around the outside of the equipment shelves.

9   If required, install connecting blocks at MDF or wall mounted cross-connect terminal.

10   If required, designate connecting blocks at MDF or wall mounted cross-connect terminal.

11   If required, install Network Channel Terminating Equipment (NCTE).

12   Enable faceplate switch S1. This is the "Loop Enable" switch.

The faceplate LEDs should go on for 4 seconds then go off and the OOS, DIS and ACT LEDs should go on again and stay on.

IF DDCH is installed, the DCH LED should flash 3 times.

13   Run PRI/DTI Verification Test. Refer to the ISDN PRI Maintenance NTP (553-2901-500).

14   Run PRI status check. Refer to the ISDN PRI Maintenance NTP (553-2901-500) for the PRI verification tests, DDP self-test, PRI status check, and PRI start-up test.

Removing the NT5D12 DDP

CAUTION

The static discharge bracelet located inside the cabinet must be worn before handling circuit cards. Failure to wear the bracelet can result in damage to the circuit cards.

Procedure 21 - Removing the NT5D12 DDP

Step	Action
1	Determine the cabinet and shelf location of the DDP card to be removed.
2	Disable Network Loop using Overlay 60. The command is DISL "loop number."
	The associated DCHI may have to be disabled first. The faceplate switch S1 should not be disabled until both PRI loops are disabled first.
3	If the DDP card is being completely removed, not replaced, remove data from memory. See the ISDN PRI Description and Administration NTP(553-2901-100).
4	Remove cross connections at MDF to wall-mounted cross-connect terminal.
5	Tag and disconnect cables from card.
6	Rearrange Clock Controller cables if required.

CAUTION

Clock Controller cables connecting the Clock Controller and DDP card must **NOT** be routed through the center of the cabinet past the power harness. Instead they should be routed around the outside of the equipment shelves.

7	If the other circuit of a DDP card is in use, **DO NOT** remove the card.
8	Remove the DDP card only if both loops are disabled. Switch S1 (faceplate switch) must be in the OFF (DIS) position before the card is removed.
9	Pack and store the DDP card and circuit card.

Configuring the NT5D12 DDP

After the NT5D12 DDP has been installed, it may be configured using the same procedures as for the standard QPC720 PRI card. Refer to the ISDN PRI Description and Administration (553-2901-100) document.

Consider the following when configuring the NT5D12 DDP card:

— The Meridian 1 software allows four ports to be defined for the NT6D80 MSDL. The DDCH (NTBK51AA) card has only two ports, 0 and 1; therefore, ports 2 and 3 must not be defined when using the NTBK51AA;

— Port 0 of the NTBK51AA can only be defined to work with Loop 0 of the NT5D12 DDP card, and Port 1 of the NTBK51AA can only be defined to work with Loop 1 of the NT5D12. This relationship must be reflected when configuring a new DCH in overlay 17 (in response to the DCHL prompt, enter either 0 or 1 when specifying the loop number used by the DCH);

— You cannot define one of the DDP loops for the NTBK51AA DDCH, and the other loop for for the QPC757 DCHI or the NT6D80 MSDL.

DDCH installation for all systems

Installation note

Before beginning an installation, do the following:

— Consult the Spares Planning Guide (553-3001-153) document and follow the instructions.

— Bring spares of all cables and boards.

— Remember that test procedures require a 24-hour minimum bit error-rate testing before being used. See the ISDN PRI Description and Administration (553-2901-100) document for these test procedures.

— The MSDL/DCHI (if needed) or the DDP cards may be installed first. However, DDP loops must be configured in software before defining DCH links.

Installing the DDCH daughterboard

Installation instructions for the DDCH (NTBK51AA) card are the same for Meridian 1 Options 21/21E, 51/51C, 61/61C, 71, and 81/81C, and Meridian SL-1 STE, RT, XT, and NT systems.

Set the address for the DDCH (see the switch settings section to set the address). If a DDCH is present on a DDP card then an external D-Channel should not be connected to J6. If a DDCH is present the LED "DCH" will light up.

CAUTION

The static discharge bracelet located inside the cabinet must be worn before handling circuit cards. Failure to wear the bracelet can result in damage to the circuit cards.

Procedure 22 - Installing the DDCH card

Step	Action
1	The DDCH can be mounted on any DDP card.
2	Unpack and inspect the DDCH daughterboard.
3	The DDCH comes with four stand-offs so that it can be mounted onto the DDP. These are easily pushed into 4 corresponding mounting holes on the DDP.
4	The DDCH is mounted so that it mates correctly with P2 and P3 on the DDP motherboard.

DDCH removal for all systems

Removing the DDCH daughterboard

Removal instructions for the DDCH (NTBK51AA) card are the same for Meridian 1 Options 21/21E, 51/51C, 61/61C, 71, and 81/81C, and Meridian SL-1 STE, RT, XT, and NT systems.

CAUTION

The static discharge bracelet located inside the cabinet must be worn before handling circuit cards. Failure to wear the bracelet can result in damage to the circuit cards.

Procedure 23 - Removing the DDCH card

Step	Action
1	The DDCH can only be removed when it is disabled in software.
2	Both ports of the associated DDP card must be disabled.
3	Disable the faceplate switch on the DDP.
4	Remove the DDP and DDCH.

Echo Canceller for all systems

PRI to Echo Canceller pin assignments

Echo Cancellers are required only if using satellite transmission. The Echo Canceller detects the length of the loop then cancels reflected transmission (hearing your own voice at the other end).

The Echo Canceller is controlled by an RS-232 port on the QPC720 PRI circuit card. The following tables give the Echo Canceller pin assignments, operating parameters, and initialization procedures.

See for PRI to Echo Canceller cabling.

Table 41
PRI to Echo Canceller pin assignments

Signal	EIA RS-232-C circuit designation	PRI pin	Echo Canceller pin
Transmitted Data (TXD)	BA	5	2
Received Data (RXD)	BB	2	3
Request to Send (RTS)	CC	-	4
Clear to Send (CTS)	CB	-	5
Signal Ground (common return)	AB	10	7
Received Line Signal Detector (DCD)	CF	1	8
Data Terminal Ready (DTR)	CD	4	20

Table 42
Echo Canceller operating parameters

Data transfer rate	4800 baud
System unit number	1
Display timeout	active
Failures before alarm	3

Table 43
Echo Canceller initialization procedures

Note: Each of the 24 channels on the Echo Canceller must be initialized as shown below:	
Bypass	OFF
Off-Hook	ON
Canceller only	OFF
H reset	OFF
H hold	OFF

Electromagnetic Interference

The electromagnetic interference (EMI) filter assembly for PRI is PO643763. The Meridian 1 meets FCC Part 15, Subpart J, Class A requirements regarding EMI. In order to accomplish this, the SDI cables must exit the cabinet through EMI filters on the I/O panel. This procedure depends on the Meridian 1 cabinet type.

Figure 38
PRI to Echo Canceller cabling
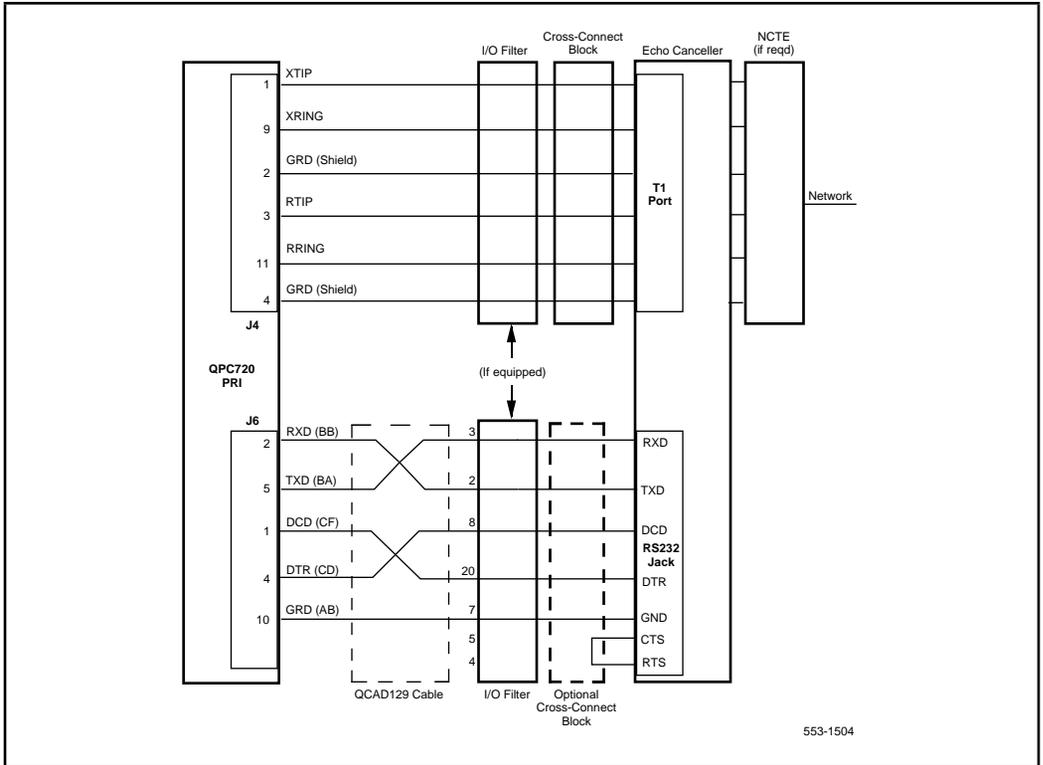
ISL installation for all systems

ISL configurations

The ISDN Signaling Link (ISL) feature operates in two modes (Figure 39):

— Shared mode—One DCH supports PRI with DTI or analog.

— Dedicated mode—In this mode, the DCH supports *only* ISL trunks using ISDN PRI signaling. The D-channel communicates with the far end using a dedicated leased line, dial-up modem, or DTI trunk.
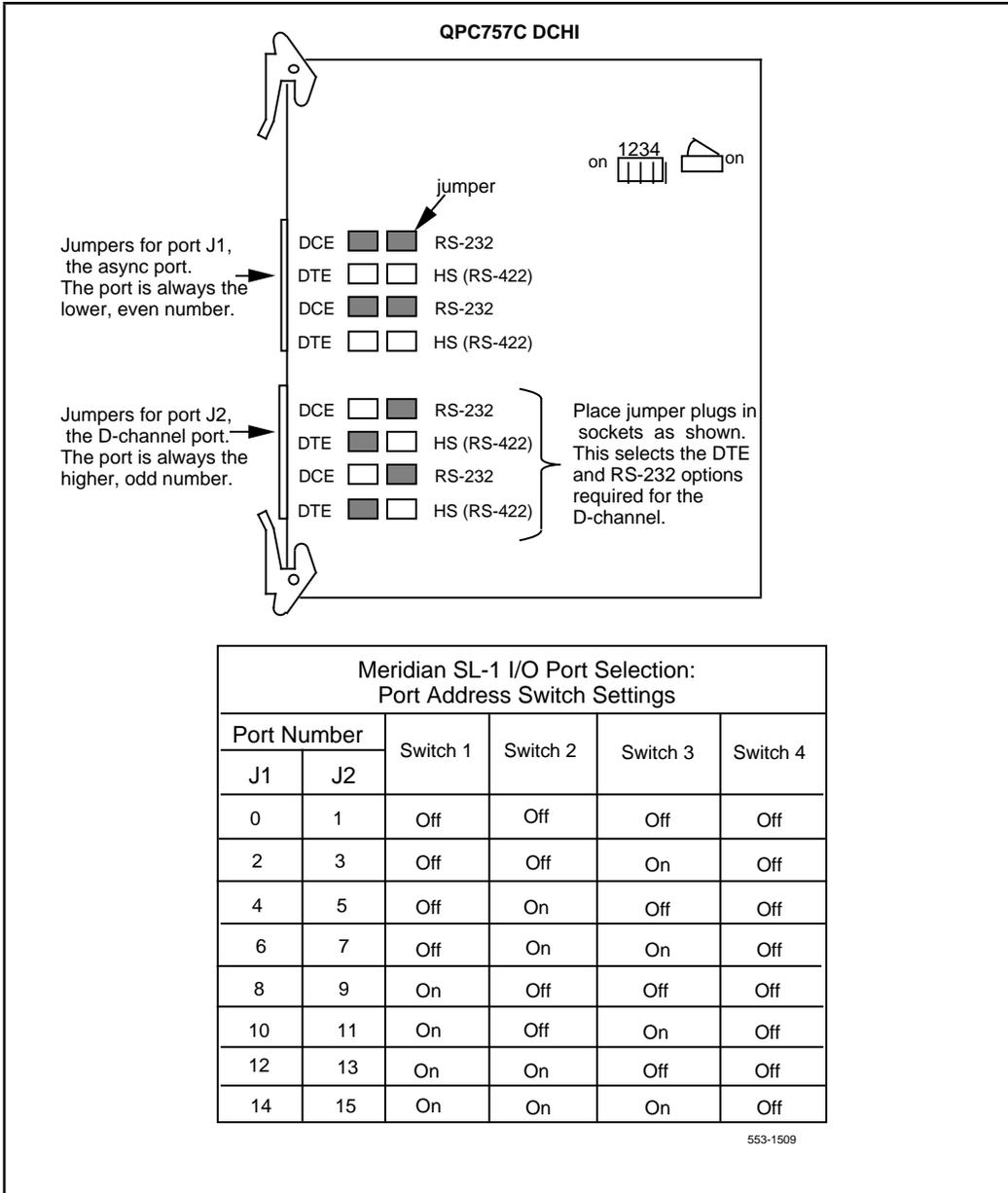
It is recommended that leased lines be data conditioned from the Central Office to ensure the integrity of the ISL configuration.

DCHI switch settings

For ISL functions, use the following switch settings for the J2 port:

— DTE for high speed programming

Note: For ISL low speed programming, see the DCHI installation section of this document.

— RS-232 for 19.2 Kbps and below

— HS for speed above 19.2 Kbps

— External clock (in LD 17) provided by modem, ADM, or ASIM, otherwise DCH runs at 64 Kbps

Figure 39
ISL settings

QPC757C DCHI

on 1234 on

jumper

Jumpers for port J1,
the async port.
The port is always the
lower, even number.

DCE   RS-232
DTE   HS (RS-422)
DCE   RS-232
DTE   HS (RS-422)

Jumpers for port J2,
the D-channel port.
The port is always the
higher, odd number.

DCE   RS-232
DTE   HS (RS-422)
DCE   RS-232
DTE   HS (RS-422)

Place jumper plugs in
sockets as shown.
This selects the DTE
and RS-232 options
required for the
D-channel.

| Meridian SL-1 I/O Port Selection: Port Address Switch Settings					
Port Number		Switch 1	Switch 2	Switch 3	Switch 4
J1	J2				
0	1	Off	Off	Off	Off
2	3	Off	Off	On	Off
4	5	Off	On	Off	Off
6	7	Off	On	On	Off
8	9	On	Off	Off	Off
10	11	On	Off	On	Off
12	13	On	On	Off	Off
14	15	On	On	On	Off

553-1509

MSDL switch settings

For ISL functions, use the following switch settings (Figure 40):

— DTE for high speed programming

— RS-232 for 19.2 Kbps and below

— External clock (in LD 17) provided by modem, ADM, ASIM, or HSDM, otherwise DCH runs at 64 Kbps

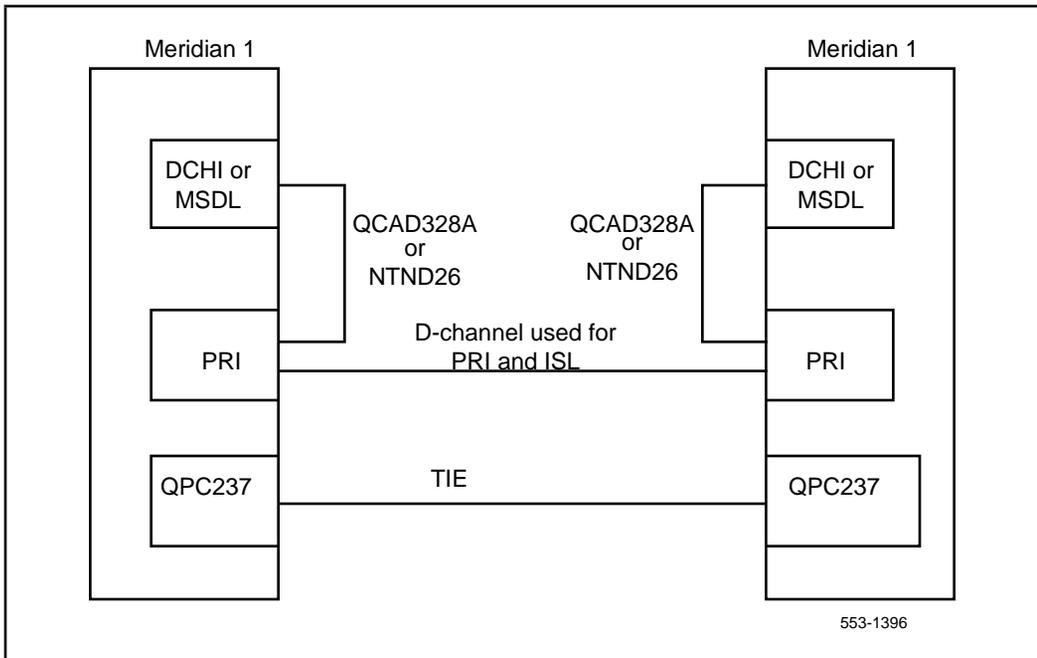**Figure 40**
MSDL/ISL settings
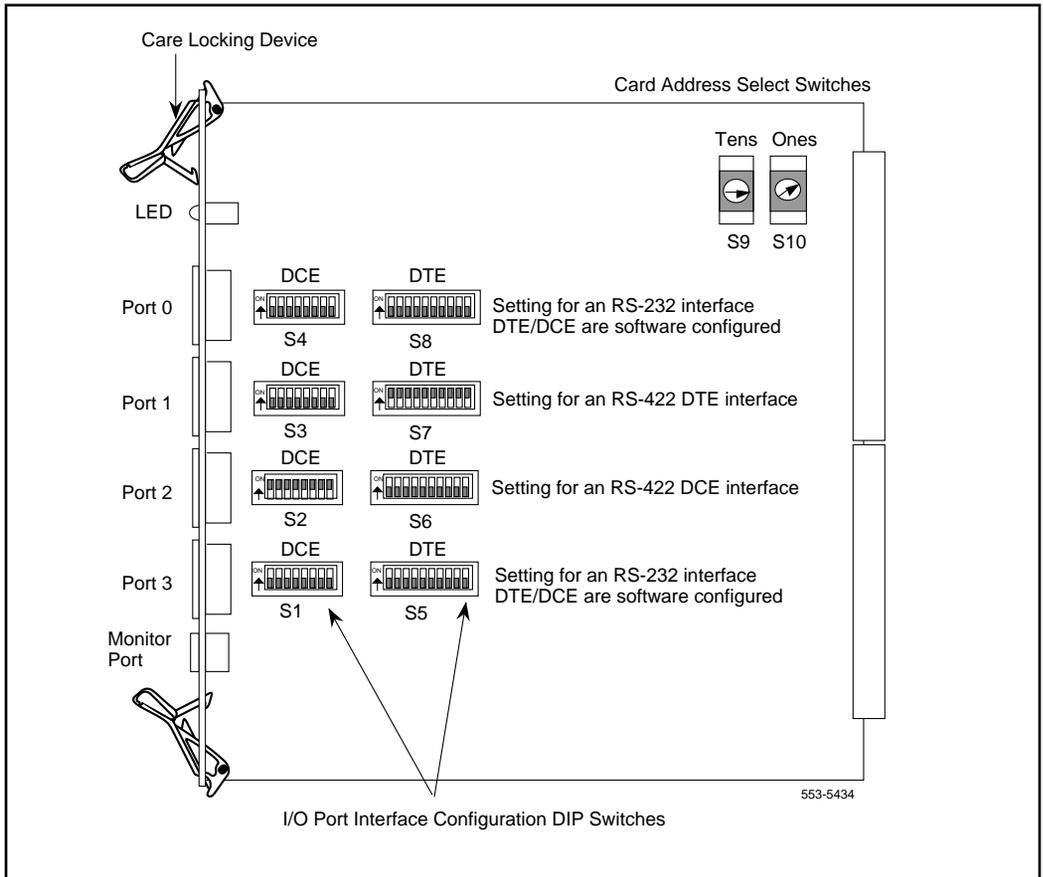
Shared mode

In shared mode, the D-channel is provided by the DCHI or MSDL card and PRI. The hardware configuration is basically the same as the ISDN PRI D-channel. See Figure 41.

Shared mode is established through service change in LD 17, prompt USR, with the response SHA.

In the shared mode, the DCH can share signaling for no more than 382 trunks, including digital and analog.
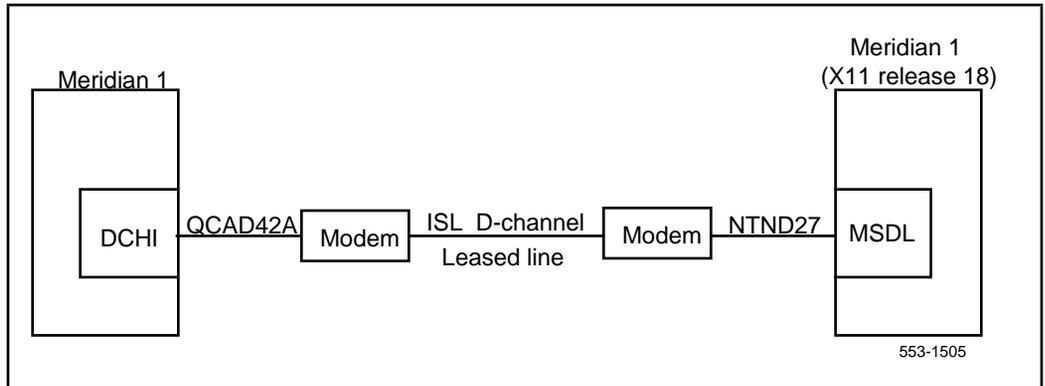
Figure 41
ISL in shared mode

Dedicated mode using leased line

In this configuration, the D-channel connects the DCHI or MSDL to a modem, which communicates with a far-end modem over a dedicated leased line. See Figure 42. A 2400-baud D-channel can support signaling for approximately 700 trunks without noncall associated messages.

Both modems should be set in the synchronous mode.

Figure 42
ISL dedicated mode: using leased line

Dedicated mode using dial-up modem

In this configuration, the DCHI or MSDL is connected to a modem, which is connected to a 500 set line card. See Figure 43. The call is connected to the far end through the 500 set-to-tie trunk path.

To set up the D-channel, program the modem at one end in the auto-dial mode, so it automatically initiates a call to the other end at power up. The autodial DN must be coordinated with personnel at the far end switch.

Installing the Hayes Smartmodem 2400

The software and hardware of the Hayes Smartmodem 2400 must be installed sequentially. The Hayes Smartmodem 2400 software must be defined before the hardware connection between the Hayes Smartmodem 2400 and the Meridian 1 can be made. Within the software installation, either the autodial or the autoanswer software can be set up first.

Examples of parameters used for actual autoanswer and autodial sites are shown on the following pages. The *Hayes Smartmodem 2400 User's Guide* contains explanations of the parameters used.

After the software parameters have been set up, the JP1 jumpers behind the front faceplate of the Hayes Smartmodem 2400 must be dumb strapped on both modems. Then see the *Hayes Smartmodem 2400 Getting Started Guide* to set up the hardware between the Meridian 1 and the modem.

Note: The Hayes Smartmodem 2400 cannot be used on leased, conditioned lines.

Figure 43
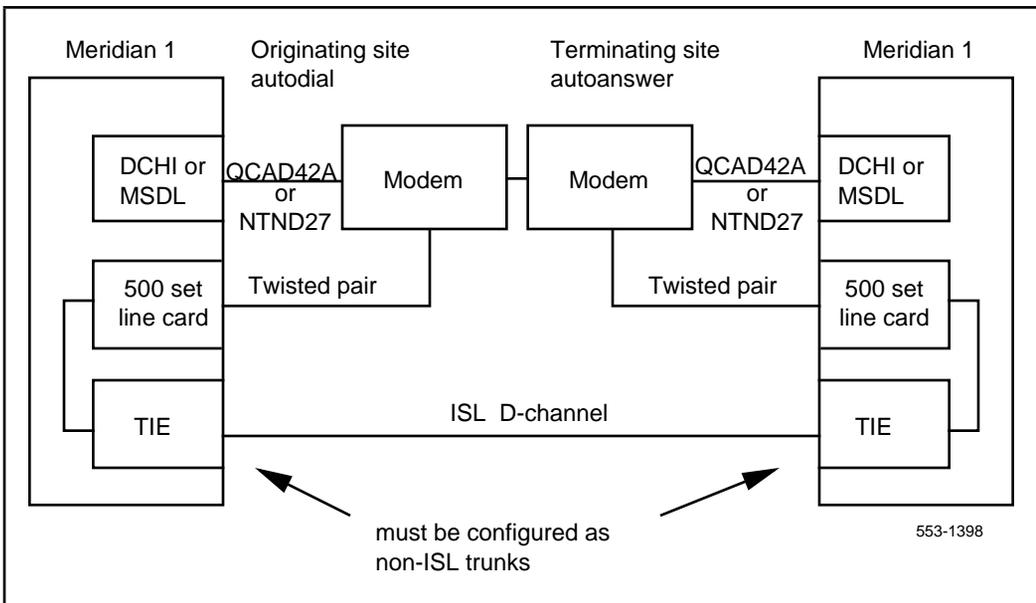**ISL dedicated mode: using dial-up Hayes Smartmodem 2400**

Table 44 identifies the signals sent from the pack to the modem, the signals the pack requires from the modem, and the state of the modem.

Table 44
Pin assignment for D-channel RS-232 interface

| PIN #	Description	Designation			Direction		State	
		EIA	CCITT	COM MON	To DTE	To DCE	0 Space On	1 Mark Off
1	frame gnd	AA	101	FG				
2	tx data	BA	103	TxD		X	+12V	−12V
3	rx data	BB	104	RxD	X		+12V	−12V
4	req to send	CA	105	RTS		X	+12V	−12V
5	clr to send	CB	106	CTS	X		+12V	−12V
6	data set rdy	CC	107	DSR	X		+12V	−12V
7	signal gnd	AB	102	SG				
8	data cxr detect	CF	109	DCD	X		+12V	−12V
9–14	(not connected)							
15	tx clock	DB	114	SCT	X		+12V	−12V
16	(not connected)							
17	rx clock	DD	115	SCR	X		+12V	−12V
18–19	(not connected)							
20	data term rdy	CD	108.2	DTR		X	+12V	−12V
21–22	(not connected)							
23	data rate sel	CH	111	DRS		X	+12V	−12V
24	ext tx clock	DA	113	SCTE		X	+12V	−12V
25	(not connected)							

Dedicated mode using PRI/DTI trunks

In this configuration, the DCHI or MSDL is connected to a High Speed Data Module (HSDM) or Asynchronous/Synchronous Interface Module (ASIM). See Figure 44. The HSDM or ASIM is connected to a Data Line Card (DLC). The call is then connected to the far end through the DLC to DTI trunk path.

To establish the D-channel in this configuration, set up the HSDM or ASIM at one end in hot line mode. The hot line DN must be coordinated with personnel at the far end, then programmed in LD 11. The preprogrammed hot line DN is dialed by the Meridian 1. If the call cannot be established, the Meridian 1 continues to dial the hot line number continuously until the call is connected.

Set the HSDM or ASIM in synchronous mode. A data rate of 9.6 Kbps is recommended because it provides internal error detection and correction. The following data rates are also supported: 1.2 Kbps, 2.4 Kbps, 3.6 Kbps, 4.8 Kbps, 7.2 Kbps, 14.4 Kbps, 19.2 Kbps, 38.4 Kbps, and 56 Kbps for ASIM. The High Speed Data Module (HSDM) supports 64 Kbps.

Note: This configuration is the least reliable because of the lockup problems inherent in smart modems from power splices and noisy lines. To increase the reliability of this configuration, a constant power source can be used when powering the modems. Also ensure that the tie lines meet data grade specifications. Northern Telecom takes no responsibility for ISL D-channel outages due to modem lockup.

Figure 44
ISL dedicated mode: using PRI/DTI trunk
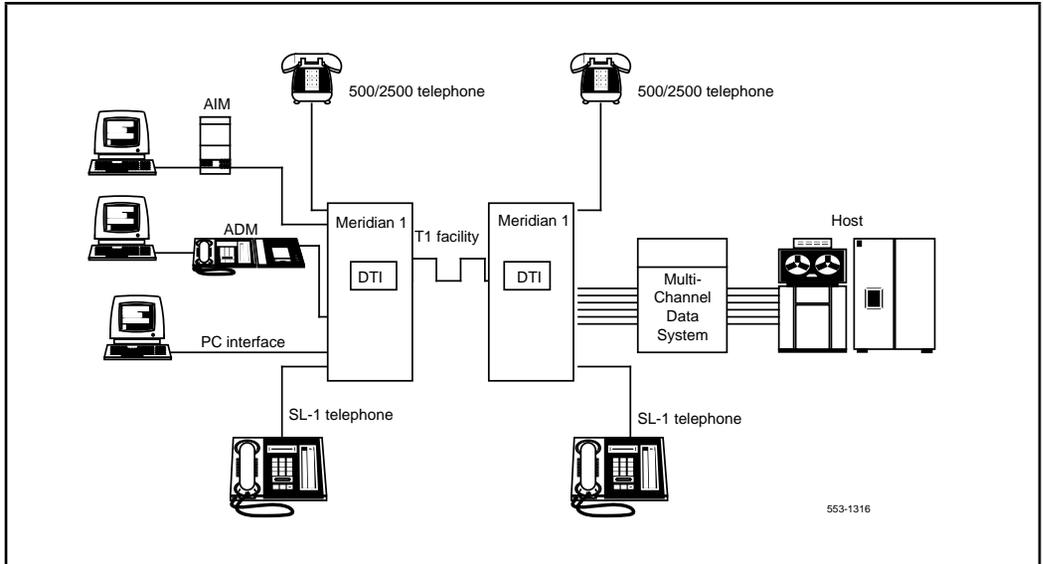
QMT11 switch settings—If using the QMT11 ASIM, set the dip switches, located on top of the unit under the flip-up, as follows:

— Hotline   On; See Note 1.

— Forced DTR   On; See Note 2.

— FDX (full duplex)   On

— SYNC   On

— INTernal CLK   On

— Modem/Network   Modem

— Auto Answer   On

— Loopback   Off

Note 1: Set only one side of the interface to originate the hot line.

Note 2: Forced Data Terminal Ready (DTR) automatically reinitiates a dropped hot line call.

QMT21C switch settings—If using the QMT21 HSDM, set the dip switches, located on top of the unit under the flip-up, as follows.

— Hotline	On; See Note 1.
— Forced DTR	On; See Note 2.
— FDX (full duplex)	On
— SYNC	On
— INTernal CLK	On
— Modem/Network	Modem
— Auto Answer	On
— Loopback	Off

Note 1: Set only one side of the interface to originate the hot line.

Note 2: Forced Data Terminal Ready (DTR) automatically reinitiates a dropped hot line call.

ISL installation

The following procedures explain the installation for ISL in both dedicated and shared modes.

Modem paths must have individual configurations such as route data blocks, trunks, and routes.

ISL dedicated mode (digital and analog)

DTI should already be up and running.

1 In LD 17, configure ISL for dedicated mode.

USR   ISLD

ISLM   Number of trunks handled by this D-channel (1–382)

2 In LD 16, configure the Route Data Block to map out the software parameters for these trunks.

3 Install the modem with leased line functionality.

4 In LD 14, reassign old trunks to the routes just built in LD 16.

5 In LD 16, delete the old DTI route. A separate Route Data Block should be built for a leased line or for a dedicated modem dialing plan.

ISL shared mode

DTI or PRI should already be up and running.

1 In LD 14, remove the PRI trunks.

2 In LD 17, configure ISL for dedicated mode.

USR   SHA

ISLM   Number of trunks handled by this D-channel (1–382)

3 In LD 16, build a PRI Route Data Block. This is the same route you just removed in step 1.

ISDN   YES

4 In LD 16, build another Route Data Block to correspond to the IAS routes.

5 In LD 14, assign trunks to the newly configured routes.

PRI cabling information

This section provides information required to build cables of nonstandard lengths for ISDN Primary Rate Interface (PRI) applications.

QCAD128/NT8D83xx

This cable transports the T1 signal from the PRI pack to the I/O panel. See Table 45.

— Standard length—10 ft (3.05 m)

— Construction—15-conductor ribbon, 28 AWG
   (0.321 mm), stranded

— P1 Connector—15-pin, male, subminiature D, with jack-screws

— P2 Connector—15-pin, male, subminiature D, with jack-screws

Table 45
QCAD128/NT8D83xx wire list

From	To	Signal
P1-1	P2-1	XTIP (transmit tip) to telephone company
P1-2	P2-2	GND (ground)
P1-3	P2-3	RTIP (receive tip) from telephone company
P1-4	P2-4	GND (ground)
P1-5	P2-5	
P1-6	P2-6	
P1-7	P2-7	
P1-8	P2-8	
P1-9	P2-9	XRING (transmit ring) to telephone company
P1-10	P2-10	
P1-11	P2-11	RRING (receive ring) from telephone company
P1-12	P2-12	
P1-13	P2-13	
P1-14	P2-14	
P1-15	P2-15	

QCAD129/NT9J93xx

This cable connects the RS-232-C interface between an Echo Canceller and the PRI card. See Table 46.

— Standard length—7 ft (2.1 m)

— Construction—22 AWG (0.644 mm), stranded

— P1 Connector—15-pin, male, subminiature D, with jack-screws

— P2 Connector—25-pin, male, subminiature D, with jack-screws

Table 46
QCAD129/NT9J93xx wire list

PRI signal	From	To	Echo signal canceller
DCD	P1-1	P2-20	DTR
RXD	P1-2	P2-2	TXD
DTR	P1-4	P2-8	DCD
TXD	P1-5	P2-3	RXD
GND	P1-10	P2-7	GND
RTS	P1-12	P2-4	
CTS	P1-9	P2-5	
TPENB (Note)	P1-15	nc	
Note: TPENB = Test Port Enable Bar			

QCAD133/NT8D83xx

For cabinets **with** an I/O filter assembly, this cable transports the T1 signal from the I/O filter to the Network Channel Terminating Equipment (NCTE) telephone company interface. See Table 47.

For cabinets **without** an I/O filter assembly, this cable transports the T1 signal from the QPC720 PRI pack to the NCTE telephone company interface.

— Standard length—50 ft (15.3 m)

— Construction—Individually foil-shielded, twisted pairs, 24 AWG (0.511 mm), stranded

— P1 Connector—15-pin, female, subminiature D with jack-screws

— P2 Connector—15-pin, male, subminiature D, with slide-latch (optional spring-latch loose-packed with cable assembly)

Table 47
QCAD133/NT8D83xx wire list

Color	From	To	PRI signal
WHITE	P1-1	P2-1	XTIP (transmit tip) to telephone company
BLACK	P1-9	P2-9	XRING (transmit ring) to telephone company
GRN SHLD	P1-2	nc	GND (ground)
RED	P1-3	P2-3	RTIP (receive tip) from telephone company
BLACK	P1-11	P2-11	RRING (receive ring) from telephone company
RED SHLD	P1-4	nc	GND (ground)

QCAD328

This cable connects the PRI pack to the D-channel interface card, the QPC757 DCHI. There are four types of QCAD328 cables: QCAD328A, QCAD328B, QCAD328C, and QCAD328D. See Table 48.

— QCAD328A—6 ft (1.8 m)

— QCAD328B—18 ft (5.5 m)

— QCAD328C—35 ft (10.67 m)

— QCAD328D—50 ft (15.24 m)

— Construction—24 AWG (0.511 mm), stranded

— P1 Connector—25-pin male, subminiature D

— P2 Connector—15-pin male, subminiature D

Table 48
QCAD328 wire list

From	To	Signal
P1-2	P2-2	SDA+
P1-13	P2-10	SDB-
P1-20	P2-15	TR
P1-15	P2-9	STA+
P1-14	P2-11	STB-
P1-3	P2-4	RDA+
P1-16	P2-12	RDB-
P1-17	P2-5	RTA+
P1-12	P2-13	RTB-
P1-8	P2-8	RR
P1-5	P1-8	CS
P1-7	P1-1	SG
P1-1	P2-1	GND

NT8D74 Clock Controller to InterGroup cable

This cable connects the QPC471 Clock Controller card to the NT8D36 InterGroup Module.

This cable is available in the following lengths:

— NT8D74AC   1.2 m (4 ft)
— NT8D74AD   1.8 m (6 ft)
— NT8D74AE   2.4 m (8 ft)
— NT8D74AF   3 m (10 ft)
  (QCAD110B)
— NT8D74AJ   4.8 m (16 ft)

NT8D75 Clock Controller to Clock Controller cable

This cable interconnects QPC471 Clock Controller cards.

This cable is available in the following lengths:

— NT8D75AC   1.2 m (4 ft)
— NT8D75AD   1.8 m (6 ft)
— QCAD125   3 m (10 ft)

NT8D79 PRI/DTI to Clock Controller cable

This cable connects the PRI/DTI card to the QPC471 Clock Controller card.

This cable is available in the following lengths:

— NT8D79AB   0.6 m (2 ft)
— NT8D79AC   1.2 m (4 ft)
— NT8D79AD   1.8 m (6 ft)
— NT8D79AE   2.4 m (8 ft)
— NT8D79AF   3 m (10 ft)
  (QCAD130)

NT8D83 PRI/DTI to I/O cable

This cable connects the PRI/DTI card (T1 port) to the I/O connector panel.

This cable is available in the following lengths:

— NT8D83AC   1.2 m (4 ft)

— NT8D83AD   1.8 m (6 ft)

NT8D85 Network to PE cable

This cable connects the following:

— QPC581 CMA card to QPC581 CMA card in dual CPU configuration

— QPC414 Network card to PRI/DTI card

— QPC414 Network card to QPC659 Dual Loop Peripheral Buffer card (for internal cabling only)

— QPC659 Dual Loop Peripheral Buffer card to QPC659 Dual Loop Peripheral Buffer card when connecting two NT8D13 PE Modules together

This cable is available in the following lengths:

— NT8D85AB   0.6 m (2 ft)

— NT8D85AC   1.2 m (4 ft)

— NT8D85AZ   1.5 m (5 ft)

— NT8D85AD   1.8 m (6 ft)

— NT8D85AE   2.4 m (8 ft)

— NT8D85AF   3 m (10 ft)

— NT8D85AJ   4.8 m (16 ft)

— NT8D85AL   6 m (20 ft)

— NT8D85AP   7.6 m (25 ft)

— NT8D85AV   13.7 m (45 ft)

NT8D86 Network to I/O cable

This cable connects the following to the I/O connector panel:

— QPC414 Network card

— PRI/DTI card

— QPC659 Dual Loop Peripheral Buffer card

— NT8D47 RPE

This cable is available in the following lengths:

— NT8D86AC   1.5 m (5 ft)
— NT8D86AD   1.8 m (6 ft)

NT8D97AX PRI/DTI I/O to MDF cable

This cable connects the PRI/DTI card to the MDF through the I/O connector panel. It is 15.2 m (50 ft) long.

NT9J93AD PRI/DTI Echo Canceller to I/O cable

This cable connects the PRI/DTI Echo Canceller port to the I/O connector panel. It is 1.8 m (6 ft) long.

NTND26 PRI to MSDL cables

These cables connect the MSDL card to the PRI cards.

— NTND26AA   6 feet
— NTND26AB   18 feet
— NTND26AC   35 feet
— NTND26AD   50 feet

NTND27 MSDL to I/O panel cables

These cables connect the MSDL card to the I/O panel.

— NTND27   6 ft

NTND98 PRI to I/O panel cables

These cables connect the PRI card to the I/O panel.

— NTND98   6 ft

ISDN card slot positions

The following tables illustrate acceptable positions for the QPC720, QPC414, QPC471, QPC775, QPC757, and NT6D80 cards.

Use this chart to determine where you are placing your cards before you actually begin your installation.

Table 49
Card slot positions for 21/ 21E, 51/51C, 61/61C, 71, and 81/81C

	21	21E	51/51C, 61/61C	71	81/81C
QPC414 1 slot	CE/PE: 4–9 (Net)	CE/PE: 4–9 (Net)	CPU/Net: 1–8	Net: 5–12	Net: 5–12
QPC720 2 slots	CE/PE: 4–8 (Net) RPE: 1, 11–12	CE/PE: 4–8 (Net) RPE: 1, 11–12	CPU/Net: 3–8 RPE: 1, 11–12	CPU: 8–13, 15–16 Net: 5–10, 13–14 RPE: 1, 11–12	Core: 0–3 Net: 5–10, 13–14 RPE: 1, 11–12
QPC471 QPC775 1 slot per CPU	CE/PE: 4–7 (Net)	CE/PE: 4–7 (Net)	CPU/Net: 9	CPU: 14	COR/Net: 9
QPC757 1 slot	CE/PE: 4–9 (Net)	CE/PE: 4–9 (Net)	CPU/Net: 1–8, 13	CE/Net: 5–14	CE/Net: 5–14
NT6D80 1 slot	—	CE/PE: 4–9 (Net)	CPU/Net: 1–8, 13	CE/Net: 5–14	CE/Net: 5–14 COR/Net: 0-8

Table 50
Card slot positions for ST, STE, RT, NT, XT

	ST QCA136	STE QCA136	RT QCA147	NT QCA58	XT QCA55
QPC414 **1 slot**	CE: 5–12	CE: 5–12	QSD76: 3–10	QSD39: 3–10 QSD40: 5–12	QSD39: 3–10 QSD40: 5–12
QPC720 **2 slots**	CE: 5–12 QSD73: 2–9	CE: 5–12 QSD73: 2–9	QSD76: 5–10 QSD73: 2–9	QSD39: 5–10 QSD40: 5–10	QSD39: 5–10 QSD40: 5–10
QPC471 **QPC775** **1 slot** **per CPU**	CE: 5–12	CE: 5–12	QSD76: 13	Shelf 0, QSD39: 13 for half group Shelf 1, QSD40: 2 for single group	QSD62: 15
QPC757 **1 slot**	CE: 5–13	CE: 5–13	QSD76: 2–10, 12	QSD39: 2–10, 12 QSD40: 5–13, 3	QSD39: 2–10 QSD40: 5–13
NT6D80 **1 slot**	—	CE: 5–13	QSD76: 2–10, 12	QSD39: 2–10, 12 QSD40: 5–13, 3	QSD39: 2–10 QSD40: 5–13

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