Meridian 1

Succession 1000

Succession 1000M

Succession 3.0 Software

ISDN Primary Rate Interface

Installation and Configuration

Document Number: 553-3001-201
Document Release: Standard 1.00
Date: October 2003

Produced in Canada

Revision history

October 2003

Standard 1.00. This document is a new NTP for Succession 3.0. It was created to support a restructuring of the Documentation Library, which resulted in the merging of multiple legacy NTPs. This new document consolidates information previously contained in the following legacy documents, now retired:

- *ISDN Primary Rate Interface: Installation* (553-2901-201)
- *1.5Mb DTI/PRI: Description, Installation and Maintenance* (553-3011-310) (Content from *1.5Mb DTI/PRI: Description, Installation and Maintenance* (553-3011-310) also appears in *ISDN Primary Rate Interface: Maintenance* (553-3001-517).)
- *2.0Mb DTI/PRI: Description, Installation and Maintenance* (553-3011-315) (Content from *2.0Mb DTI/PRI: Description, Installation and Maintenance* (553-3011-315) also appears in *ISDN Primary Rate Interface: Maintenance* (553-3001-517).)

Contents

About this document

This document is a global document. Contact your system supplier or your Nortel Networks representative to verify that the hardware and software described is supported in your area.

Subject

This document describes the basic hardware and the associated installation procedures needed to equip ISDN Primary Rate Interface (PRI) on Succession 1000M, Succession 1000, and Meridian 1 systems.

Note on legacy products and releases

This NTP contains information about systems, components, and features that are compatible with Succession 3.0 Software. For more information on legacy products and releases, click the **Technical Documentation** link under **Support** on the Nortel Networks home page:

http://www.nortelnetworks.com/

Applicable systems

This document applies to the following systems:

- Meridian 1 Option 11C Chassis
- Meridian 1 Option 11C Cabinet
- Meridian 1 Option 51C
- Meridian 1 Option 61
- Meridian 1 Option 61C

- Meridian 1 Option 61C CP PII
- Meridian 1 Option 81
- Meridian 1 Option 81C
- Meridian 1 Option 81C CP PII
- Succession 1000
- Succession 1000M Chassis
- Succession 1000M Cabinet
- Succession 1000M Half Group
- Succession 1000M Single Group
- Succession 1000M Multi Group

Note that memory upgrades may be required to run Succession 3.0 Software on CP3 or CP4 systems (Options 51C, 61, 61C, 81, 81C).

System migration

When particular Meridian 1 systems are upgraded to run Succession 3.0 Software and configured to include a Succession Signaling Server, they become Succession 1000M systems. Table 1 lists each Meridian 1 system that supports an upgrade path to a Succession 1000M system.

Table 1
Meridian 1 systems to Succession 1000M systems (Part 1 of 2)

This Meridian 1 system...	Maps to this Succession 1000M system
Meridian 1 Option 11C Chassis	Succession 1000M Chassis
Meridian 1 Option 11C Cabinet	Succession 1000M Cabinet
Meridian 1 Option 51C	Succession 1000M Half Group
Meridian 1 Option 61	Succession 1000M Single Group
Meridian 1 Option 61C	Succession 1000M Single Group
Meridian 1 Option 61C CP PII	Succession 1000M Single Group

Table 1
Meridian 1 systems to Succession 1000M systems (Part 2 of 2)

This Meridian 1 system...	Maps to this Succession 1000M system
Meridian 1 Option 81	Succession 1000M Multi Group
Meridian 1 Option 81C	Succession 1000M Multi Group
Meridian 1 Option 81C CP PII	Succession 1000M Multi Group

Note the following:

- When an Option 11C Mini system is upgraded to run Succession 3.0 Software, that system becomes a Meridian 1 Option 11C Chassis.
- When an Option 11C system is upgraded to run Succession 3.0 Software, that system becomes a Meridian 1 Option 11C Cabinet.

For more information, see one or more of the following NTPs:

- *Small System: Upgrade Procedures* (553-3011-258)
- *Large System: Upgrade Procedures* (553-3021-258)
- *Succession 1000 System: Upgrade Procedures* (553-3031-258)

Intended audience

This document is intended for individuals responsible for installing and configuring ISDN PRI.

Conventions

Terminology

In this document, the following systems are referred to generically as "system":

- Meridian 1
- Succession 1000
- Succession 1000M

The following systems are referred to generically as "Small System":

- Succession 1000M Chassis
- Succession 1000M Cabinet
- Meridian 1 Option 11C Chassis
- Meridian 1 Option 11C Cabinet

The following systems are referred to generically as "Large System":

- Meridian 1 Option 51C
- Meridian 1 Option 61
- Meridian 1 Option 61C
- Meridian 1 Option 61C CP PII
- Meridian 1 Option 81
- Meridian 1 Option 81C
- Meridian 1 Option 81C CP PII
- Succession 1000M Half Group
- Succession 1000M Single Group
- Succession 1000M Multi Group

The call processor in Succession 1000 and Succession 1000M systems is referred to as the "Succession Call Server".

Related information

This section lists information sources that relate to this document.

NTPs

The following NTPs are referenced in this document:

- *Meridian Link ISDN/AP General Guide* (553-2901-100)
- *Spares Planning* (553-3001-153)
- *Circuit Card: Description and Installation* (553-3001-211)
- *Software Input/Output: Administration* (553-3001-311)
- *Software Input/Output: System Messages* (553-3001-411)
- *Software Input/Output: Maintenance* (553-3001-511)
- *ISDN Primary Rate Interface: Maintenance* (553-3001-517)
- *Small System: Planning and Engineering* (553-3011-120)

Online

To access Nortel Networks documentation online, click the **Technical Documentation** link under **Support** on the Nortel Networks home page:

http://www.nortelnetworks.com/

CD-ROM

To obtain Nortel Networks documentation on CD-ROM, contact your Nortel Networks customer representative.

ISDN Primary Rate Interface equipment overview

Contents

The section contains information on the following topics:

Introduction

This chapter describes the basic hardware needed to equip ISDN PRI on Succession 1000M, Succession 1000, and Meridian 1 systems.

Primary Rate Interface (PRI) hardware requirements

The following hardware is required to equip ISDN PRI on a Large System:

- NT6D11(AB/AE/AF) D-Channel Interface (DCH) card (for 2.0 Mb PRI)
- QPC757 D-channel Interface (DCH) for (1.5 Mb PRI)
- NT6D80 Multipurpose Serial Data Link (MSDL) card
- NTBK51 Downloadable D-Channel Daughterboard (DDCH), the NT5D97 dual-port DTI2/PRI2 card, or the NT5D12 dual-port 1.5 Mb DTI/PRI card
- NT8D72 (AB/BA) PRI2 card
- NT5D97 dual-port DTI2/PRI2 card
- QPC720 1.5 Mb PRI card
- NT5D12 dual-port 1.5 DTI/PRI card
- QPC775 or NTRB53 Clock Controller

  Note: The NTRB53 Clock Controller cannot be combined with a QPC775 or a QPC471 card in one system

Additional hardware is also required for PRI capability and applications. Installation instructions are given in other Nortel Networks publications, or supplied by the manufacturer. This additional hardware includes:

- QPC414 Network card
- Channel Service Unit (CSU)

- Echo canceller
- ROM circuit card requirements:
  - — the QPC939A for a Succession 1000M Half Group
  - — the QPC939A for Succession 1000M Single Group

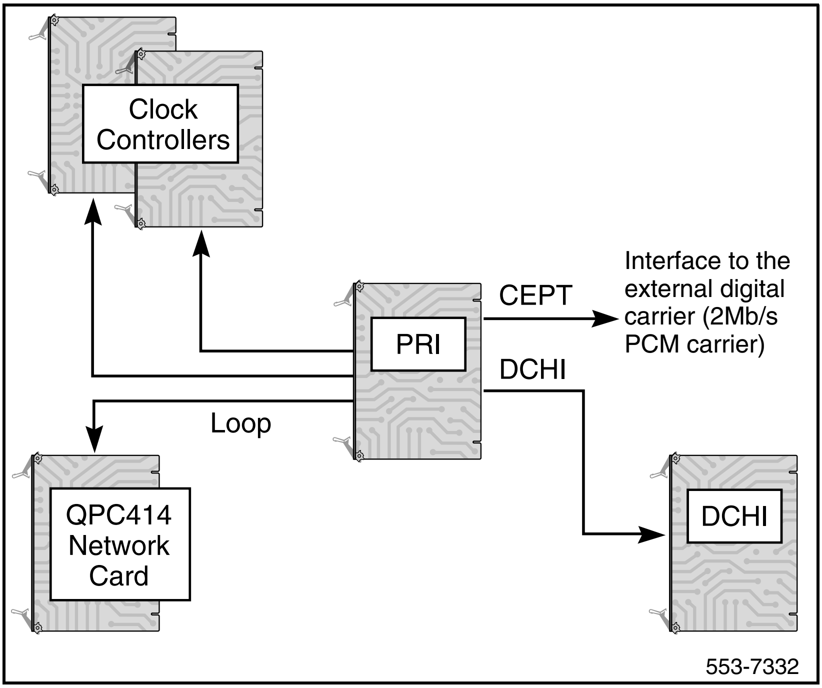
  Note: Succession 1000M Multi Group ROM requirements are fulfilled by the NT6D66 Call Processor (CP) card.

- QMT8 Asynchronous Data Module (ADM)

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

> ***Note:*** Figure 1 shows a basic configuration, not the dual-port NT5D12 DTI/PRI card, nor the associated dual-port NTBK51AA Downloadable D-Channel daughterboard.

Figure 1
PRI hardware (shown without downloadable PRI and DCH cards)



ISDN Signaling Link (ISL) hardware

The following hardware is required for ISDN Signaling Link (ISL) capability and applications.

Equipment required for shared mode capability:

- NT6D11(AB/AE/AF) D-Channel (DCH) card (for 2.0 Mb PRI)
- QPC757 D-channel (DCH) for (1.5 Mb PRI)
- NT6D80 Multipurpose Serial Data Link (MSDL) card
- NTBK51 Downloadable D-Channel Daughterboard (DDCH), the NT5D97 dual-port DTI2/PRI2 card, or the NT5D12 dual-port 1.5 Mb DTI/PRI card

- NT8D72 (AB/BA) PRI2 card
- NT5D97 dual-port DTI2/PRI2 card
- QPC720 1.5 Mb PRI card
- NT5D12 dual-port 1.5 DTI/PRI card
- QPC775 Clock Controller or NTRB53

Equipment required for dedicated mode using leased lines:

- NT6D11(AB/AE/AF) D-Channel (DCH) card (for 2.0 Mb PRI)
- QPC757 D-channel (DCH) for (1.5 Mb PRI)
- NT6D80 Multipurpose Serial Data Link (MSDL) card
- NTBK51 Downloadable D-Channel Daughterboard (DDCH), used as an option to the NT6D80 MSDL
- modem set in synchronous mode

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

- NT6D11(AB/AE/AF) D-Channel (DCH) card (for 2.0 Mb PRI)
- QPC757 D-channel (DCH) for (1.5 Mb PRI)
- NT6D80 Multipurpose Serial Data Link (MSDL) card
- NTBK51 Downloadable D-Channel Daughterboard (DDCH), used as an option to the NT6D80 MSDL
- modem with auto-dial capability

  Note: This configuration is the least reliable due to lockup problems inherent in Smart Modems from power spikes 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. Nortel Networks takes no responsibility for ISL D-Channel outages due to modem lockup.

- 500 set line card
- QPC71 2W TIE, or QPC237 4W TIE E&M

Equipment required for dedicated mode using a DTI/DTI2 trunk:

- NT6D11(AB/AE/AF) D-Channel (DCH) card (for 2.0 Mb PRI)
- QPC757 D-channel (DCH) for (1.5 Mb PRI)
- NT6D80 Multipurpose Serial Data Link (MSDL) card
- NTBK51 Downloadable D-Channel Daughterboard (DDCH), used as an option to the NT6D80 MSDL
- NT5D97 dual-port DTI2/PRI2 card
- QPC472 1.5 Mb DTI card or NT5D12 dual-port 1.5 DTI/PRI card
- QMT8 Asynchronous Data Module (ADM), QMT11 Asynchronous/Synchronous Interface Module (ASIM) or QMT21 High Speed Data Module (HSDM)
- Data line card

64 Kb/s Clear Data Hardware

The QMT21 High Speed Data Module (HSDM) is required in the clear-data pathway to support the 64Kb/s clear-data function. One module is required at each system end of any connection.

D-Channel Handler description

This section provides descriptions of the D-Channel (DCH) cards, the MSDL card, and the Downloadable D-Channel Daughterboard.

NT6D11 DCH

Power requirements

The power requirements for the NT6D11AB/11AE/AF DCH are:

- +5 volts at 3 amperes
- +12 volts at 75 milliamperes
- -12 volts at 75 milliamperes

DCH/PRI interface

The NT6D11AB/AE/AF DCHs connect to the PRI2 cards by means of a special RS422 cable, the QCAD328A, which is a special RS422 cable; refer to “QCAD328” on page 391 of the Cabling chapter for more details.

DCH faceplate

NT6D11AB/AE/AF DCHs have one Light Emitting Diode (LED), to indicate an active or inactive state, and two external connectors:

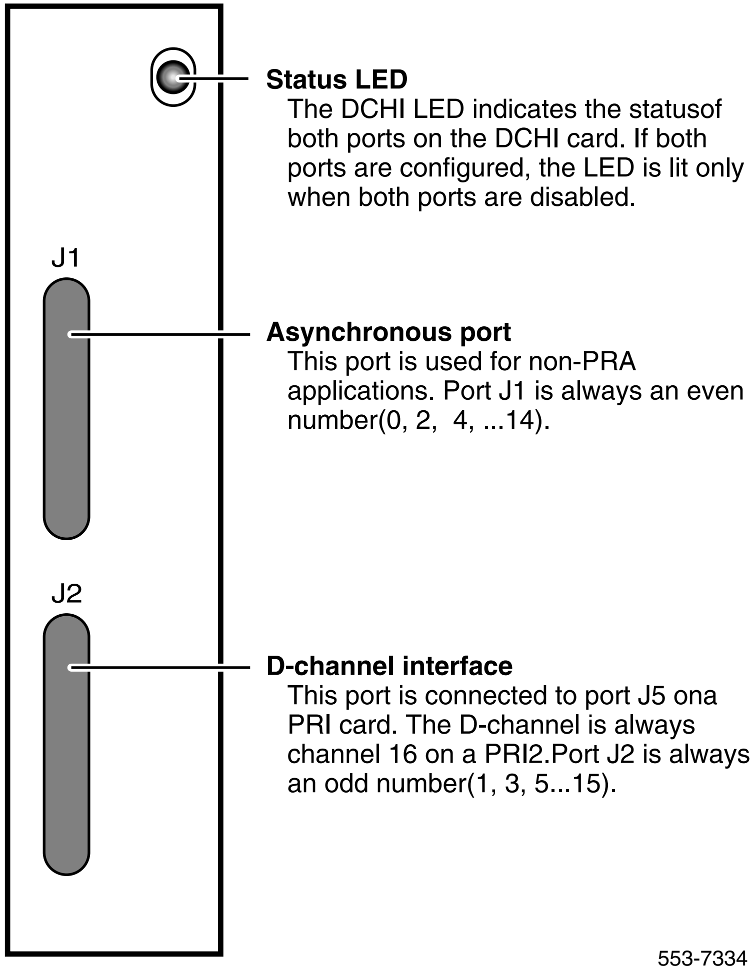
- Port J1 is a standard asynchronous port providing an interface for non-PRI applications.

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

- Port J2 is the D-Channel Interface port.

Figure 2 on page 25 shows the faceplate layout.

Figure 2
NT6D11 DCH faceplate layout



QPC757 DCH

Power requirements

The power requirements for the QPC757 DCH are:

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

DCH/PRI interface

The QPC757 DCH 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
- DCH READY

PRI READY and DCH READY are handshake signals.

QPC757 faceplate

The QPC757 DCH, as shown in Figure 3 on page 27 has one LED to indicate an active or inactive state and two external connectors as follows:

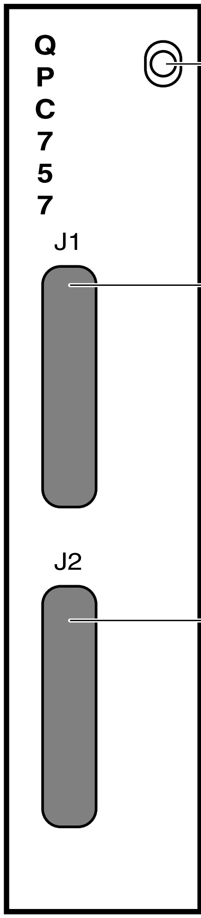
- Port J1 is a standard asynchronous port in LD 48

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

- Port J2 is the D-Channel Interface port.

Note: A QPC757 vintage C is required if the ISL Revert to Conventional Signaling feature is configured. 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 DCH faceplate layout



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.

Asynchronous port
This port is used for non-PRI applications.

Print the configuration record to determine how the port is configured.

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

Check the async port status with
LD48
STAT ESDI N

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).

Check the D-channel port status with
LD96
STAT DCHI N

553-1373

NT6D80 MSDL

The NT6D80 MSDL card can be used in conjunction with, or independent of, the QPC757, or NT6D11AB/AE/AF DCH.

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

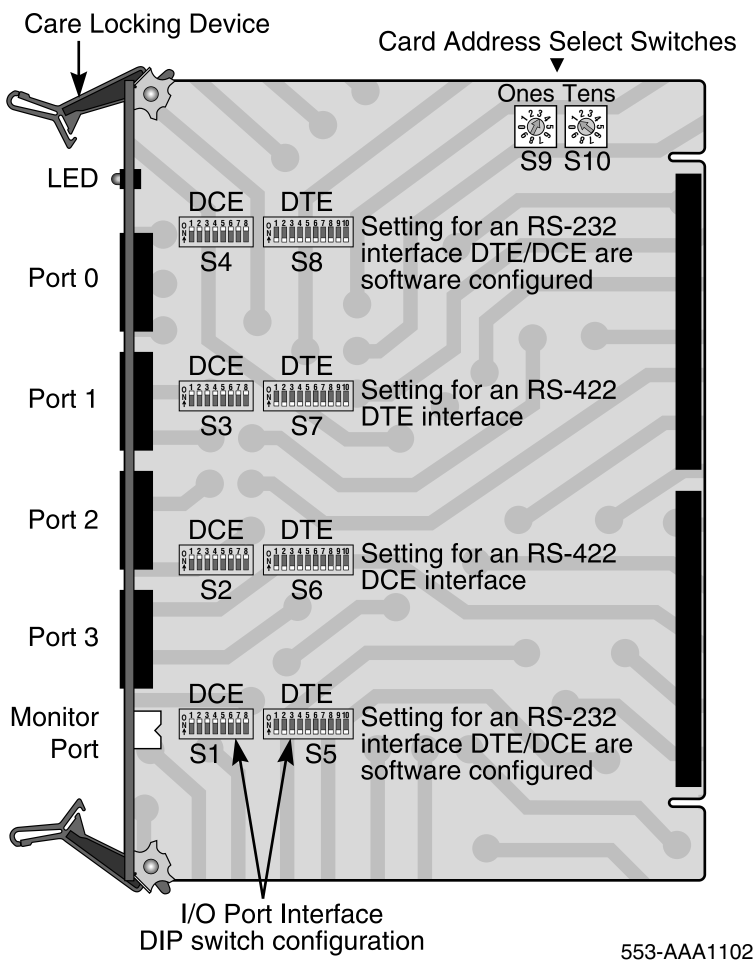
MSDL/PRI interface

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

MSDL faceplate

The NT6D80 MSDL has one LED to indicate an active or inactive state and four external connectors. Each port can be RS-422 or RS-232 connectors, with either DCE or DTE interfaces. Refer to Figure 4 on page 29.

Figure 4
NT6D80 MSDL faceplate layout



NTBK51 Downloadable D-Channel Daughterboard

The NTBK51 is a two port Downloadable D-Channel Daughterboard (DDCH) that has been introduced as an option to the NT6D80 MSDL, the NT5D97 dual-port DTI2/PRI2 card, or the NT5D12 dual-port 1.5 Mb DTI/PRI card.

The NTBK51 supports all the features of the existing 4 port MSDL (NT6D80), and eliminates the need for an external DCH card and associated cables for MSDL applications. The NTBK51 can support a maximum of 32 (16*2) MSDL type D-Channels per system, unlike the MSDL which can support a maximum of 64.

> ***Note 1:*** Only one version, the NTBK51AA, can be used with the NT5D97, or the NT5D12. The 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 the use of port 0 on the NT5D97, or NT5D12 card.
>
> ***Note 2:*** The software allocation for NTBK51AA DDCH is similar to the MSDL. It is both physical and logical, and supports D-Channel functionality only.
>
> ***Note 3:*** Port 0 has to be an even loop on the DDP2, and Port 1 has to be an odd loop. Port 2 and Port 3 should not be configured.

The connection between the dual-port cards and the DDCH daughterboard is made using two headers: one 30 pin and one 40 pin connector.

Standard PRI cards

This section provides a description of the standard ISDN PRI cards, namely the NT8D72 (AB/BA) PRI2 card, and the QPC720 1.5 Mb PRI card.

NT8D72 PRI2

Power requirements

The NT8D72AB and NT8D72BA PRI use power and ground connections from the backplane. Power requirements are:

+5 volts at 4 amperes

+12 volts at 50 milliamperes

-12 volts at 50 milliamperes

NT8D72 faceplate

The NT8D72 contains five LEDs and six external connectors. Figure 5 on page 32 shows the faceplate layout.

Figure 5
NT8D72 PRI faceplate layout

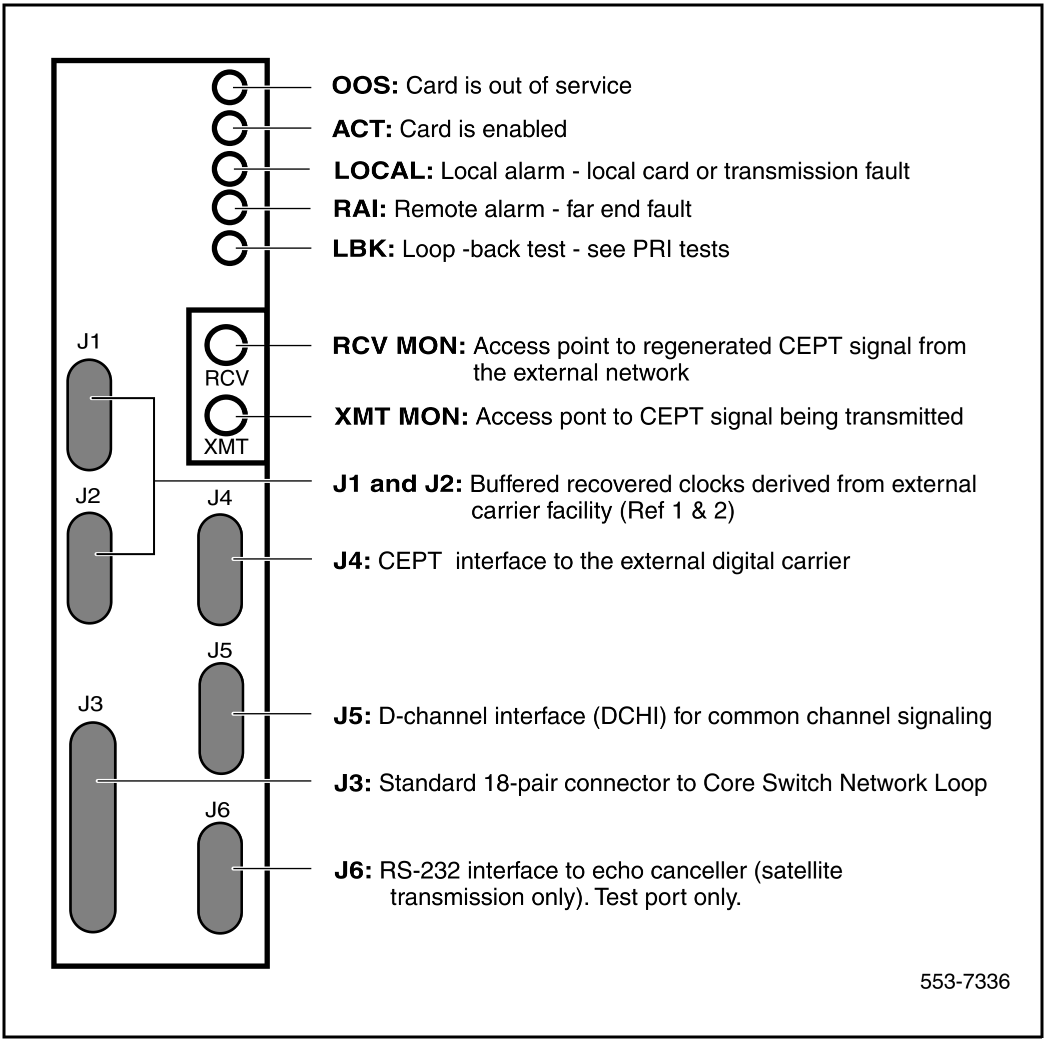


Table 2 gives information about the external connectors located on the NT8D72 PRI2 faceplate.

Table 2
NT8D72 PRI External connectors

Faceplate Destination	Type	Description
J1	9-pin female, D-connector	Reference Clock 0 interface
J2	9-pin female, D-connector	Reference Clock 1 interface
J3	36-pin connector	Loop interface
J4	15-pin male, D-connector	External digital trunk
J5	15-pin male, D-connector	D-Channel interface
J6	15-pin female, D-connector	Echo Canceller/RS-232 interface
RCV MON	Miniature bantam jack	Monitor DSI from network
XMT MON	Miniature bantam jack	Monitor DSI from PRI

Cable requirements

Table 3 lists the types of cable used and the lengths required for internal and external NT8D72 PRI2 connections.

> ***Note:*** No additional cabling is required for nB+D configurations. Multiple PRIs and the D-Channel are associated at the PRI prompt in LD 17.

Table 3
NT8D72AB and NT8D72BA PRI: Cables and cable lengths (Part 1 of 2)

Cable Type	From	To	Maximum length (meters)
NT8D79AA	PRI card	Clock controller (CC-0)	2.13
NT8D79AA	PRI card	Clock controller (CC-1)	2.13
QCAD328A	PRI card	DCH card	1.8

Table 3
NT8D72AB and NT8D72BA PRI: Cables and cable lengths (Part 2 of 2)

QCAD328B	PRI card	DCH card	5.5
QCAD328C	PRI card	DCH card	10.67
QCAD328D	PRI card	DCH card	15.24
NTND26AA	PRI card	MSDL	1.8
NTND26AB	PRI card	MSDL	5.5
NTND26AC	PRI card	MSDL	10.67
NTND26AD	PRI card	MSDL	15.24
NT8D85AB	PRI card Network	Network Card	15.24
RS-232	PRI card	Echo canceller	15.24
NT8D7207	PRI card	I/O panel	3.05
NT8D7205	I/O panel	crossconnect	15.24

Carrier interface

The NT8D72 PRI2 provides an interface to the 2Mb external digital line either directly or through an office repeater, echo canceller or line terminating unit (LTU).

Echo canceller interface

Echo cancellers are required only on satellite transmission circuits. The echo canceller detects the length of the loop, and then cancels out reflected transmission. (Callers will not hear echoes of their own voices reflecting back to them from the far end of the call.)

The echo canceller's control protocol must conform with that of the Tellabs Model 251. Both the echo canceller and the PRI circuit card act as Data Terminal Equipment (DTE).

QMT21 High Speed Data Module

The QMT21 High Speed Data Module supports the 64K Clear Data feature. (It allows data terminating equipment (DTE) to send and receive 64-Kb/s clear data.) The QMT21B is required for Large System to Large System configurations.

QPC720 PRI for 1.5/2.0 Mb gateway

Systems which are being used as a 1.5/2.0 Mb Gateway, one or more QPC720 (1.5 Mb) Primary Rate Interface circuit cards will also be needed.

> ***Note:*** Older vintages of the QPC720 PRI cannot be used for Gateway applications. The 1.5/2.0 Mb Gateway feature requires the use of a QPC720 circuit card with firmware updated to provide modified PAD values.

Clock operation for the NT8D72

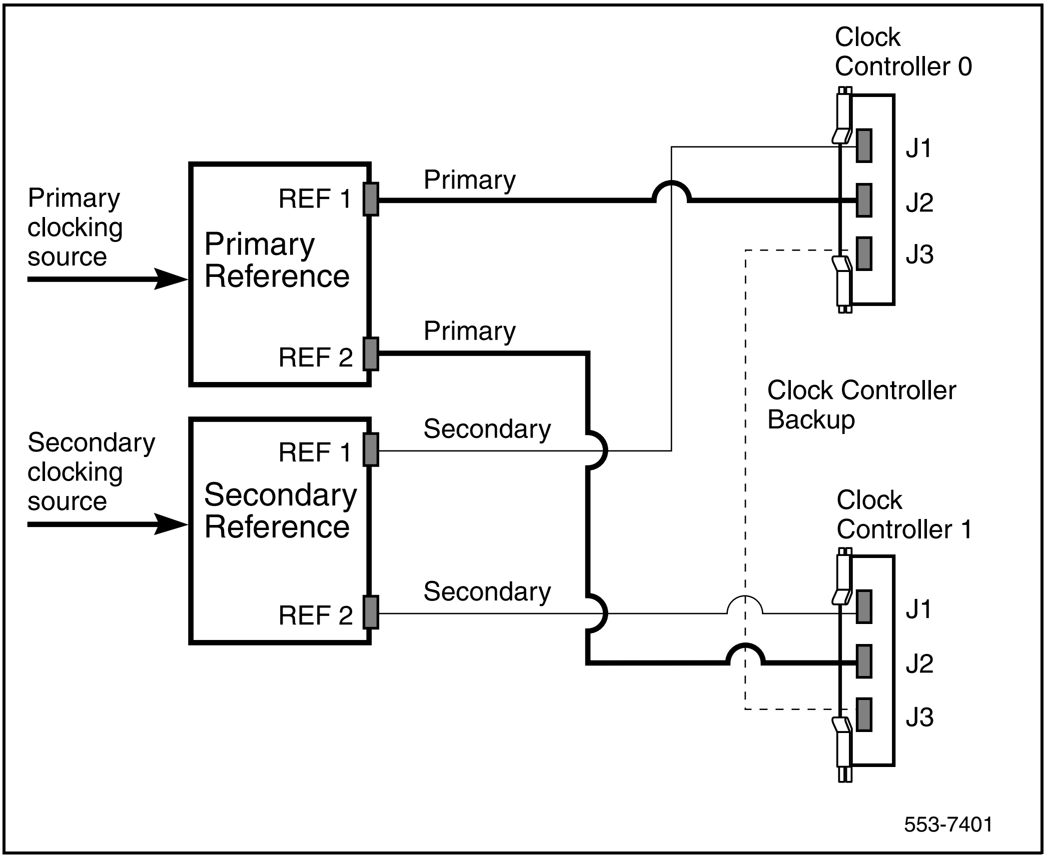
There are two types of clock operation—tracking mode and free-run mode.

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.

As shown in Figure 6 on page 36, a 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.

Figure 6
Clock controller primary and secondary tracking



Free run (non-tracking) mode

The clock synchronization of the system can 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 alarm

Reference clock errors

The system 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 LD 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 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 LD 60 with the command EREF.

A PRI 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:

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 clock check indicates the switch 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 local alarm, tracking is restored to the secondary reference clock if defined.

Note: If the switch is put into free-run mode 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 LD 60, tracking on the primary or secondary reference clock is automatically switched in the following manner:

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

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

QPC720 PRI contains five LEDs and six external connectors. Figure 7 on page 39 shows the QPC720 PRI faceplate layout. Table 4 on page 39 gives information about the external connectors located on the QPC720 PRI faceplate.

Figure 7
QPC720 PRI faceplate layout

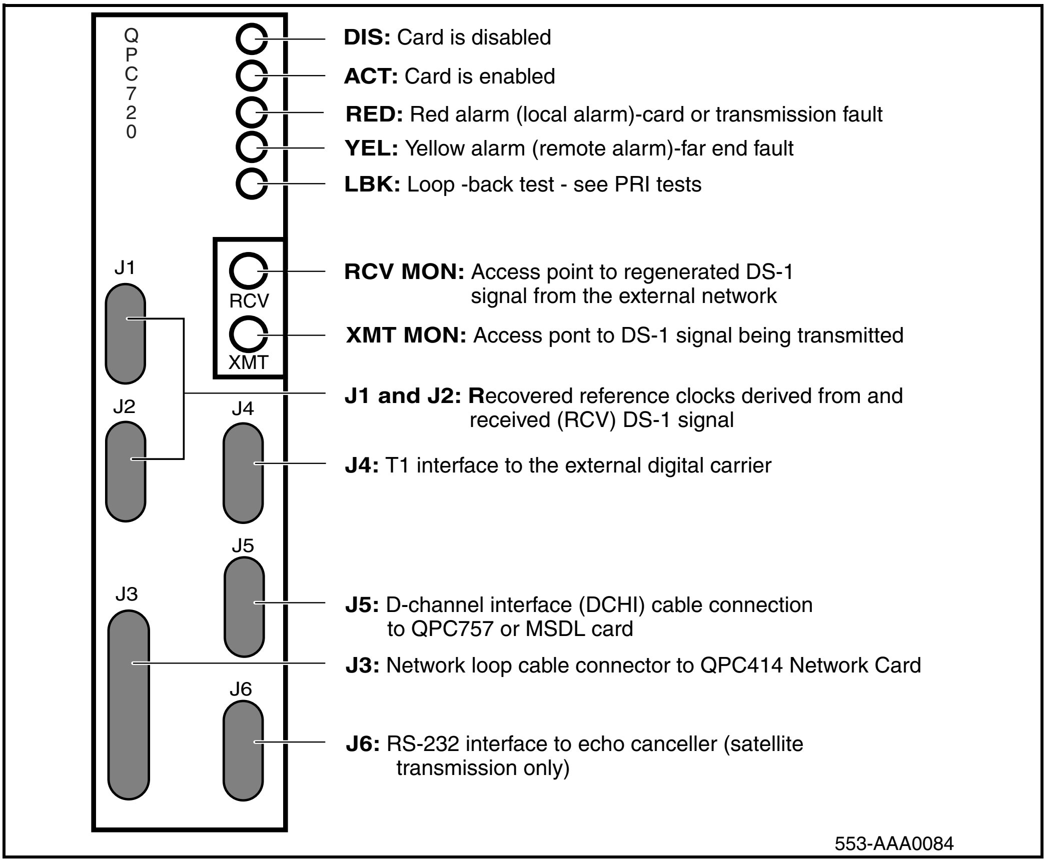


Table 4
QPC720 PRI external connectors

Faceplate destination	Type
J1	9-pin female, D-connector
J2	9-pin female, D-connector
J3	36-pin connector

Faceplate destination	Type
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

QPC720 Cable requirements

Table 5 on page 41 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.

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.

- 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 the 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 system to an outside network. The QMT21 module allows Data Terminal Equipment (DTE) to send and receive 64K Clear Data. See *Meridian Link ISDN/AP General Guide* (553-2901-100) for more information about the 64K Clear Data feature.

Table 5
QPC720 PRI cables and cable lengths (Part 1 of 2)

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

Table 5
QPC720 PRI cables and cable lengths (Part 2 of 2)

Cable type	From	To	Maximum length (feet)	Maximum length (meters)
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 not available in the U.S.A. There can be no mixing of QPC775 and QPC471 in one system.

Disk drive hardware

The following hardware is required for Large System upgrades:

- 3.5-inch disk drive unit
- disk drive controller for above
- cable for above

NT5D97 Dual-port DTI2/PRI2 card

The NT5D97 is a dual-port 2.0 Mb DTI2/PRI2 card (the DDP2 firmware functions in DTI2 or PRI2 mode, depending on DIP switch settings) that integrates the functionality of two NT8D72BA PRI2 cards, and one QPC414 ENET card into a single CE card. The NT5D97 occupies a single slot in the Network shelf and provides two DTI2/PRI2 network connections: an interface to an external D-Channel Handler (the NT6D11AF) or the NT6D80 Multi-purpose Serial Data Link card, and an optional plug-on NTBK51AA Downloadable D-Channel daughterboard (DDCH) with two DCH interface ports.

The NT5D97 DDP2 card can be mixed in the same machine with PRI2 NT8D72BA cards.

The NT5D97 DDP2 card hardware design uses a B57 ASIC E1/T1 framer. The carrier specifications comply with the ANSI TI.403 specification. The NT5D97 provides an interface to the 2.048 Mbps external digital line either directly or through an office repeater, Network Channel Terminating Equipment (NCTE), or Line Terminating Unit (LTU).

DANGER OF ELECTRIC SHOCK
The NT5D97 DDP2 card is not designed to be connected directly to the Public Switched Network, or other exposed plant networks. Such a connection should only be done using an isolating-type networking terminating device that provides voltage surge protection, such as a Line Terminating Unit (LTU), Network Channel Terminating Equipment (NCTE), or Network Termination 1 (NT1), as certified by your local, regional, or national safety agency and telecommunications authority.

External D-Channel Interface DCH or MSDL

The connection between the DDP2 card and the external DCH or MSDL is through 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 DCH or MSDL. These are:

- Receiver Ready (RR), originating at the DDP2 card, to indicate to the DCH or MSDL that the D-channel link is operational.
- Transmitter Ready (TR), originating at the DCH or MSDL, to indicate to the DDP2 card that the DCH are ready to use the D-channel link.

Table 6 indicates how the RR control signal operates with regard to the DDP2 status.

Table 6
DCH/MSDL Receiver Ready control signals

RR State	Condition
ON	D-Channel data rate selected at 64 Kbps *and* PRI2 loop is enabled *and* PRI2 link is not in OOS or Local Alarm mode state *and* PRI2 link is not transmitting a Remote Alarm pattern *and* PRI2 link is not receiving a Remote Alarm Indication from a remote facility
OFF	All other conditions

NT5D97 faceplate

Figure 8 on page 46 illustrates the faceplate layout for the NT5D97 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 7 on page 47 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 8
NT5D97 faceplate

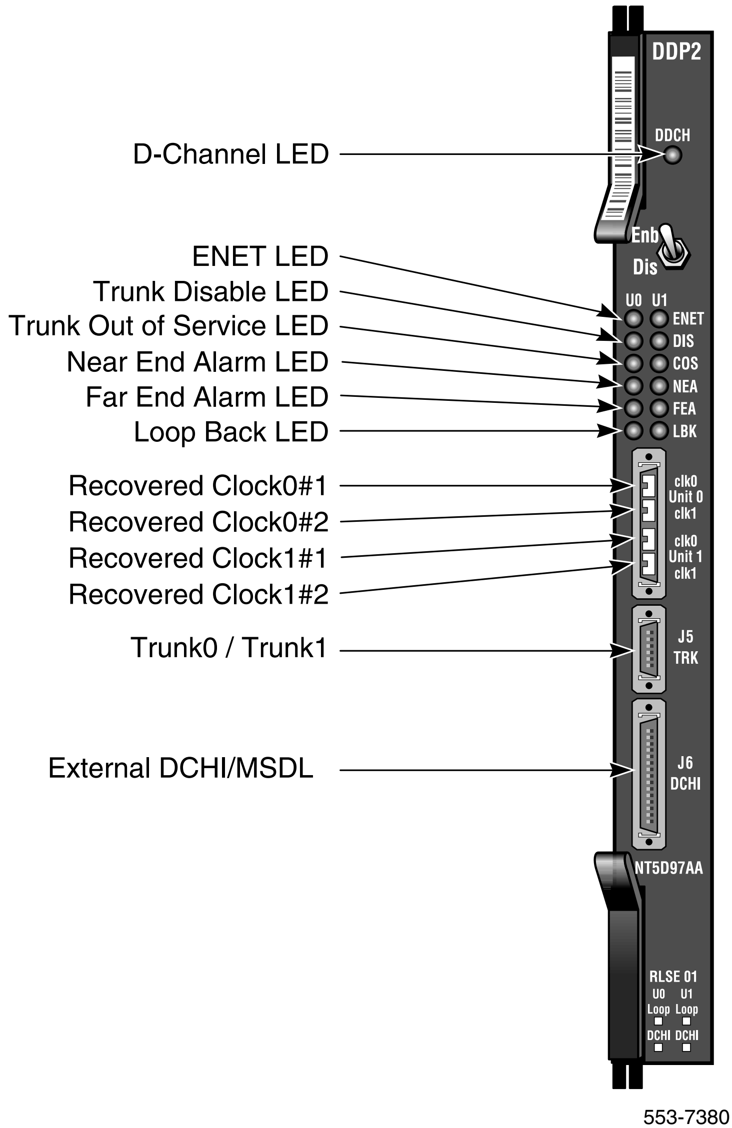


Table 7
External connectors and LEDs

Function	Faceplate Designator	Type	Description
Switch	ENB/DIS	Plastic, ESD protected	Card Enable/disable switch
Connectors	Unit 0 Clock 0	RJ11 Connector	Connects reference clock 0 to Clock Controller card 0
	Unit 0 Clock 1	RJ11 Connector	Connects reference clock 0 to Clock Controller card 1
	Unit 1 Clock 0	RJ11 Connector	Connects reference clock 1 to Clock Controller card 0
	Unit 1 Clock 1	RJ11 Connector	Connects reference clock 1 to Clock Controller card 1
	J5 TRK	9 Pin Female D Connector	Two external E1 Trunk 0 and Trunk 1
	J6 DCH	26 Pin Female D Connector	Connects to external DCH or MSDL
LEDs	ENET	2 Red LEDs	ENET 0 or ENET 1 is disabled
	DIS	2 Red LEDs	Trunk 0 or Trunk 1 is disabled
	OOS	2 Yellow LEDs	Trunk is out of service
	NEA	2 Yellow LEDs	Local (Near End) Alarm
	FEA	2 Yellow LEDs	Far End Alarm
	LBK	2 Yellow 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 the system CPU.

ENET LEDs

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

- When the enable/disable switch is in disabled state (lit by hardware).
- After power-up, before the card is enabled.
- When the ENET port on the card is disabled by software.

Trunk Disable (DIS) LEDs

Two red LEDs indicate if the "trunk port 0" or "trunk port 1" portions of the card are disabled. These LEDs are lit in the following cases:

- upon reception of the "disable loop" message from the software
- after power-up

OOS LEDs

Two yellow LEDs indicate if the "trunk port 0" and "trunk port 1" portions of the card are out-of-service.

NEA LEDs

Two yellow LEDs 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.

FEA LEDs

Two yellow LEDs indicate if a 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 yellow LEDs indicate if a 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. Normal call processing is inhibited during the remote loopback test.

DCH LED

When the dual colored LED is red, it indicates the on-board DDCH is present but disabled. When the dual colored LED is green, it indicates the on-board DDCH is present and enabled. If a DDCH is not configured on the DDP2 card, this lamp is not lit.

Unit 0 Clk Connectors

Two RJ11 connectors for connecting:

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

Unit 1 Clk Connectors

Two RJ11 connectors for connecting:

- Digital trunk unit 1 recovered clock to primary or secondary reference source on clock controller card 0.
- Digital trunk unit 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 unit 0 receive and transmit Tip / Ring pairs
- Digital trunk unit 1 receive and transmit Tip / Ring pairs

Connector J6 (DCH)

A 26-pin D-type connector is used to connect the DDP2 card to the external MSDL or D-channel handler.

System capacity and performance

Physical capacity

Each NT5D97 DDP2 card occupies one slot on the network shelf. Each card supports two digital trunk circuits and two network loops. The total number of DDP2 cards per system is limited by the number of network loops, physical capacity of the shelf, number of DTI2/PRI2 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 and only supports D-channel functionality.

The system has a total capacity of 16 addresses (Device Addresses or DNUM) that can be reserved for DCH card, MSDL card or DDCH card. One exception is DNUM 0 which is commonly assigned to the TTY terminal.

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

The DCH has one D-Channel unit, the DDCH has two D-Channel units, and the MSDL has a maximum of four units. Therefore, the total number of D-Channel is derived by the following formula:

Total_Num_DCH-Units = Num_DCHx1 + Num_DDCHx2 + Num_MSDLx4

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

CPU capacity

Using a NT5D97 DDP2 card instead of DTI2/PRI2 cards does not increase the load on the system CPU. The DDP2 replaces an ENET card and two DTI2/PRI2 cards. Emulating the ENET card and the overall CPU capacity is not impacted by using a DDP2 card instead of a DTI2/PRI2 card.

Power requirements

Table 8 on page 51 lists the power requirements for the NT5D97 DDP2 card.

Table 8
NT5D97 DDP2 power requirements

Voltage	Source	Current	
		DDP2 (without NTBK51AA)	**DDP2 (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 DDP2 card supports testing and maintenance functions through the following procedures:

- Self test upon power up or reset
- Signalling test performed in the LD 30
- Loopback tests, self tests, and continuity tests performed by LD 60 and LD 45
- The D-Channel (DCH, MSDL, DDCH) maintenance is supported by LD 96.

> ***Note:*** The MSDL selftest is not applicable to the NTBK51AA D-Channel daughterboard.

Cable requirements

This section lists the types of cable used and the lengths required for internal and external NT5D97 DDP2 connections.

> ***Note:*** No additional cabling is required for nB+D configurations. Multiple DDP2 cards and the D-channel are associated through software in LD 17.

DDP2 cable assemblies include:

- E1 carrier cables
  - — NTCK45AA (A0407956)
  - — NT8D7217 (A0617192)
  - — NTCK78AA (A0618294)
  - — NTCK79AA (A0618296)
- DDP2 to QPC471/QPC775 Clock Controller Cables
  - — NTCG03AA
  - — NTCG03AB
  - — NTCG03AC
  - — NTCG03AD
- DDP2 to DCH cables
  - — NTCK46AA
  - — NTCK46AB
  - — NTCK46AC
  - — NTCK46AD
- DDP2 to MSDL cables
  - — NTCK80AA
  - — NTCK80AB
  - — NTCK80AC
  - — NTCK80AD

A description of each type of DDP2 cable follows.

E1 carrier cables

NTCK45AA (A0407956)

The NTCK45AA (8 ft.) is an 120Ω cable for systems equipped with an I/O filter panel, connecting the TRK port (P1, D-type 9 pin male) on the DDP2 faceplate to the I/O filter (P2, P3 D-type 9 pin males).

Figure 9
NTCK45AA

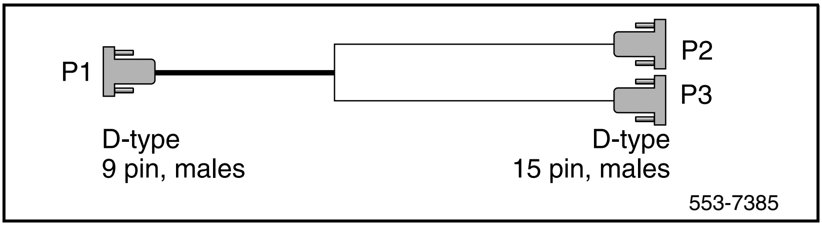


Table 9 lists the pin attributes for the NTCK45AA cable.

Table 9
NTCK45AA cable pins (Part 1 of 2)

Cable	Name	Description	Color	DDP2 pins	I/O Panel pins
0	T-PRI0TX	Trunk 0 Transmit Tip	Black	P1-1	P2-6
0	R-PRI0TX	Trunk 0 Transmit Ring	Red	P2-2	P2-7
0	T-PRI0RX	Trunk 0 Receive Tip	Black	P1-3	P2-2
0	R-PRI0RX	Trunk 0 Receive Ring	White	P1-4	P2-3
0		GND Shield Wire	Bare	N/C	Case P2
0		GND Shield Wire	Bare	N/C	Case P2
0		Standard Wire (3”)	Bare	Case P2	P2-5
0		Standard Wire (3”)	Bare	Case P2	P2-9
1	T-PRI1TX	Trunk 1 Transmit Tip	Black	P1-5	P3-6

Table 9
NTCK45AA cable pins (Part 2 of 2)

Cable	Name	Description	Color	DDP2 pins	I/O Panel pins
1	R-PRI1TX	Trunk 1 Transmit Ring	Red	P1-6	P3-7
1	T-PRI1RX	Trunk 1 Receive Tip	Black	P1-7	P3-2
1	R-PRI1RX	Trunk 1 Receive Ring	White	P1-8	P3-3
1		GND Shield Wire	Bare	N/C	Case P3
1		GND Shield Wire	Bare	N/C	Case P3
1		Standard Wire (3”)	Bare	Case P3	P3-5
1		Standard Wire (3”)	Bare	Case P3	P3-9

NT8D7217 (A0617192)

The NT8D7217 (50 ft.) is a 120Ω cable for systems equipped with an I/O filter panel, connecting the 9 pin I/O filter connector to the 9 pin NCTE connector.

Figure 10
NT8D7217

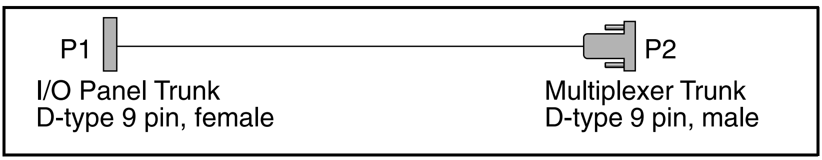


Table 10 which follows lists the pin attributes for the NT8D7217 cable.

Table 10
NT8D7217 cable pins

Cable	Name	Description	Color	DDP2 pins	I/O Panel pins
0	T-PRI0TX	Trunk 0 Transmit Tip	Black	P1-6	P2-6
0	R-PRI0TX	Trunk 0 Transmit Ring	White	P1-7	P2-7
0	T-PRI0RX	Trunk 0 Receive Tip	Black	P1-2	P2-2
0	R-PRI0RX	Trunk 0 Receive Ring	Red	P1-3	P2-3
0		GND Shield Wire	Bare	P1-5	N/C
0		GND Shield Wire	Bare	P1-9	N/C
1	T-PRI1TX	Trunk 1 Transmit Tip	Black	P1-6	P2-6
1	R-PRI1TX	Trunk 1 Transmit Ring	White	P1-7	P2-7
1	T-PRI1RX	Trunk 1 Receive Tip	Black	P1-2	P2-2
1	R-PRI1RX	Trunk 1 Receive Ring	Red	P1-3	P2-3
1		GND Shield Wire	Bare	P1-5	N/C
1		GND Shield Wire	Bare	P1-9	N/C

NTCK78AA (A0618294)

The NTCK78AA (50 ft.) is a 120Ω cable for connecting the TRK port on the DDP2 faceplate (P1, D-type 9 pin male) to the Main Distribution Frame (MDF) (P2, P3 D-type 15-pin males). The NTCK78AA is used for systems not equipped with an I/O filter panel.

Figure 11
NTCK78AA

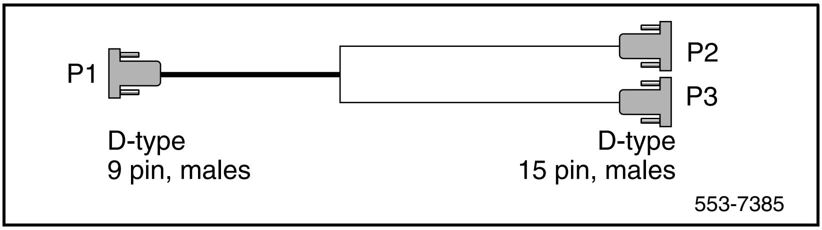


Table 11 lists the pin attributes for the NTCK78AA cable.

Table 11
NTCK78AA cable pins

Cable	Name	Description	Color	DDP2 pins	NCTE pins
0	T-PRI0TX	Trunk 0 Transmit Tip	Black	P1-1	P2-1
0	R-PRI0TX	Trunk 0 Transmit Ring	Red	P1-2	P2-9
0	T-PRI0RX	Trunk 0 Receive Tip	Black	P1-3	P2-3
0	R-PRI0RX	Trunk 0 Receive Ring	White	P1-4	P2-11
0		GND Shield Wire	Bare	P1 Case	P2-2
0		GND Shield Wire	Bare	P1 Case	P2-4
1	T-PRI1TX	Trunk 1 Transmit Tip	Black	P1-5	P3-1
1	R-PRI1TX	Trunk 1 Transmit Ring	Red	P1-6	P3-9
1	T-PRI1RX	Trunk 1 Receive Tip	Black	P1-7	P3-3
1	R-PRI1RX	Trunk 1 Receive Ring	White	P1-8	P3-11
1		GND Shield Wire	Bare	P1 Case	P3-2
1		GND Shield Wire	Bare	P1 Case	P3-4

NTCK79AA (A0618296)

The NTCK79AA (40 ft) is a 75Ω coaxial cable for connecting the TRK port on the DDP2 faceplate (P1, D-type 9 pin male) to the Line Terminating Unit (LTU) (P2, P3, P4, P5 BNC males).

Figure 12
NTCK79AA

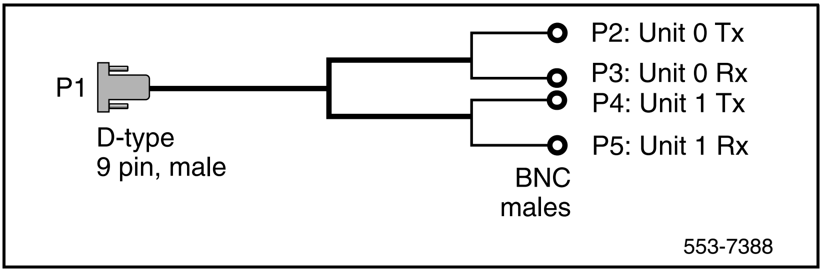


Table 12 lists the pin attributes for the NTCK79AA cable.

Table 12
NTCK79AA cable pins (Part 1 of 2)

Cable	Name	Description	Color	DDP2 pins	NCTE pins
0	T-PRI0TX	Trunk 0 Transmit Tip	Red	P1-1	P2 inner conductor
0	R-PRI0TX	Trunk 0 Transmit Ring	Red	P1-2	P2 shield
0	T-PRI0RX	Trunk 0 Receive Tip	Green	P1-3	P3 inner conductor
0	R-PRI0RX	Trunk 0 Receive Ring	Green	P1-4	P3 shield
1	T-PRI1TX	Trunk 1 Transmit Tip	Red	P1-5	P4 inner conductor
1	R-PRI1TX	Trunk 1 Transmit Ring	Red	P1-6	P4 shield
1	T-PRI1RX	Trunk 1 Transmit Tip	Green	P1-7	P5 inner conductor

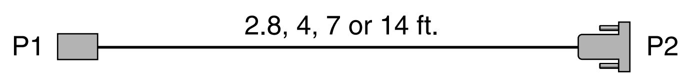
Table 12
NTCK79AA cable pins (Part 2 of 2)

Cable	Name	Description	Color	DDP2 pins	NCTE pins
1	R-PRI1RX	Trunk 1 Receive Ring	Green	P1-8	P5 shield
1		Outer metalized PVC shield	Bare	N/C	P1 Case
1		3 stranded wire	Bare	N/C	P1 Case

Reference clock cables

The NTCG03AA (14 ft), NTCG03AB (2.8 ft), NTCG03AC (4.0 ft), or NTCG03AD (7 ft), is a DDP2 card to Clock Controller cable, connecting each of the CLK0 or CLK1 ports on the DDP2 faceplate to the primary or secondary source ports on Clock Controller card 0 or 1.

Figure 13
NTCG03AA/AB/AC/AD



Connector P1 - 4 pin, male, RJ11 (DDP2 faceplate)
Connector P2 - 9 pin, male, D-type (Clock Controller)

Note: Includes a 9 pin D-type adaptor.

553-7384

MSDL/DCH cables

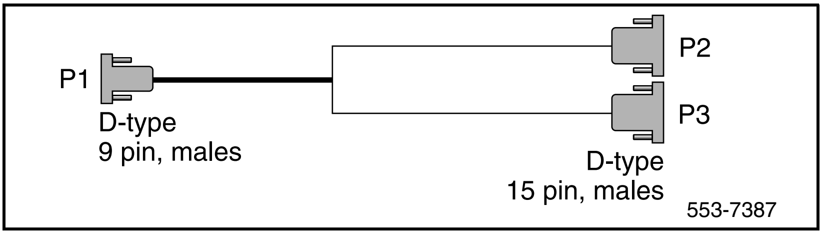
External DCH cable

The NTCK46 cable connects the DDP2 card to the NT6D11AF/NT5K75AA/NT5K35AA D-Channel Handler card. The cable is available in four different sizes:

- NTCK46AA (6 ft.) - DDP2 to DCH cable

- NTCK46AB (18 ft.) - DDP2 to DCH cable
- NTCK46AC (35 ft.) - DDP2 to DCH cable
- NTCK46AD (50 ft.) - DDP2 to DCH cable

Figure 14
NTCK46AA/AB/AC/AD

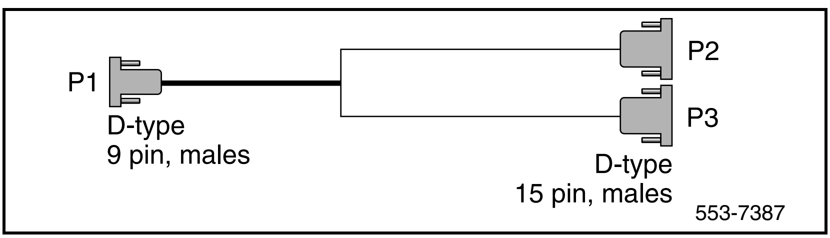


External MSDL cable

The NTCK80 cable connects the DDP2 card to the NT6D80 MSDL card. The cable is available in four different sizes:

- NTCK80AA (6 ft) - DDP2 to MSDL cable
- NTCK80AB (18 ft) - DDP2 to MSDL cable
- NTCK80AC (35 ft) - DDP2 to MSDL cable
- NTCK80AD (50 ft) - DDP2 to MSDL cable

Figure 15
NTCK80AA/AB/AC/AD



Cable diagrams

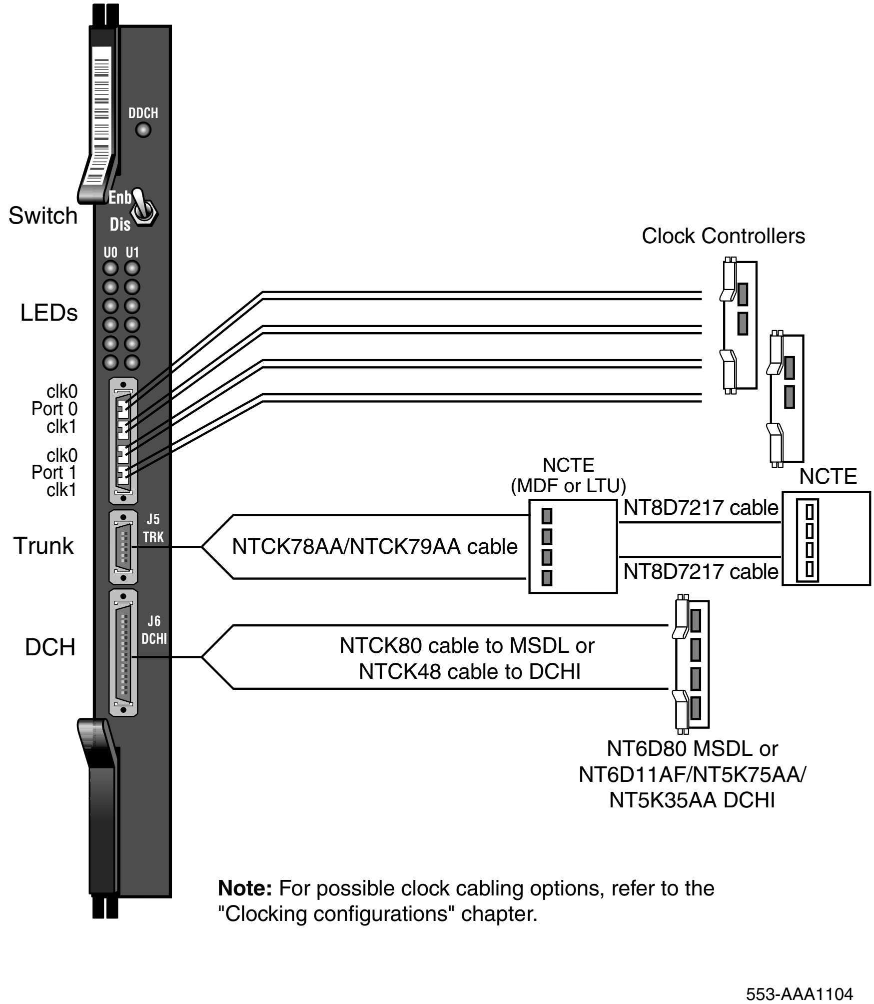
Figure 16 on page 61 and Figure 17 on page 62 provide examples of typical cabling configurations for the DDP2.

Figure 16 on page 61 shows a typical DDP2 cabling for a system with an I/O panel, with the connection between the I/O panel and a Network Channel Terminating Equipment (NCTE).

Figure 17 on page 62 shows cabling for a system without an I/O panel. Here, the DDP2 faceplate is cabled directly to the NCTE.

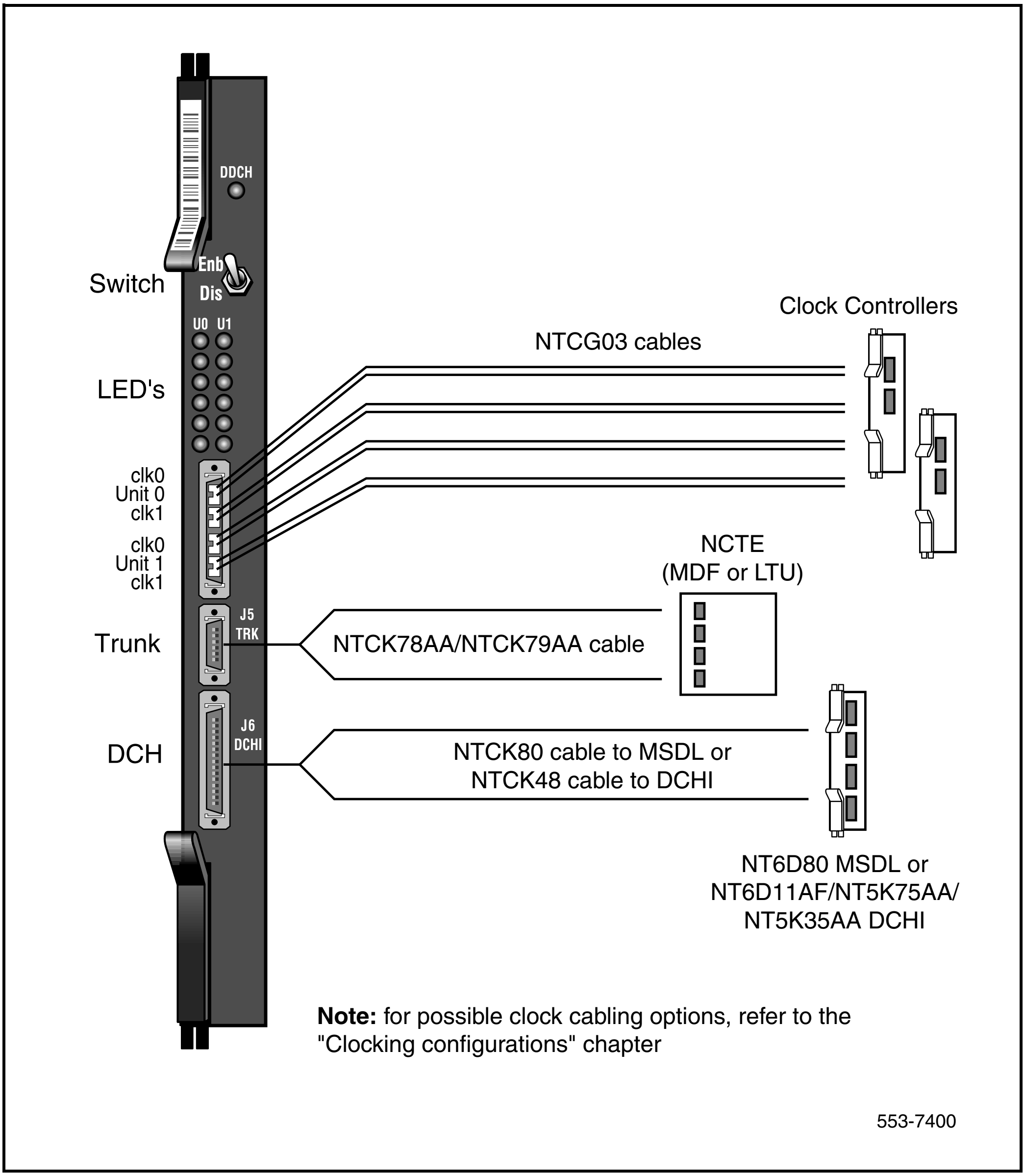
> ***Note:*** Since several clock cabling options exist, none has been represented in the diagrams. Refer to "Clock configurations" on page 66 for a description on each available option.

Figure 16
DDP2 cable for systems with an I/O panel



Note: For possible clock cabling options, refer to the "Clocking configurations" chapter.

Figure 17
DDP2 cable for systems without an I/O panel



Clock for the NT5D97

Clock operation

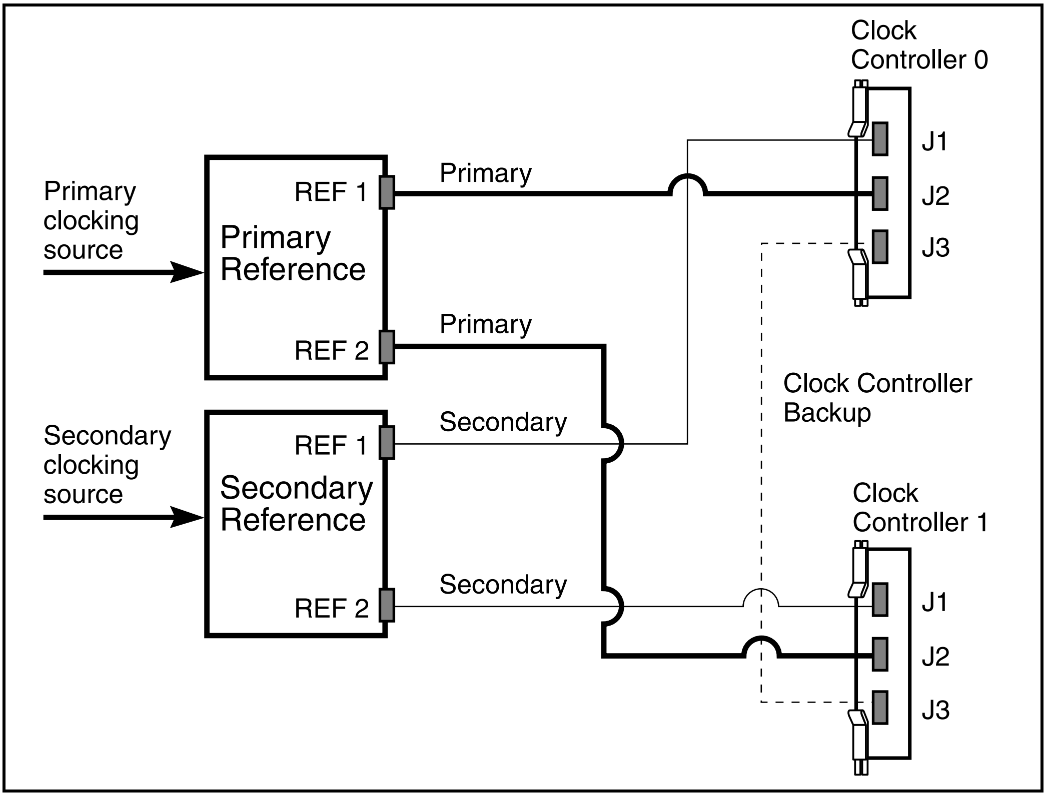
There are two types of clock operation — tracking mode and free-run mode.

Tracking mode

In tracking mode, the DDP2 loop supplies an external clock reference to a clock controller. Two DDP2 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 18 on page 64, a 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.

Figure 18
Clock Controller primary and secondary tracking



Free run (non-tracking) mode

The clock synchronization of the system can 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

The system 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 LD 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 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 LD 60 with the command EREF.

A DDP2 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 system is put into free-run mode by the craftsperson, it resumes tracking on a reference clock unless the clock-switching option is disabled (LD 60, command MREF), or the reference clock is "undefined" in the database.

Automatic clock switching

If the EREF command is selected in LD 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.

Clock configurations

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

A single CPU system has one Clock Controller card. This card can receive reference clocks from two sources referred to as the primary and secondary sources. These two sources can originate from a PRI2, DTI2, etc. PRI2 cards such as the NT8D72BA 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 NT8D72BA.

The NT5D12 card is capable of supplying two references from each clock source, i.e., four references in total. NT5D12 can supply Clk0 and Clk1 from Unit 0 and Clk0 and Clk1 from Unit 1. Either Unit 0 or Unit 1 can originate primary source, as shown in Figure 19 through Figure 22 on pages 64 to 72.

There is one Clock Controller cable required for the DDP2 card, which is available in four sizes; this is the NTCG03AA/AB/AC/AD. Refer to "Reference clock cables" on page 58 for more information.

Table 13 summarizes the clocking options. Table 14 on page 68 explains the options in more detail.

Table 13
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 14
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 DDP2. Connector Clk0 provides a clock source from Unit 0. Connector Clk0 provides a clock source from Unit 1. Refer to Figure 19 on page 69.
Option 2	This option provides a Dual CPU system with 2 references of a clock source derived from port 0 of the DDP2. Connector Clk0 provides a Ref 1 clock source from Unit 0. Connector Clk1 provides a Ref 2 clock source from Unit 0. Refer to Figure 20 page 70
Option 3	This option provides a Dual CPU system with 2 references of a clock source derived from port 1 of the DDP2. Connector Clk0 provides a Ref 1 clock source from Unit 1. Connector Clk1 provides a Ref 2 clock source from Unit 1. Refer to Figure 21 page 71
Option 4	This option provides a Dual CPU system with 2 references from each clock source derived from the DDP2. Connector Clk0 provides a Ref 1 clock source from Unit 0. Connector Clk1 provides a Ref 2 clock source from Unit 0. Connector Clk0 provides a Ref 1 clock source from Unit 1. Connector Clk1 provides a Ref 2 clock source from Unit 1. Refer to Figure 22 page 72.

Figure 19
Clock Controller – Option 1

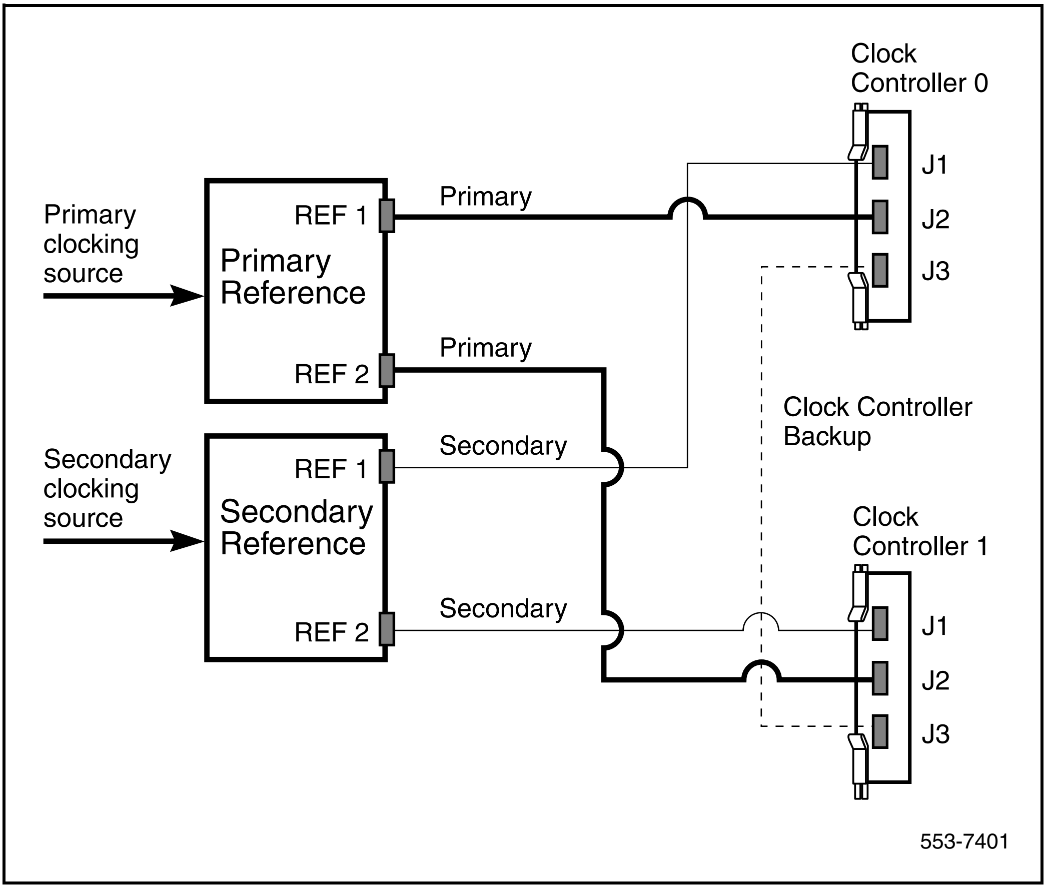


Figure 20
Clock Controller – Option 2

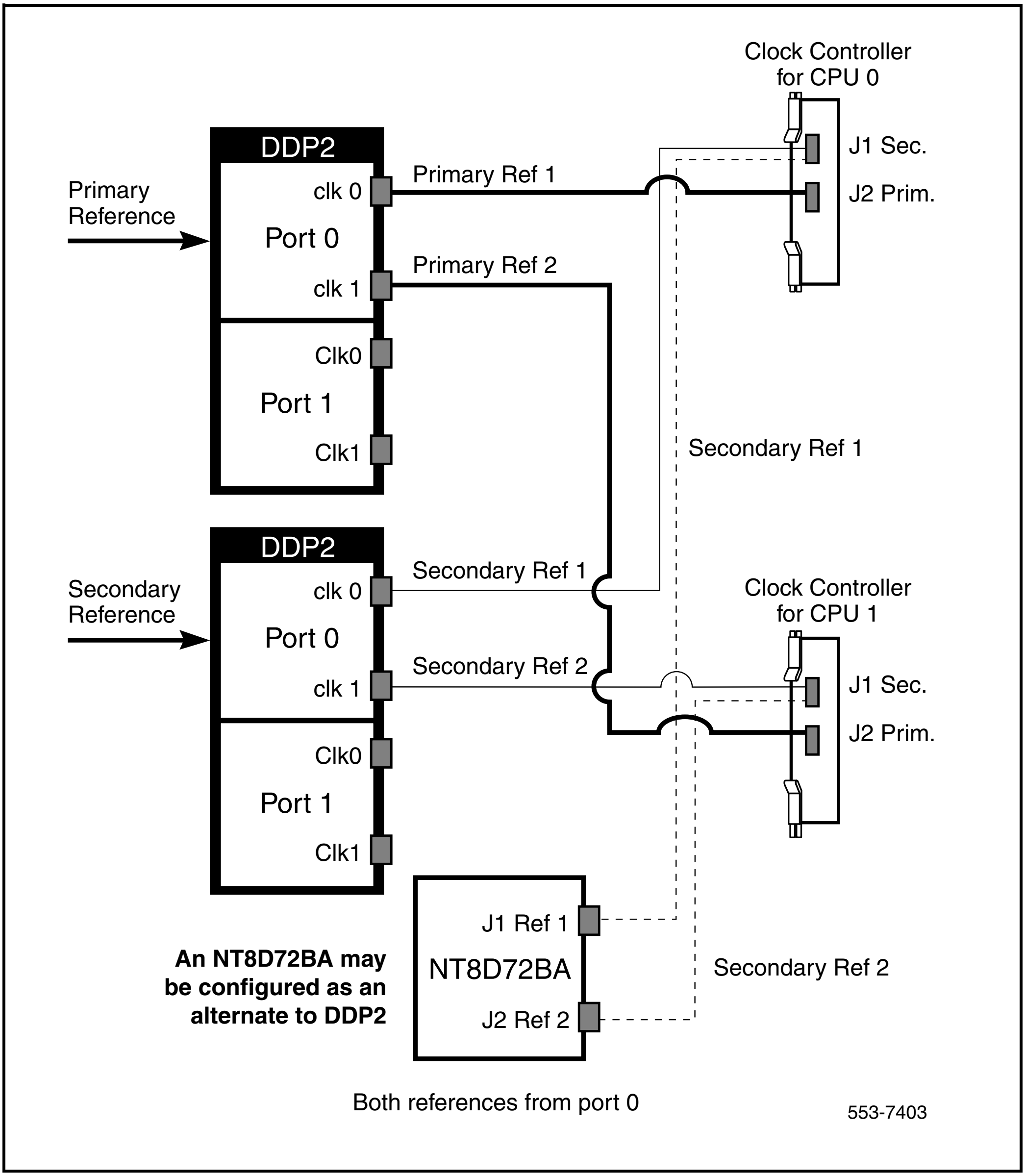


Figure 21
Clock Controller – Option 3

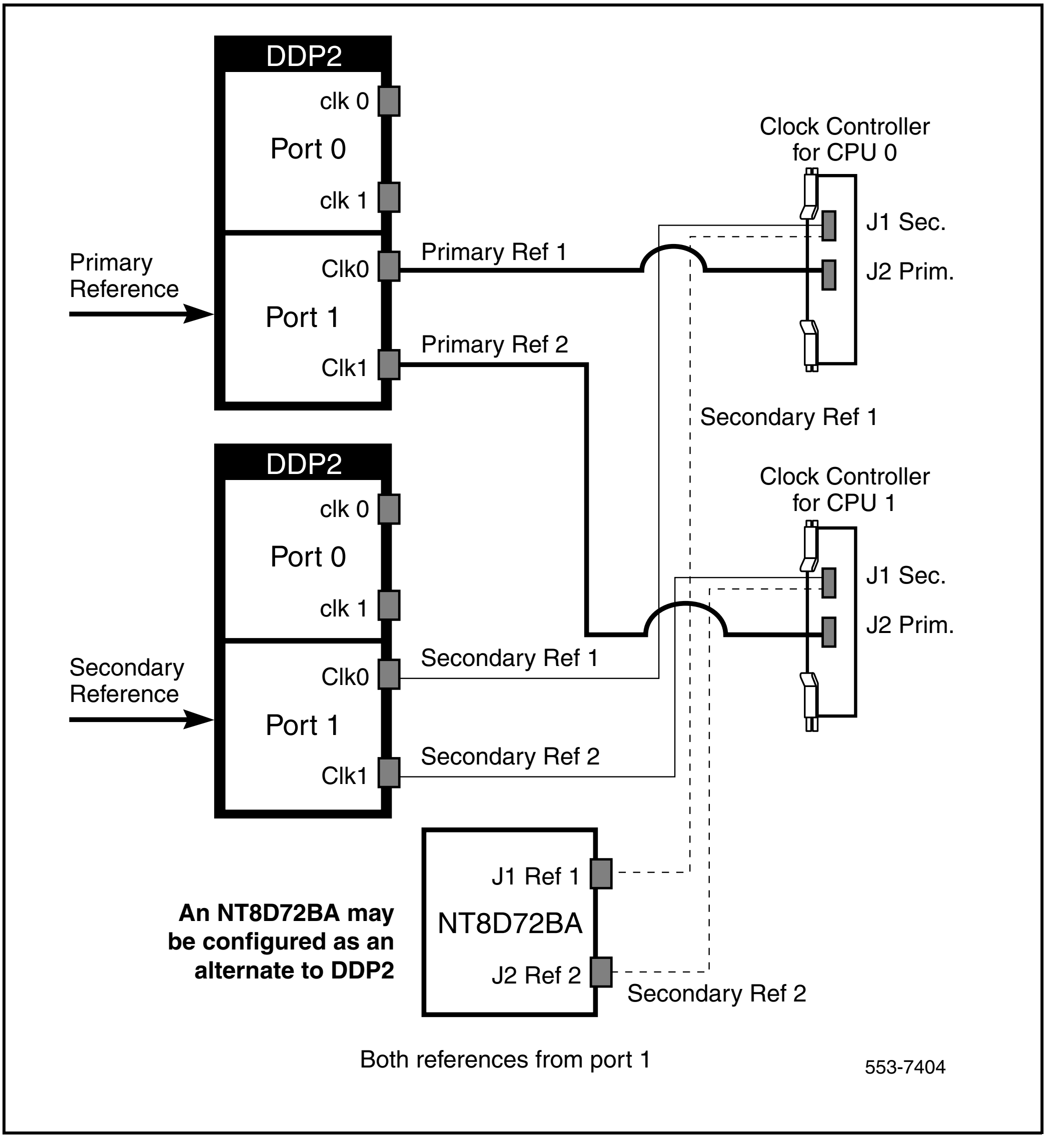
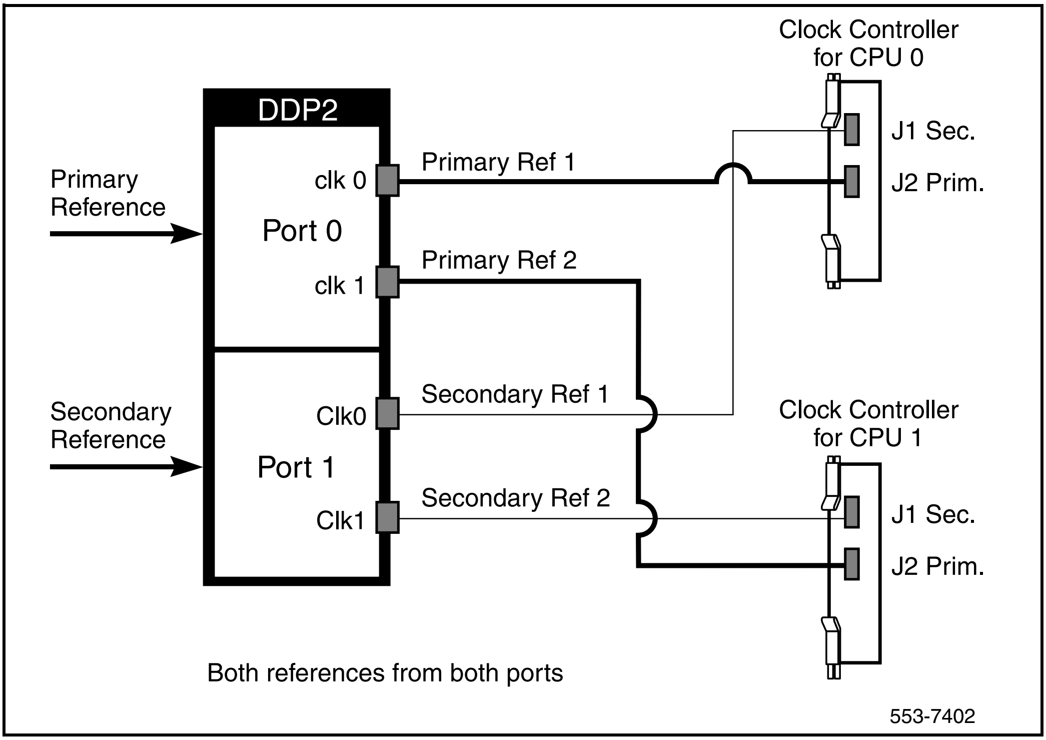


Figure 22
Clock Controller – Option 4



NT5D12 Dual-port DTI/PRI

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/DDP2 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 Mb external digital line either directly or through an office repeater, Line Terminating Unit (LTU), or Channel Service Unit (CSU).

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

Table 15
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

NT5D12 faceplate

Figure 23 on page 76 and Figure 24 on page 77 illustrate the faceplate layout for the NT5D12 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 7 on page 47 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 23
NT5D12 faceplate - general view

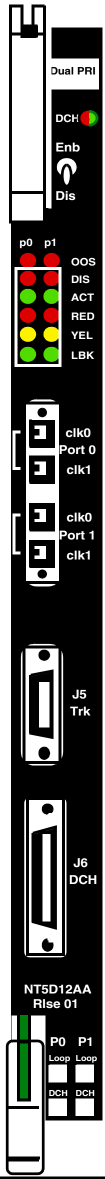


Figure 24
DDP faceplate - detailed view

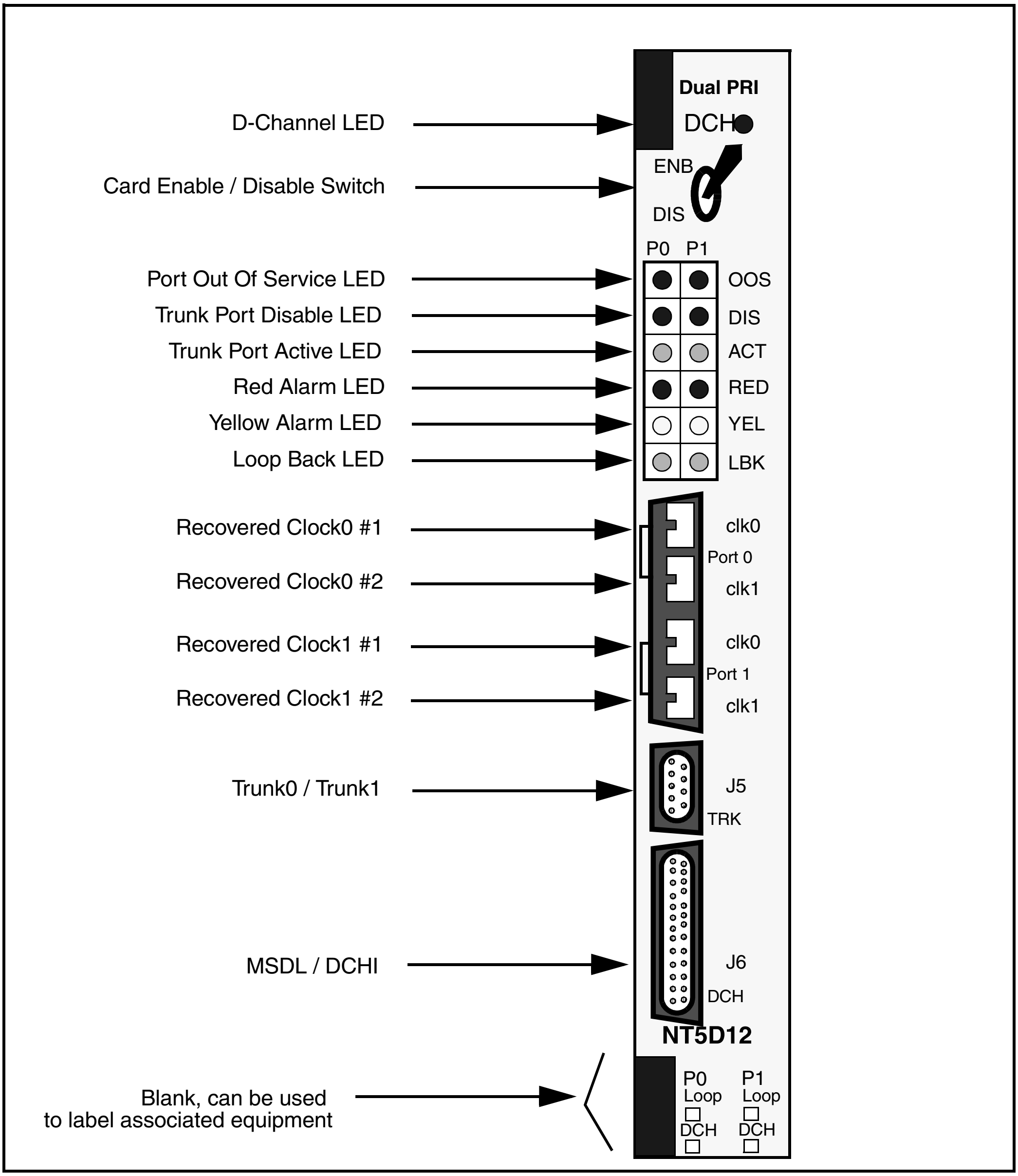


Table 16
External connectors and LEDs

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

Function	Faceplate Designator	Type	Description
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 system CPU.

Port Out of Service LEDs

Two red LEDs 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 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 indicate if the “trunk port 0” and “trunk port 1” portion of the card is active.

RED LEDs

Two red LEDs 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 indicate if a 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 indicate the 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

A dual color red/green LED 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 is not 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.

The system has a total capacity of 16 addresses (Device Addresses or DNUM) that can 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-Channels 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 system 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 17 on page 83 lists the power requirements for the DDP card.

Table 17
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:

- Self test upon power up or reset;
- Signaling test performed in the LD 30;
- Loopback tests, self tests, and continuity tests performed by LD 60 and LD 45;
- The D-Channel (MSDL, DCHI, DDCH) maintenance is supported by LD 96.

NT5D12 Cable 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 LD 17.
>
> ***Note 2:*** A detailed discussion of each type of DDP cable listed below follows.

New DDP cable assemblies include:

- System 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

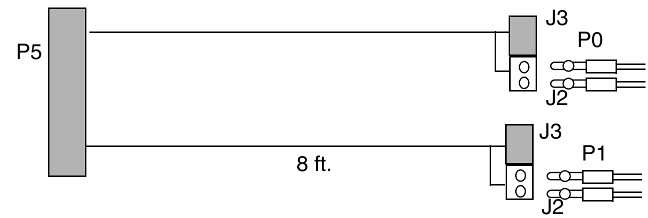
Trunk Tip/Ring cables

NT5D16AA

The NT5D16AA (8 ft.) is a 100Ω cable for 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-type trunk connector mounted on a small PCB. There are no bantam plugs on the DDP faceplate.

Figure 25
NT5D16AA



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 systems equipped with I/O filter.

Table 18 lists the pin attributes for the NT5D16AA cable.

Table 18
NT5D16AA cable pins (Part 1 of 2)

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

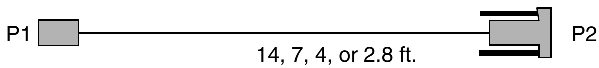
Table 18
NT5D16AA cable pins (Part 2 of 2)

Cable	Name	Description	Color	DDP pins (J5)	I/O Panel pins (J2, J3)
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

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.

Figure 26
NTCG03AA , NTCG03AB, NTCG03AC, or NTCG03AD



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.

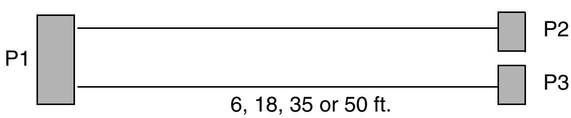
MSDL/DCHI cables

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

Figure 27
NTCK46AA, NTCK46AB, NTCK46AC, NTCK46AD



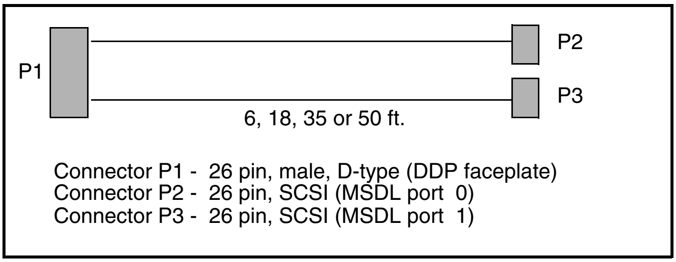
Connector P1 - 26 pin, male, D-type (DDP faceplate)
Connector P2 - 25 pin, male, D-type (DCHI port 0)
Connector P3 - 25 pin, male, D-type (DCHI port 1)

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

Figure 28
NTCK80AA, NTCK80AB, NTCK80AC, NTCK80AD



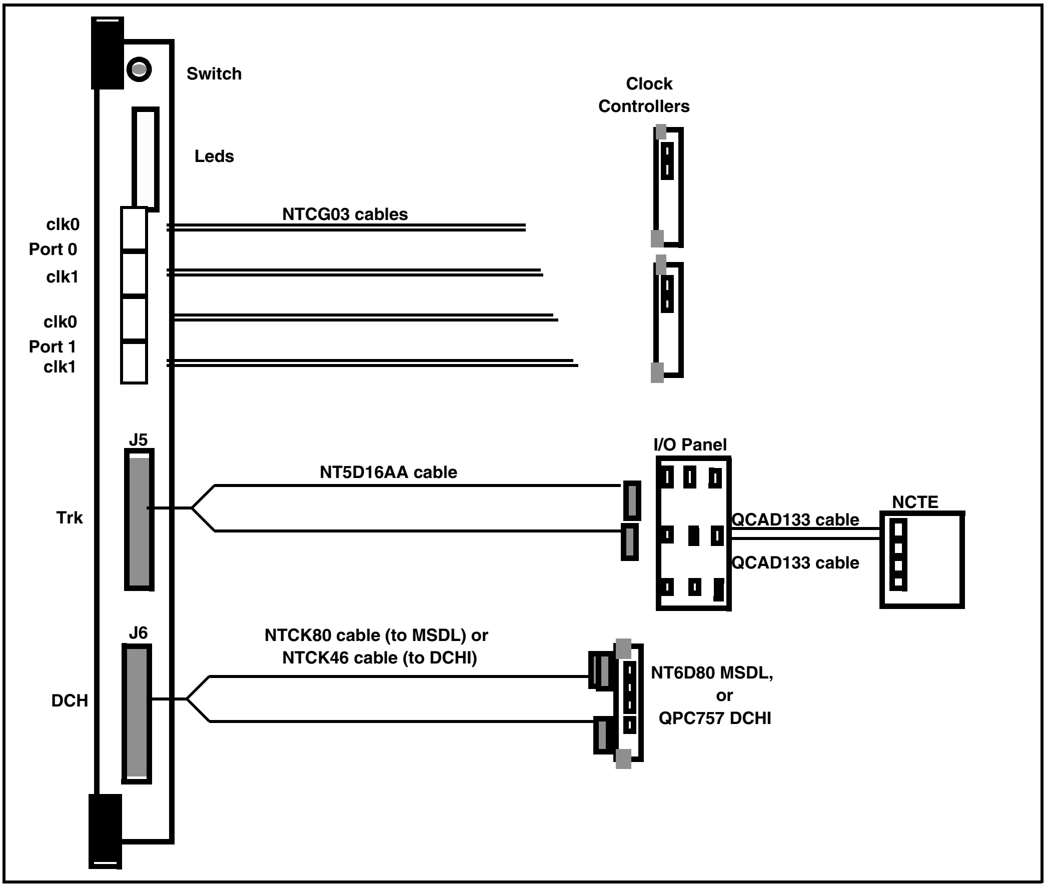
Cable diagrams

Figure 29 on page 89 provides an example of a typical cabling configuration 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 on page 89 shows a typical DDP cabling for a system Option with an I/O panel, with the connection between the I/O panel and a Network Channel Terminating Equipment (NCTE).

> ***Note:*** Since there exists several clock cabling options, none has been represented in the diagram. Please refer to “Clock configurations” on page 93 for a description on each available option.

Figure 29
DDP cable for systems with an I/O panel



Clock

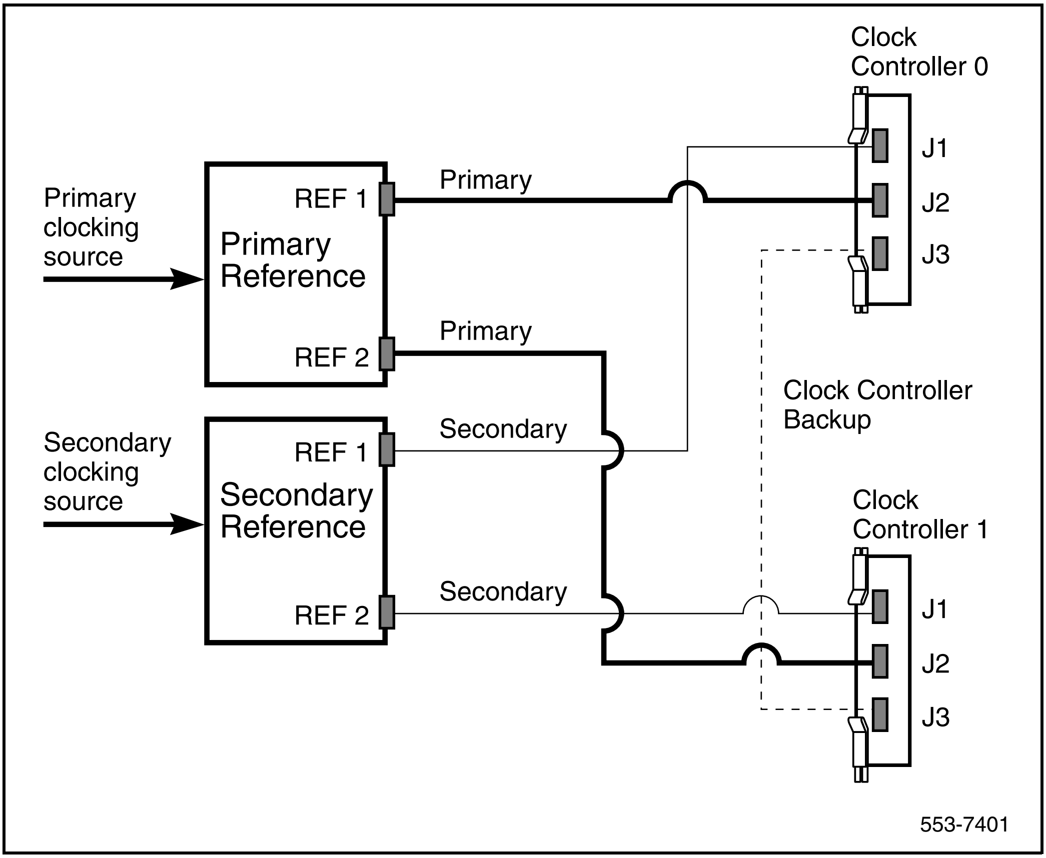
There are two types of clock operation - tracking mode and free-run mode.

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 30 on page 91, a 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. Lock the clock controllers to the reference clock.

Figure 30
Clock Controller primary and secondary tracking



Free run (non-tracking) mode

The clock synchronization of the system can 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

The system 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 LD 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 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 LD 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 system is put into free-run mode by the craftsperson, it resumes tracking on a reference clock unless the clock-switching option is disabled (LD 60, command MREF), or the reference clock is "undefined" in the database.

Automatic clock switching

If the EREF command is selected in LD 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.

Clock configurations

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

A single CPU system has one Clock Controller card. This card can receive reference 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 the primary source, as shown in Figure 31 through Figure 34 on page 97 to 100.

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 86 for more information.

Table 19 on page 94 summarizes the clock options. Table 20 page 95 explains the options in more detail.

Table 19
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 20
Clock Controller options - description (Part 1 of 2)

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 31 "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 32 "Clock Controller - Option 2"

Table 20
Clock Controller options - description (Part 2 of 2)

Clock Option	Notes
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 33 "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 34 "Clock Controller - Option 4"

Figure 31
Clock Controller - Option 1

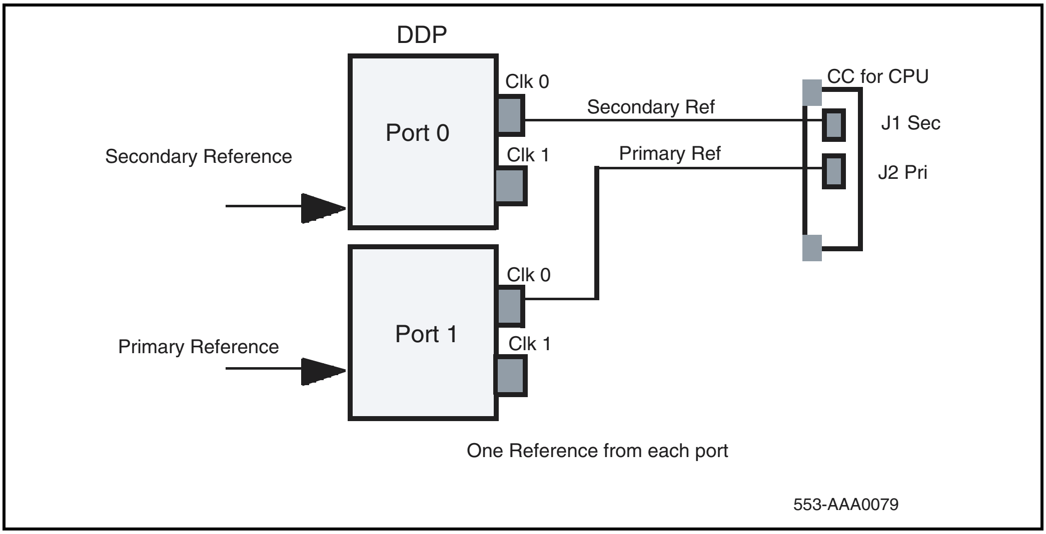


Figure 32
Clock Controller - Option 2

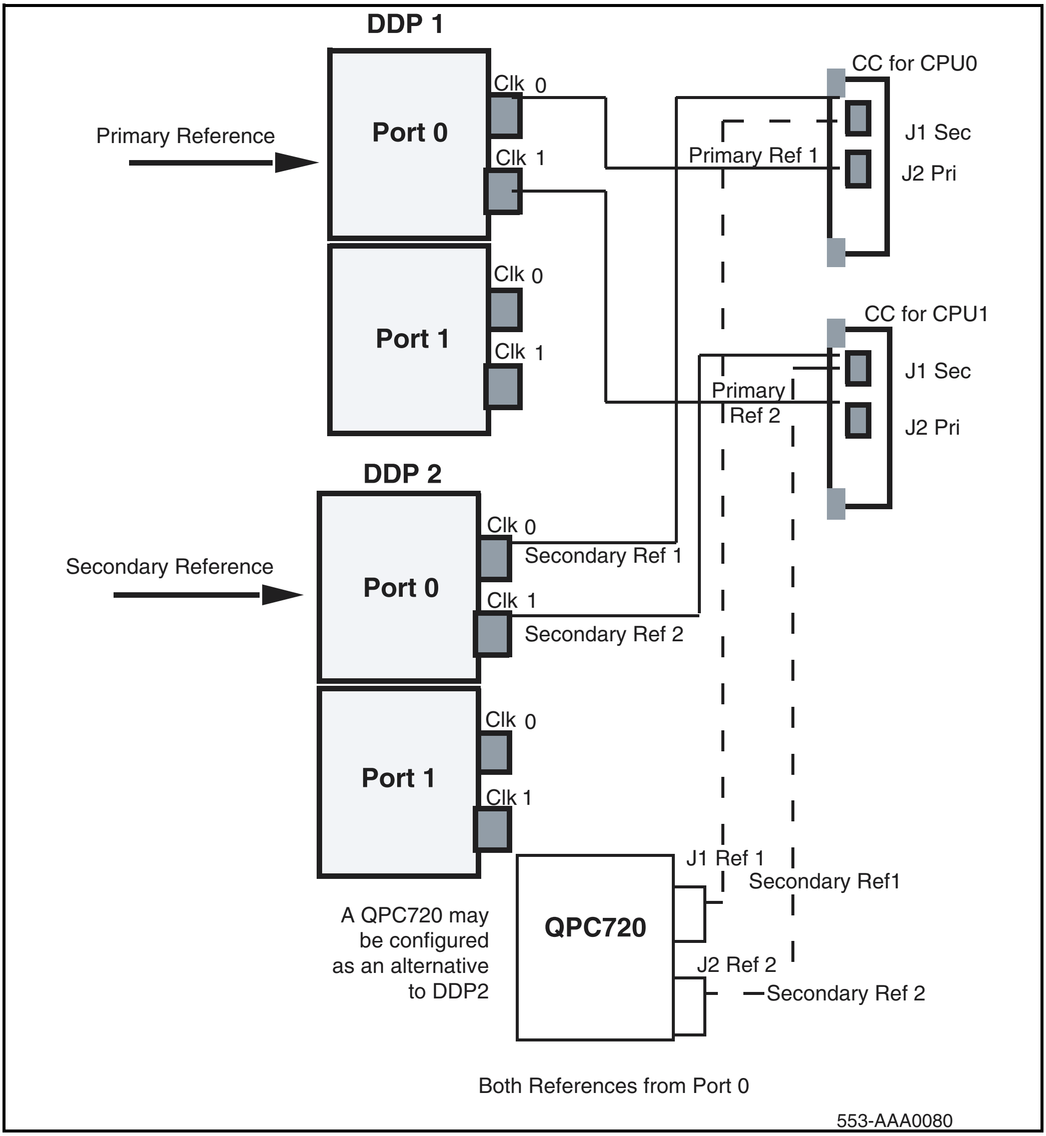


Figure 33
Clock Controller - Option 3

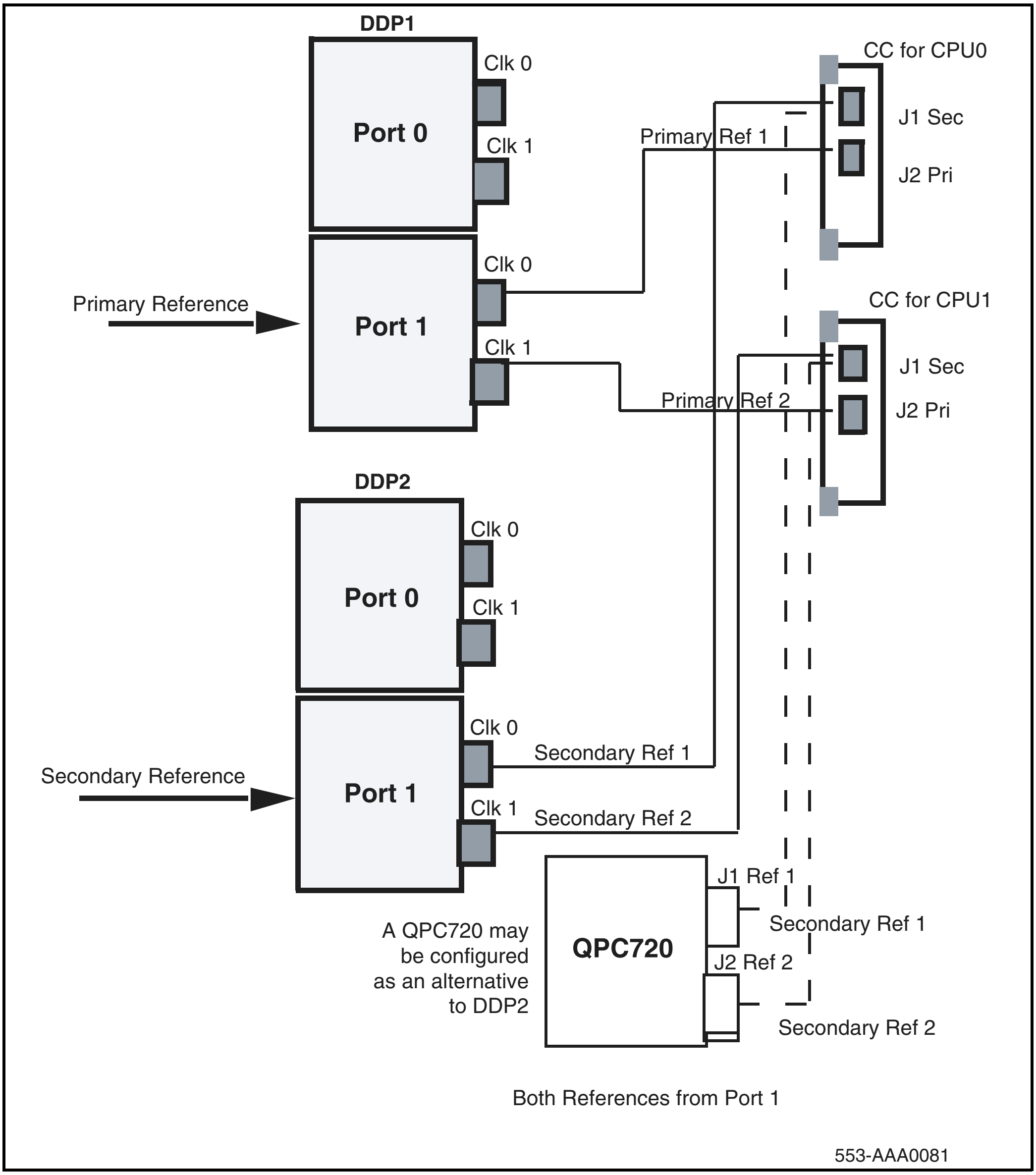
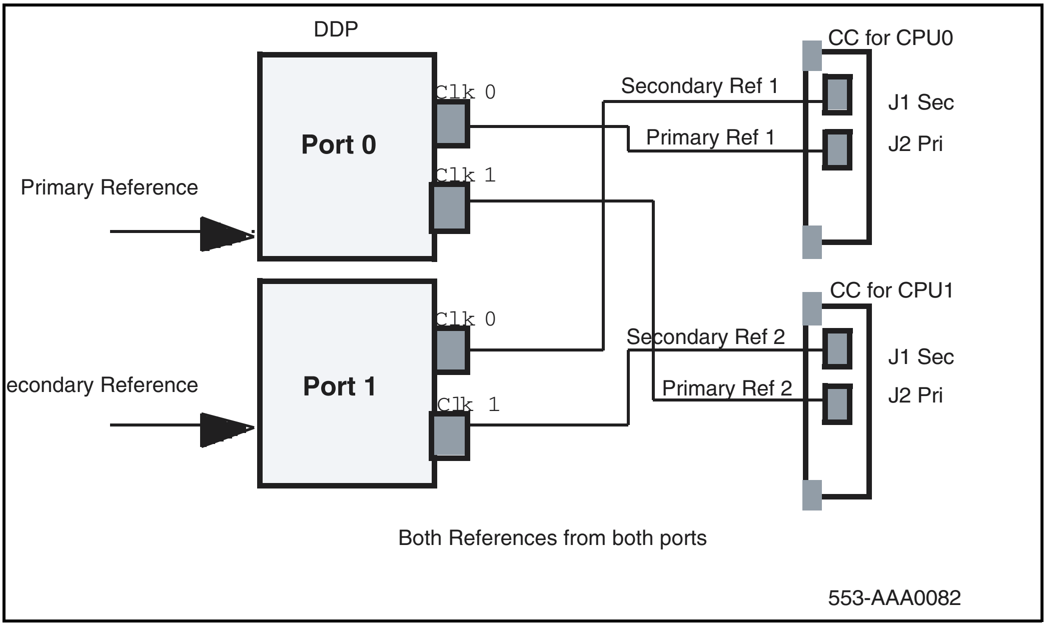


Figure 34
Clock Controller - Option 4



DCH installation

Contents

The section contains information on the following topics:

Install the NT6D11AB, NT6D11AE, NT6D11AF DCH

Installation procedures for the NT6D11AB, NT6D11AE, and NT6D11AE DCHI cards are the same for all Large Systems. These instructions apply to hardware both for primary and backup D-channels. D-channel lines must be conditioned for 64K before D-channels can be brought up.

Note: To configure J1, the asynchronous port on the DCHI card, refer to the documentation of the application being interfaced, and to *Circuit Card: Description and Installation* (553-3001-211). J1 configuration is not described in this NTP.

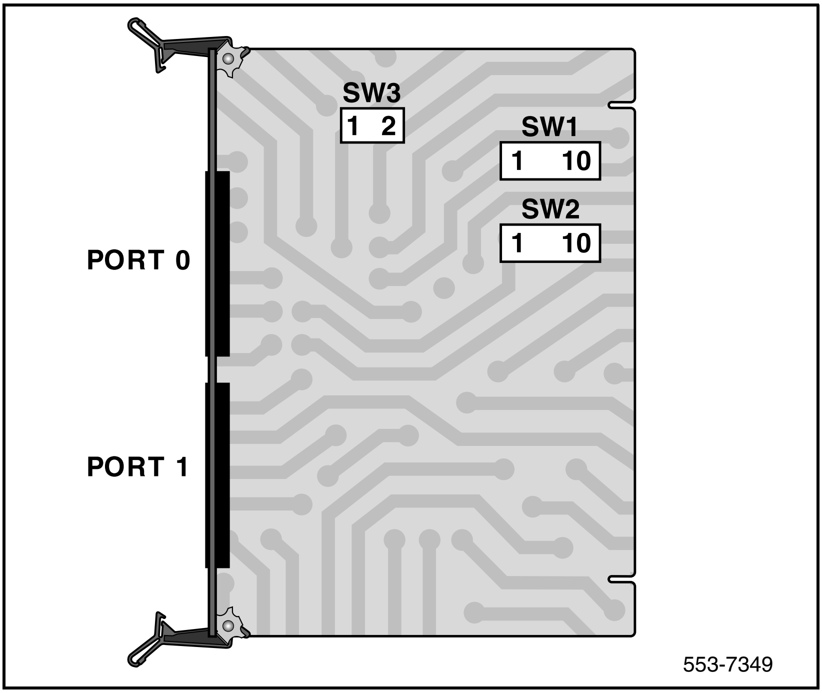
Set up the NT6D11AB, NT6D11AE, NT6D11AF DCHI

DIP switch settings

The NT6D11AB/AE/AF has three sets of DIP switches. Each port has its own bank of 10 DIP switches (SW1 & SW2) to select the port address (8 bits) and mode of operation (2 bits). SW1 is used for port 0 settings, SW2 is used for port 1 settings. SW3 is used to select the D-channel protocol. Port 0 is used to select whether the asynchronous ESDI port is be disabled or not.
Port 1 is used to select the standard or expanded D-channel addressing mode on the NT6D11AB/AE/AF.

The DIP switches are located as shown by Figure 35.

Figure 35
NT6D11 DIP switches



Protocol selection

SW3 is used to select the D-channel protocol, as shown by Table 21.

> ***Note:*** The setting must be 1 for ISDN applications.

Table 21
Protocol selection switch settings

Protocol	Switch Setting	
	SW3.1	SW3.2
DPNSS1	0	0
ISDN	1	1

Valid switch combinations

The following are the only allowable switch setting combinations (not including address switch settings).

Port 0

Port 0 can be configured as asynchronous ESDI, or disabled. If the port is configured as disabled, it will not be visible to the system CPU. Refer to Table 22.

Table 22
Port 0 settings

Mode	Switch setting			
	SW1.1	SW1.2	SW3.1	SW3.2
Asynchronous ESDI	1	0	0	0
Asynchronous ESDI	1	0	1	1
Port disabled	1	1	-	-

Port 1

The following are the only valid emulation mode combinations. If the port is configured as disabled, it will not be visible to the system CPU. Refer to Table 23.

> ***Note:*** The ISDN emulation must be selected.

Table 23
Port 1 settings

Mode	Emulates	Switch setting			
		SW2.1	SW2.2	SW3.1	SW3.2
DPNSS1	NT5K35	0	0	0	0
ISDN	NT6D11	0	0	1	1
Expanded DPNSS1	NT5K75	0	1	0	0
Port disabled		1	1	-	-

Jumper settings

The NT6D11AB/AE/AF has two banks of option straps, one for each port. These select between DCE and DTE operation and whether the signalling interface is RS232 or RS422. Refer to Figure 36 on page 106 and Figure 37 on page 107.

Figure 36
NT6D11 DCH with ISL high-speed programming jumper settings

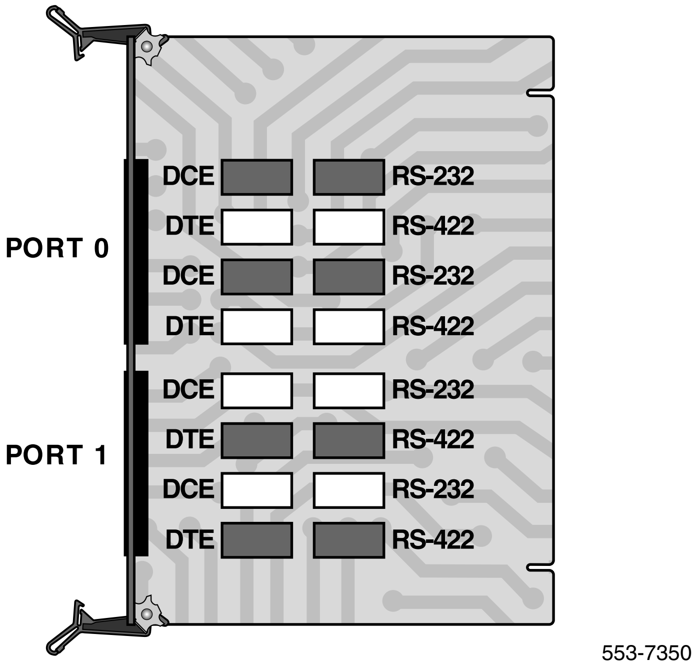
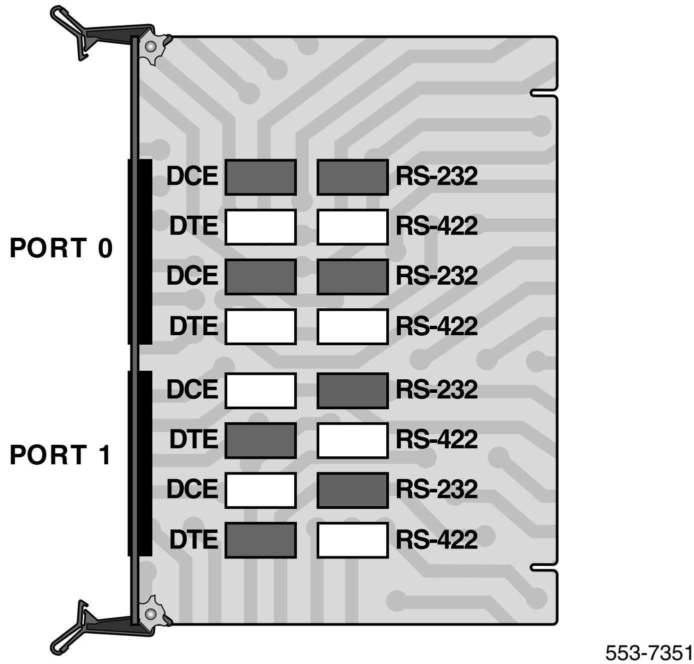


Figure 37
NT6D11 DCH with ISL low-speed programming jumper settings



Port addressing modes

Port 0 Mode selection

Port 0 is used to select whether the asynchronous ESDI port is be disabled or not. Refer to Table 24.

> ***Note:*** The asynchronous ESDI port must be set to “disabled”.

Table 24 (Part 1 of 2)
Port 0 mode selection

Port Mode	Switch Setting	
	SW1.1	SW1.2

Table 24 (Part 2 of 2)
Port 0 mode selection

Not used	0	-
Asynchronous ESDI	1	0
Port disabled	1	1

Port 1 mode selection

Port 1 is used to select the standard or expanded D-channel addressing mode on the NT6D11AB/AE/AF. Refer to Table 25.

Table 25
Port 1 mode selection

Port Mode	**Switch Setting**	
	SW2.1	SW2.2
Synchronous, D-channel, standard addressing ***Note:*** THIS SELECTION MUST BE MADE FOR ISDN.	0	0
Synchronous, D-channel, expanded addressing	0	1
Not used	1	0
Port disabled	1	1

Port address switch settings

Port address switch settings in the standard mode, for ISDN

Table 26 depicts the port address switch settings that apply to SW1 or SW2, the D-channel port, for ISDN mode.

Table 26
Port address switch settings for ISDN (Part 1 of 2)

Port Address	Switch Setting							
	Half Group No.			Device No.				
	S3	S4	S5	S6	S7	S8	S9	S10
0	0	0	0	0	0	0	0	x
1	0	0	0	0	0	0	1	x
2	0	0	0	0	0	1	0	x
3	0	0	0	0	0	1	1	x
4	0	0	0	0	1	0	0	x
5	0	0	0	0	1	0	1	x
6	0	0	0	0	1	1	0	x
7	0	0	0	0	1	1	1	x
8	0	0	0	1	0	0	0	x
9	0	0	0	1	0	0	1	x
10	0	0	0	1	0	1	0	x
11	0	0	0	1	0	1	1	x
12	0	0	0	1	1	0	0	x
13	0	0	0	1	1	0	1	x
14	0	0	0	1	1	1	0	x
15	0	0	1					

Table 26
Port address switch settings for ISDN (Part 2 of 2)

Port Address	Switch Setting							
	Half Group No.			Device No.				
	S3	S4	S5	S6	S7	S8	S9	S10
16-31	0	0	1					
32-47	0	1	0					
48-63	0	1	1					
64-79	1	0	0					
80-95	1	0	1					
96-111	1	1	0					
112-127	1	1	1					

Install the NT6D11AB, NT6D11AE, NT6D11AF DCHI

Follow Procedure 1 to install the NT6D11 DCH on the Large System.

Procedure 1
Install the NT6D11AB, NT6D11AE, NT6D11AF DCH

1 Determine the cabinet and shelf location for the circuit pack being installed.

The NT6D11AB, NT6D11AE, or NT6D11AF DCHI card can be installed in any slot appropriate for an I/O port card on a Network shelf. (The NT6D11 DCHI card can be located on the Common Equipment shelf only on single-CPU switches.)

2 Unpack and inspect the card.

3 Set the option switches on the DCHI card. For PRA capability, set port J2 to odd. For ISL capability, set port J2 for high speed or low speed operation (See Figure 36, Figure 37, and Table 26 starting on page 106).

4 Set faceplate toggle switch to DISABLE.

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

6 Connect DCHI port J2 to the NT8D72AB or NT8D72BA PRI port J5 with a QCAD328A cable.

7 Set faceplate toggle switch to ENABLE.

8 Coordinate the start-up and verification of the DCHI with the start-up of the PRI.

9 Enable the DCHI card using LD 96, command ENL DCHI N.

End of Procedure

Remove the NT6D11AB, NT6D11AE, NT6D11AF DCH

Use Procedure 2 to remove the NT6D11AB, NT6D11AE, NT6D11AF DCH from a Large System.

CAUTION
The NT6D11AB, NT6D11AE, NT6D11AF DCH must be software disabled before it is hardware disabled, or initialization will occur.

Procedure 2
Remove the NT6D11AB, NT6D11AE, NT6D11AF DCH

1 Disable the NT6D11AB, NT6D11AE, NT6D11AF DCHI using LD 96, command DIS DCHI N.

2 If asynchronous port J1 is enabled, it must also be software disabled, using LD 37, or initialization will occur.

3 If the circuit pack is being completely removed, not replaced, remove data from memory.

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

5 Set faceplate toggle switch to DISABLE.

6 Disconnect NT6D11AB, NT6D11AE, NT6D11AF DCHI cables.

7 Remove NT6D11AB, NT6D11AE, NT6D11AF DCHI card.

8 Pack and store the card.

End of Procedure

Install the QPC757 DCH

Installation procedures for the QPC757 DCHI card are the same for all Large Systems. These procedures apply to both primary and backup D-channels. See Figure 38 on page page 113, Figure 39 on page 114 and Table 27 on page 114, for option switch settings per port number of the DCHI card, in Primary Rate Interface mode.

Use Procedure 3 to install the QPC757 DCHI card on Large Systems.

Procedure 3
Install 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.

2 Unpack and inspect the 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.

10 Enable the DCHI card using LD 96, command ENL DCH x.

End of Procedure

Figure 38
QPC757 option and PRI/ISL high-speed programming switch settings

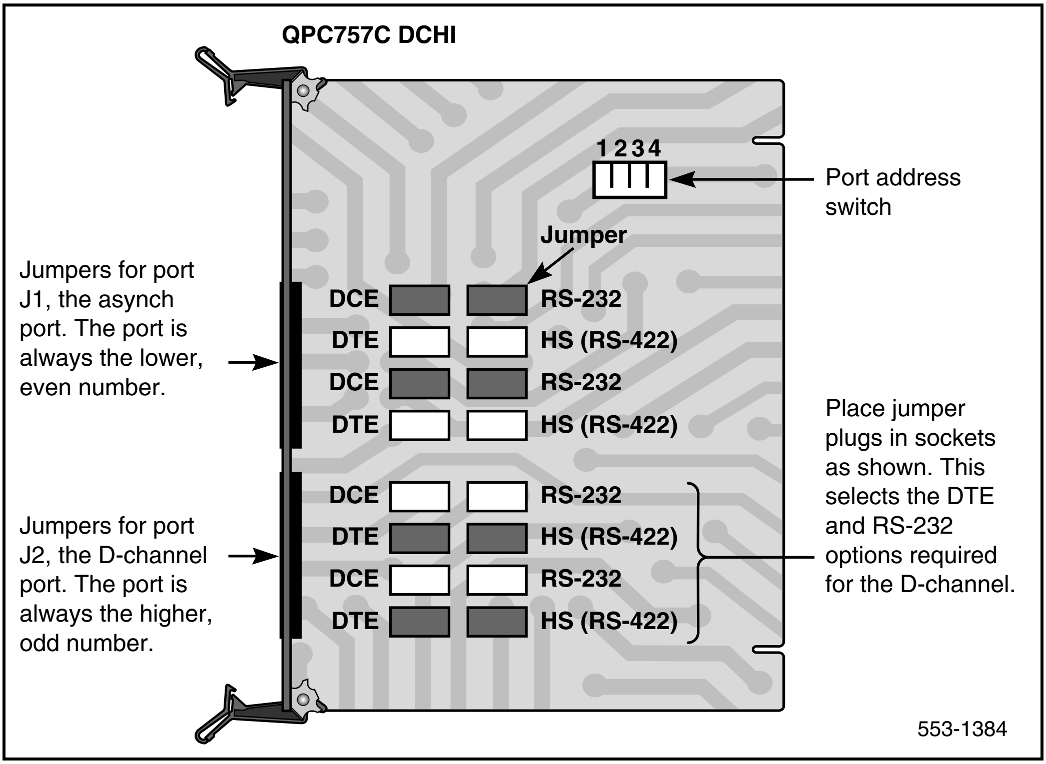
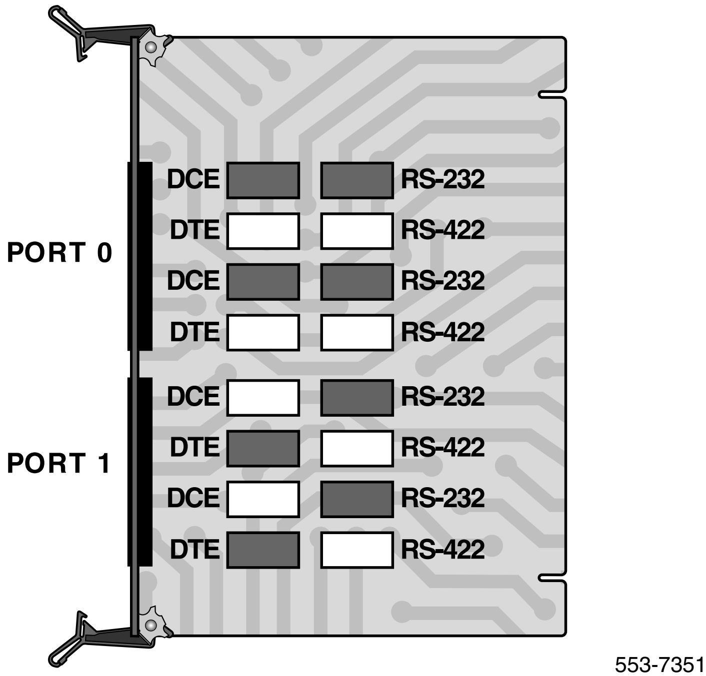


Figure 39
QPC757 option and PRI/ISL low-speed programming switch settings



Port address switch settings

Table 27 shows the port address switch settings that apply to SW1, SW2 (the D-channel port), SW3, and SW4.

Table 27
D-channel port address switch settings for PRI (Part 1 of 2)

Port Number		Port Address Switch Settings			
J1	J2	SW1	SW2	SW3	SW4
0	1	Off	Off	Off	Off

Table 27
D-channel port address switch settings for PRI (Part 2 of 2)

Port Number		Port Address Switch Settings			
2	2	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

D-channel parameter downloading

The system software automatically downloads 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 enabling 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)

Remove the QPC757 DCHI

Use Procedure 4 to remove the QPC757 DCHI card from Large Systems.

CAUTION
The QPC757 DCH must be software disabled before it is hardware disabled to prevent initialization

Procedure 4
Remove the QPC757 DCH

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.

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.

End of Procedure

NTBK51 DDCH installation and removal

Contents

This section contains information on the following topics:

Introduction

This chapter provides installation and removal procedures for the NTBK51 Downloadable D-channel Daughterboard, the NT5D97 dual-port DTI2/PRI2 card, and the NT5D12 dual-port 1.5 Mb DTI/PRI card on all Large Systems.

> ***Note:*** The only version of the NTBK51 DDCH that can be used on an NT5D97, or NT5D12 installed on a Large System, is the NTBK51**AA**. Vintage NTBK51**BA** cannot be used, due to a different pin configuration (the NTBK51BA is used on Small Systems.)

Before beginning an installation:

- Consult the *Spares Planning* (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.

- Remember that either the DDCH, the MSDL, or NT5D97, or NT5D12 card can be installed first. However, NT5D97 PRI2 loops, and NT5D12 PRI loops, must be configured in software before defining DCH links.

Install NTBK51 DDCH on NT5D97 dual-port DTI2/PRI2 card

Installation procedures for the NTBK51 DDCH are the same for all Large Systems. Use Procedure 5 below.

The DDCH can be mounted on any NT5D97 DDP2 card. Set the address for the DDCH (see the switch settings section to set the address). If a DDCH is present on a DDP2 card then an external D-channel should not be connected to J6. If a DDCH is present the LED “DDCH” lights 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 5
Install the NTBK51 on the NT5D97 dual-port DTI2/PRI2 card

1 Unpack and inspect the DDCH daughterboard.

The DDCH comes with four stand-offs so that it can be mounted onto the NT5D97. These are easily pushed into four corresponding mounting holes on the DDP2.

2 Mount the DDCH so that it mates with P1 and P2 on the NT5D97 motherboard.

Note: P 1 and P 2 contain (40+30) sockets as the NTBK51AA respective pins (40+30), which enables the technician to “mate” them. This is applicable for the NT5D97AA/AB. The NT5D97AD has 44+34 sockets. In order to place the NTBK51AA (40+30 pins), place the NTBK51AA inside P1 and P2. Start from their lower edge. (The remaining “free” sockets (4+4) in P1 and P2 are in their upper edge.)

3 Set the DDP2 ENB/DIS faceplate switch to Enable (ON). The DDCH LED then flashes three times.

End of Procedure

Remove NTBK51 DDCH from NT5D97 dual-port DTI2/PRI2 card

Removal procedures for the NTBK51 DDCH are the same for all Large Systems.

CAUTION
A static discharge bracelet must be worn before handling circuit cards. Failure to wear the bracelet can result in damage to the circuit cards.

The NTBK51 can only be removed when it is disabled in software. Both ports of the associated DDP2 card must be disabled. Follow the steps in Procedure 6 on page 119 to remove the NTBK51 from the NT5D97 dual-port DTI2/PRI2 card.

Procedure 6
Remove the NTBK51 from the NT5D97 dual-port DTI2/PRI2 card

1 Set the DDP2 ENB/DIS faceplate switch to Disable (OFF).

2 Remove the DDP2 and the DDCH.

End of Procedure

Install NTBK51 DDCH on NT5D12 dual-port DTI/PRI

Installation procedures for the NTBK51 DDCH are the same for all Large 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” lights up.

CAUTION

A static discharge bracelet must be worn before handling circuit cards. Failure to wear the bracelet can result in damage to the circuit cards.

The DDCH can be mounted on any DDP card. Follow the steps in Procedure 7 to install the NTBK51 on the NT5D12 dual-port DTI/PRI card.

Procedure 7
Install the NTBK51 DDCH on the NT5D12 dual-port DTI/PRI

1 Unpack and inspect the DDCH daughterboard.

The DDCH comes with four stand-offs so that it can be mounted onto the DDP. These are easily pushed into four corresponding mounting holes on the DDP.

2 Mount the NTBK51 DDCH so that it mates correctly with P1 and P2 on the NT5D12 DDP motherboard.

End of Procedure

Remove NTBK51 DDCH from NT5D12 dual-port DTI/PRI

Removal procedures for the NTBK51 DDCH are the same for all Large Systems.

CAUTION

A static discharge bracelet must be worn before handling circuit cards. Failure to wear the bracelet can result in damage to the circuit cards.

The DDCH can only be removed when it is disabled in software. Both ports of the associated DDP card must be disabled. Follow the steps in Procedure 8 on page 121 to remove the NTBK51 from the NT5D12 dual-port DTI/PRI card.

Procedure 8
Remove the NTBK51 from the NT5D12 dual-port DTI/PRI card

1 Disable the faceplate switch on the DDP.

2 Remove the DDP and DDCH.

End of Procedure

MSDL installation for all systems

Contents

The section contains information on the following topics:

Install the MSDL

Installation procedures for the MSDL card are the same for Large Systems. Use Procedure 9 below. See Figure 40 on page 125, and Table 28 on page 125 for the port and interface switch settings.

The MSDL card goes into the following slots:

Half Group, Single Group	CPU/Network Module slot 1–8, 13
Multi Group	Network Module slot 5–14

Refer to *Software Input/Output: System Messages* (553-3001-411) and *Circuit Card: Description and Installation* (553-3001-211) for more information.

Procedure 9
Install the MSDL card

1. Determine module and slot location for the MSDL card. Unpack and inspect the MSDL card.
2. Set the MSDL switch settings to correspond to Table 28, and Figure 40.

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

4. 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 can be defective. Go to step 8.

5. Connect the appropriate cable between the NT6D80 and the PRI card MSDL interface.

6. Enable the MSDL card in LD96.

7. 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.

8. 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.

End of Procedure

Figure 40
MSDL card layout

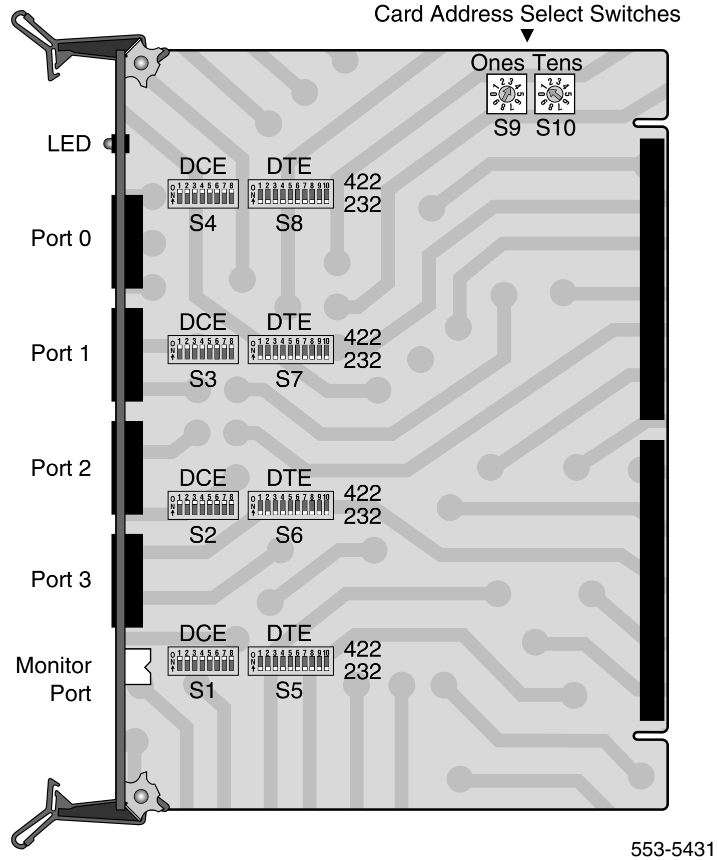


Table 28
MSDL switch settings (Part 1 of 2)

	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

Table 28
MSDL switch settings (Part 2 of 2)

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

Replace the MSDL

Replacement procedures for the MSDL card are the same for all Large Systems. Use Procedure 10 below.

Procedure 10
Replace 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 28 and Figure 40.

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 can be defective. Go to step 11.

8 Connect the appropriate cable between the NT6D80 and the PRI card MSDL interface.

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 and reinsert it. If the red LED does not flash three times, the card is defective and must be replaced.

NT8D72 and QPC720 PRI card installation

Contents

The section contains information on the following topics:

Introduction

This chapter contains information on how to install the 2.0 Mb NT8D72 and the 1.5 Mb QPC720 PRI cards on all Large Systems.

Information on how to install the dual-port cards NT5D97 and NT5D12 is contained in this document.

PRI circuit pack locations

The PRI circuit pack occupies two adjacent slots on a shelf. As many as five circuit packs can be plugged into an empty Network shelf, along with a Power Converter circuit pack. Specific locations will depend on available space.

Note 1: Due to physical width, Bus Terminating Units (BTUs) and PRIs cannot fit next to each other on a shelf.

Note 2: This chapter includes instructions for installing an additional network shelf on a system (when no vacant Network slots are available to install PRI packs, additional network shelves can replace Peripheral Equipment shelves located on the rear of the Common Equipment or Disk shelves). Refer to “Install an additional network shelf” on page 155.

Cable requirements

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

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

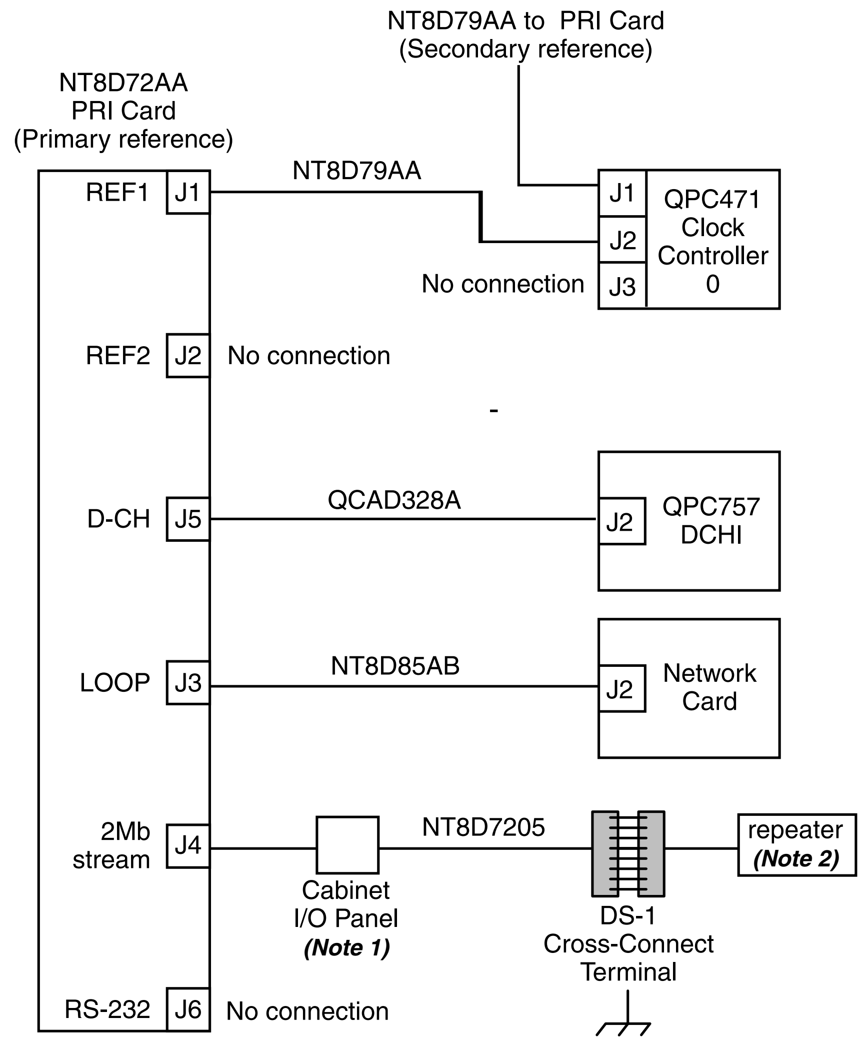
In addition to twisted-pair conductors, 75-ohm coaxial cable can also be used to provide connection to the office repeater or line terminating unit (LTU).

For manufacture cables of lengths different than those of the standard cables provided, see "Non-standard cables" on page 385 of this practice.

For the 2.0 Mb NT8D72 PRI card, see Figure 41 on page 131, Figure 42 on page 132, Figure 43 on page 133, and Figure 44 on page 131 for Half Group and Single Group cabling arrangements applying to the system; also, refer to Table 52 on page 142. For the 2.0 NT8D72 on a Multi Group arrangement, see Figures 45 and 46 on page 135; also refer to Table 30 on page 144.

For the 1.5 Mb QPC720 PRI card on Half Group and Single Group systems, see Figure 47 on page 137, Figure 48 on page 138, Figure 49 on page 139, also, refer to Table 31 on page 145. For the QPC720 on Multi Group systems, see Figures 51 and 52 on page 141; also refer to Table 32 on page 147.

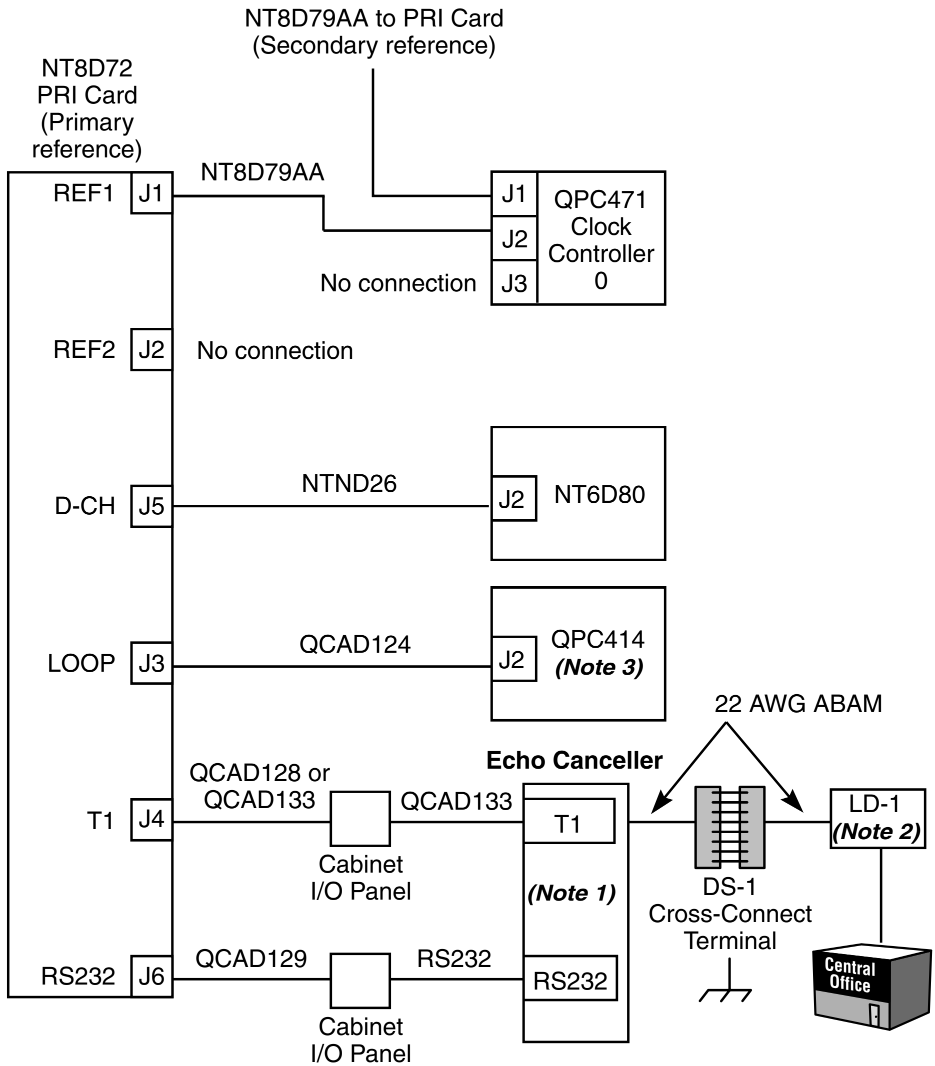
Figure 41
NT8D72(Half Group cabling) on Half and Single Group systems without an echo canceller



Note 1: Maximum cable distance from PRI card to cross connect is 200 m (655 ft) .
Note 2: Maximum cable distance from PRI card to repeater is 229 m (750 ft).

553-1389

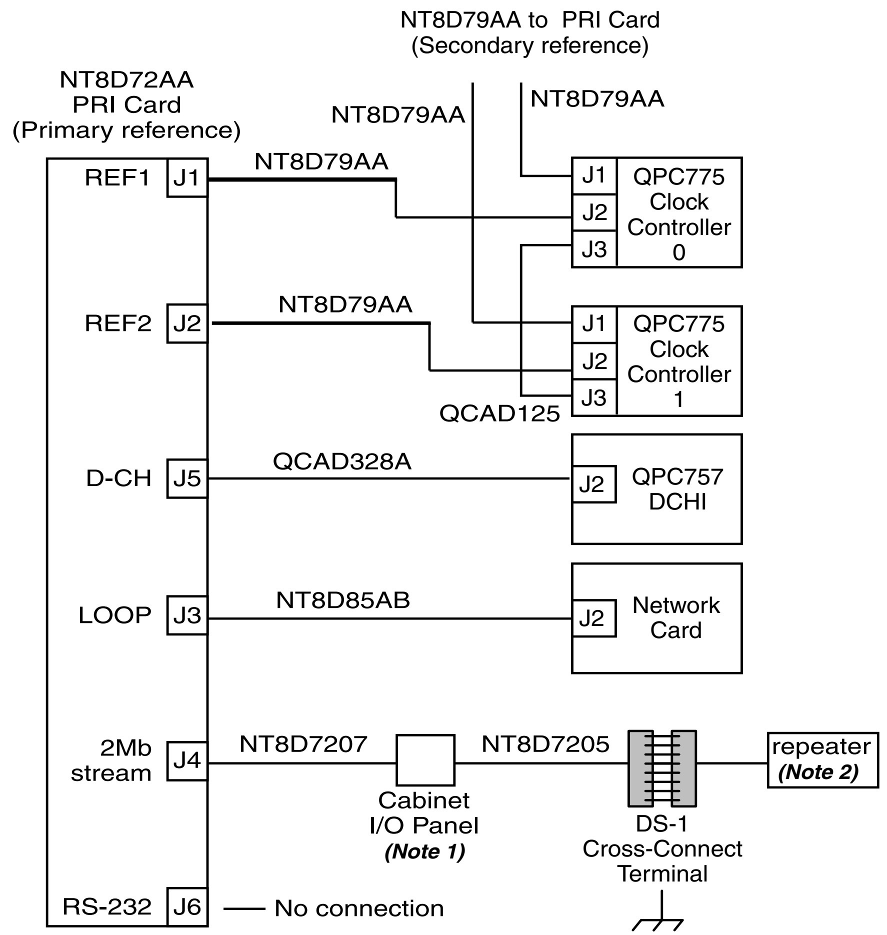
Figure 42
NT8D72 (Half Group cabling) for Half and Single Group systems, with an echo canceller



Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 200 m (655 ft).
Note 2: Maximum cable distance from PRI card to LD-1 is 229 m (750 ft).
Note 3: QPC720 does not interface with NT8D04 Superloop Network Card.

553-1390

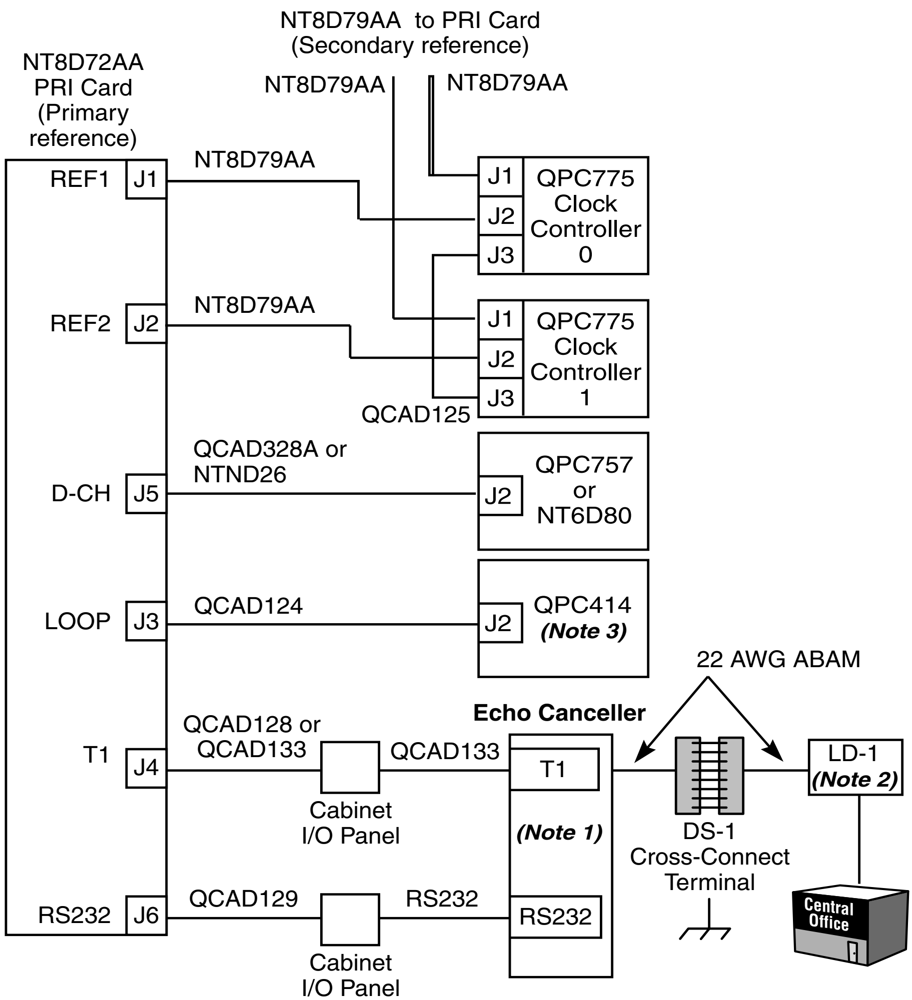
Figure 43
NT8D72 (Single Group cabling) for Half and Single Group systems, without an echo canceller



Note 1: Maximum cable distance from PRI card to cross connect is 200 m (655 ft) .
Note 2: Maximum cable distance from PRI card to repeater is 229 m (750 ft).

553-1391

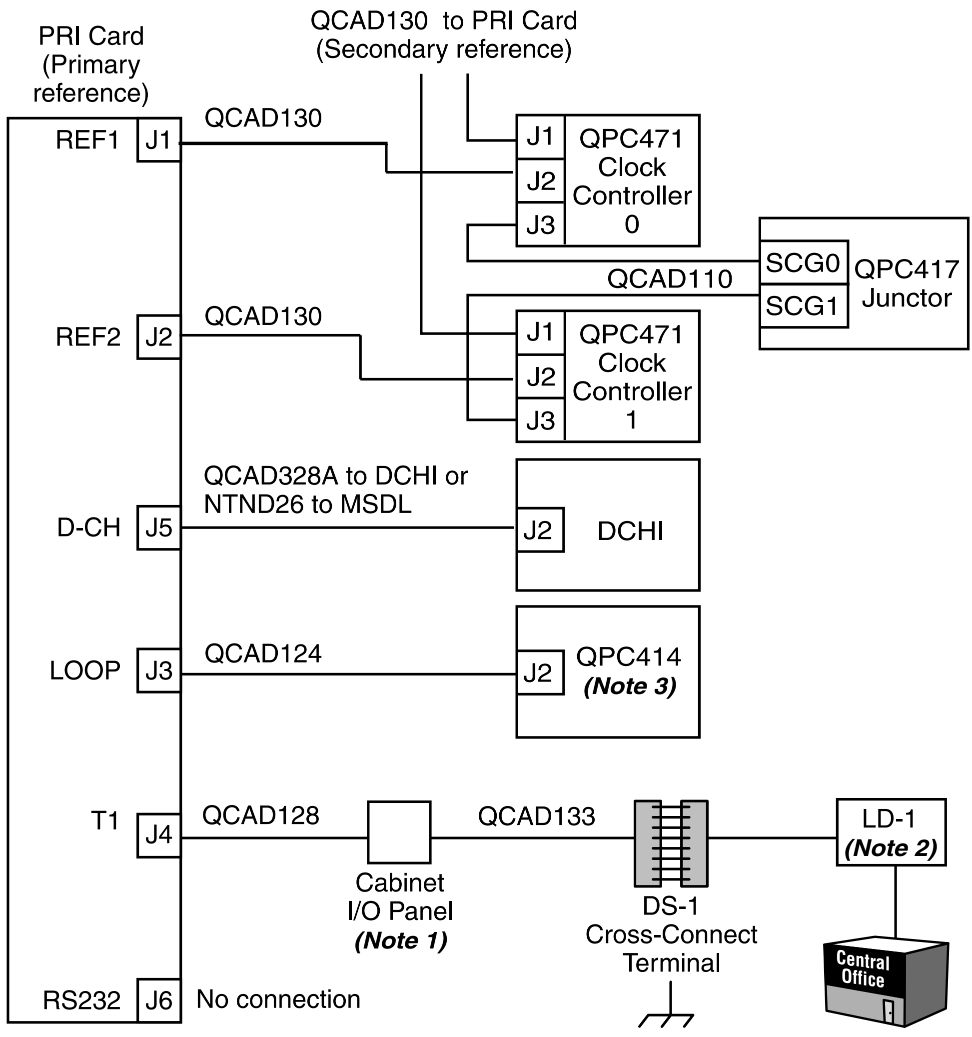
Figure 44
NT8D72 (Single Group cabling) for Half and Single Group systems, with an echo canceller



Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 200 m (655 ft).
Note 2: Maximum cable distance from PRI card to LD-1 is 229 m (750 ft).
Note 3: QPC720 does not interface with NT8D04 Superloop Network Card.

553-1392

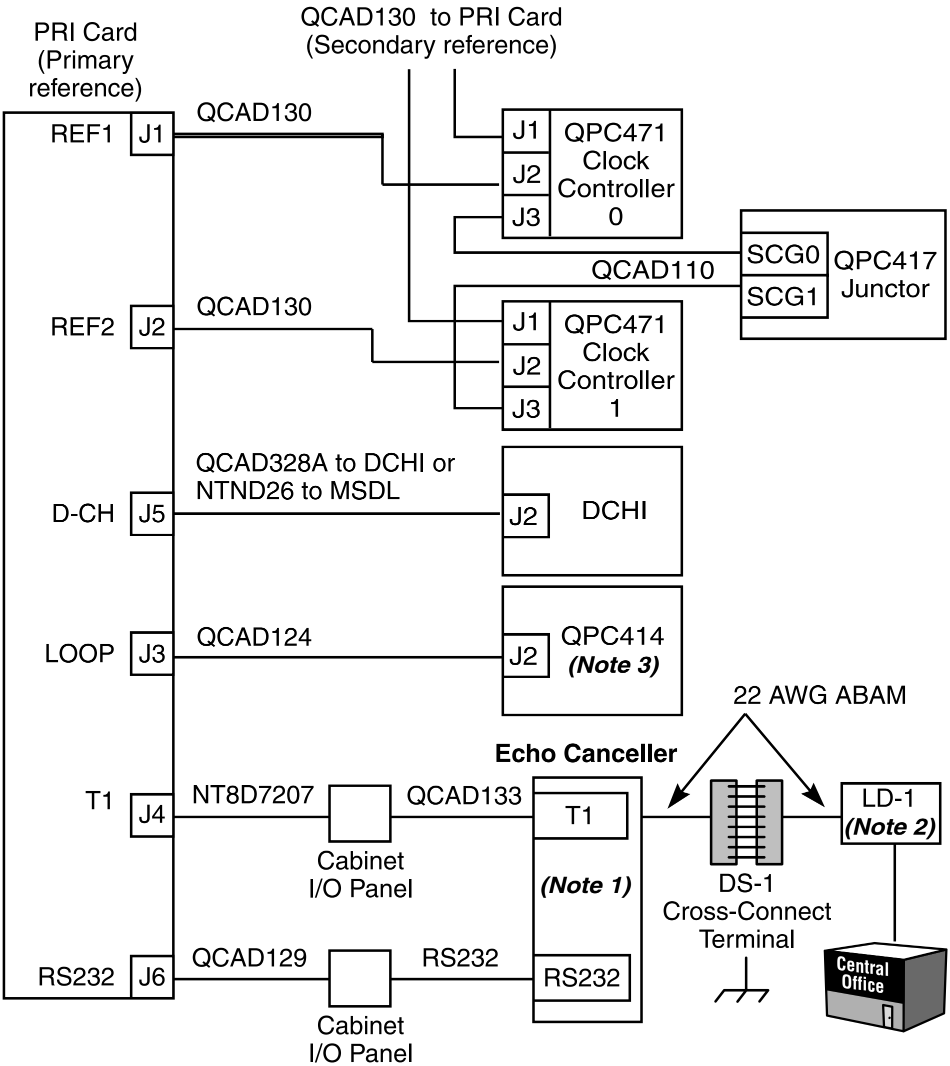
Figure 45
NT8D72 (Multi Group cabling) for Multi Group systems without an echo canceller



Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 200 m (655 ft).
Note 2: Maximum cable distance from PRI card to LD-1 is 229 m (750 ft).
Note 3: QPC720 does not interface with NT8D04 Superloop Network Card.

553-7366

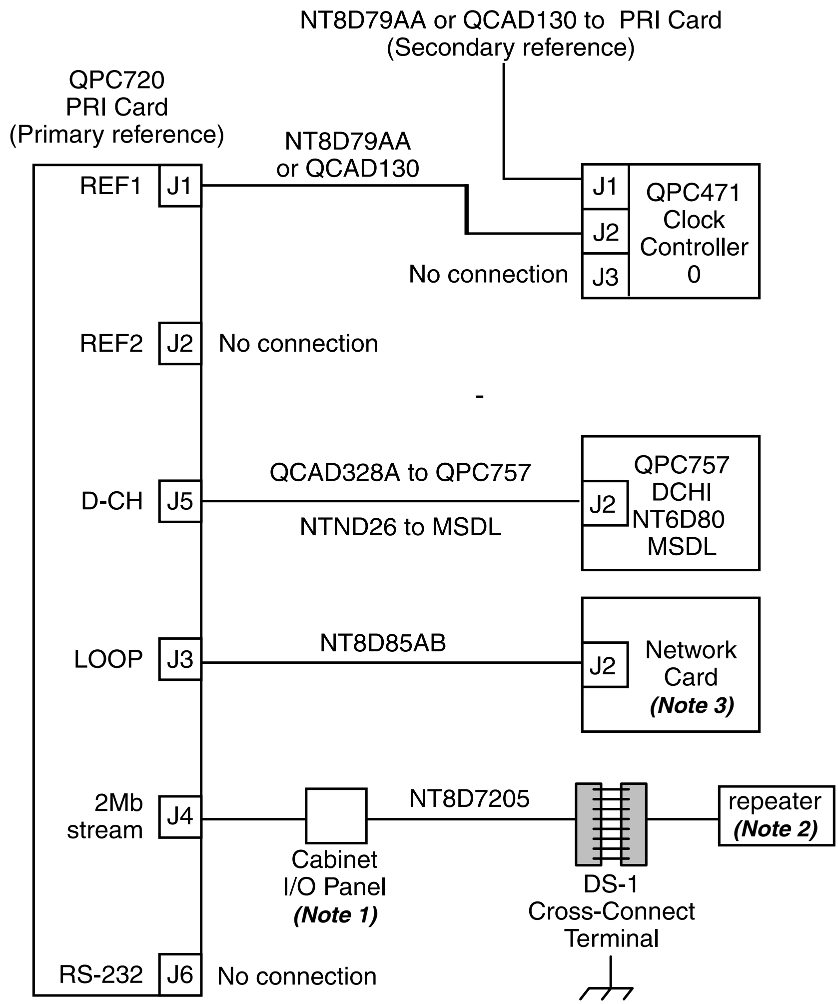
Figure 46
NT8D72 (Multi Group cabling) for Multi Group systems with an echo canceller



Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 200 m (655 ft).
Note 2: Maximum cable distance from PRI card to LD-1 is 229 m (750 ft).
Note 3: QPC720 does not interface with NT8D04 Superloop Network Card.

553-7367

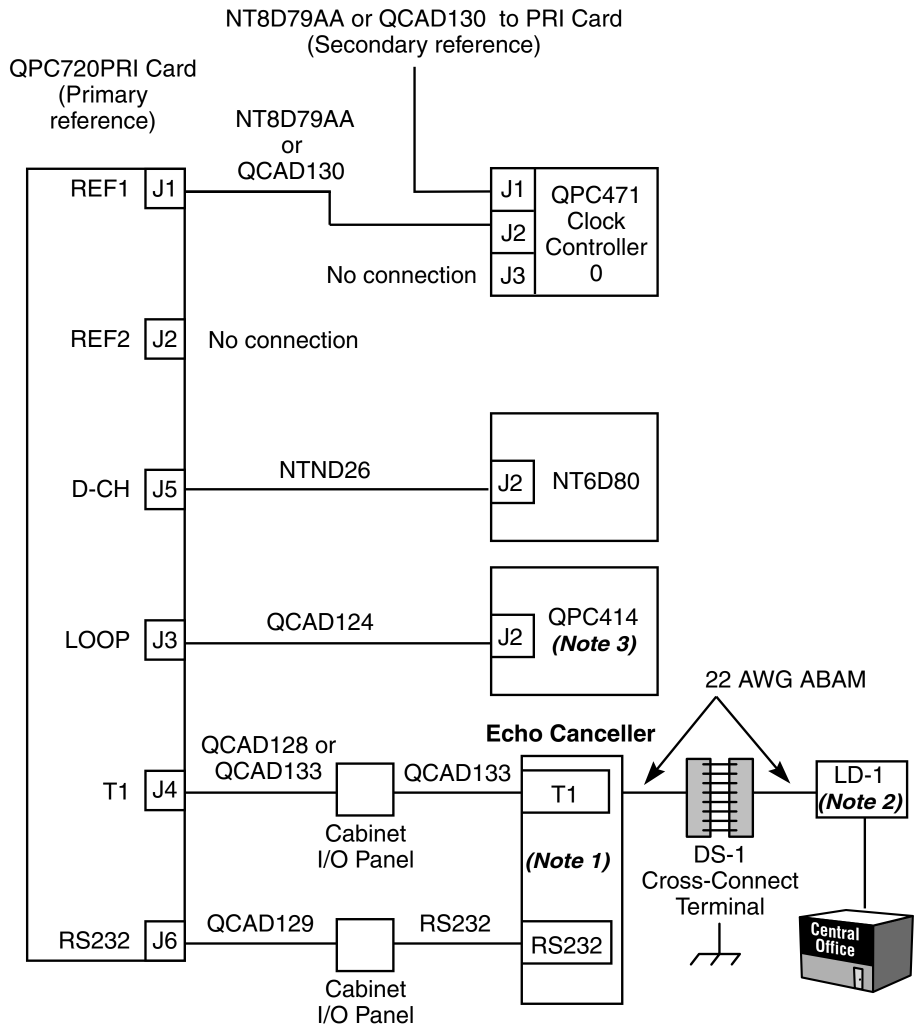
Figure 47
QPC720 (Half Group cabling) for Multi Group systems without an echo canceller



Note 1: Maximum cable distance from PRI card to cross connect is 200 m (655 ft) .
Note 2: Maximum cable distance from PRI card to repeater is 229 m (750 ft).
Note 3: QPC720 does not interface with NT8D04 Superloop Network Card.

553-1389.1

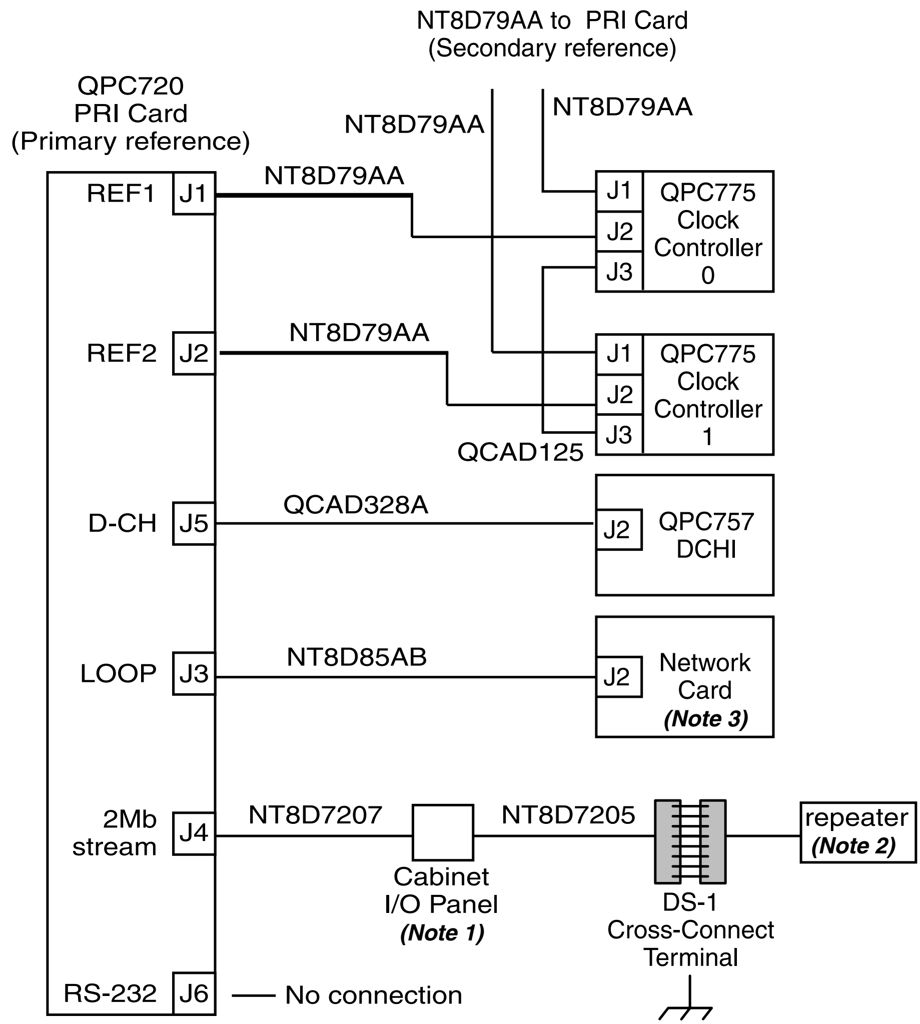
Figure 48
QPC720 (Half Group cabling) for Multi Group systems with an echo canceller



Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 200 m (655 ft).
Note 2: Maximum cable distance from PRI card to LD-1 is 229 m (750 ft).
Note 3: QPC720 does not interface with NT8D04 Superloop Network Card.

553-1390.1

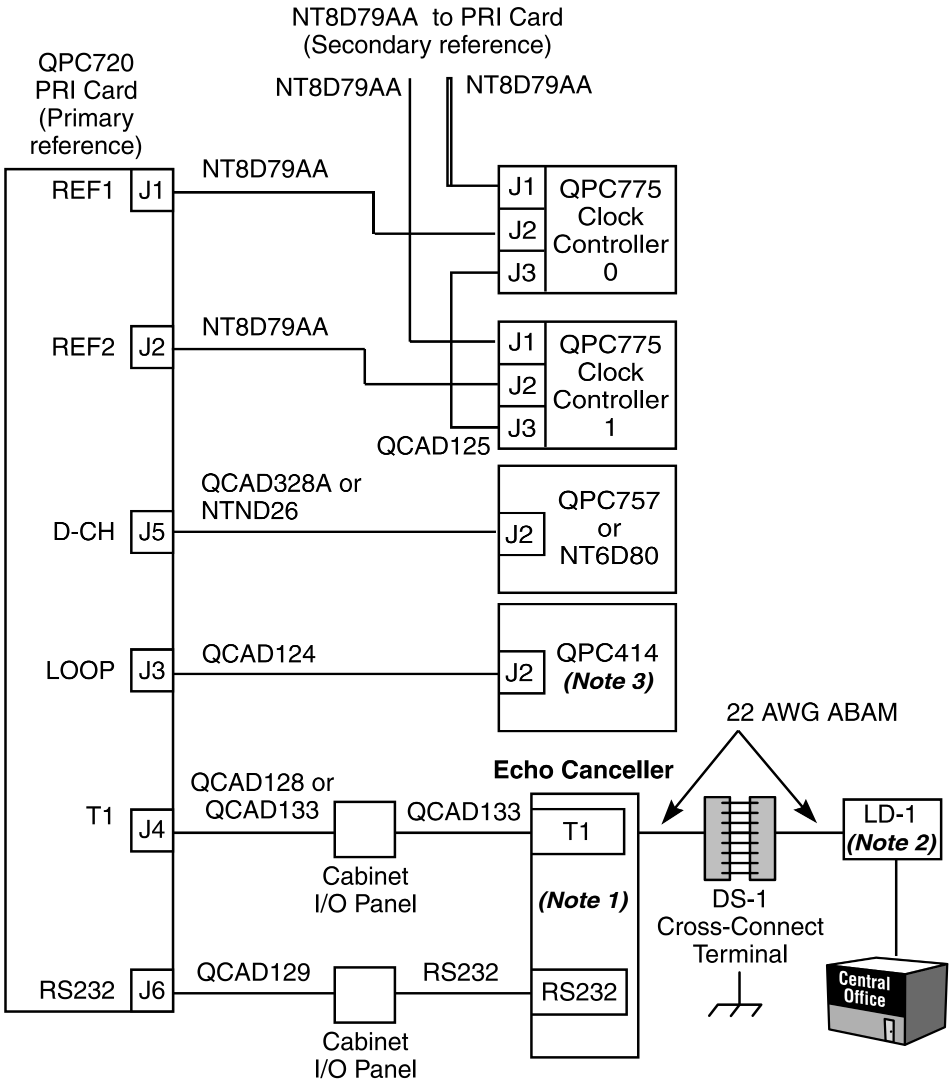
Figure 49
QPC720 (Single Group cabling) for Multi Group systems without an echo canceller



Note 1: Maximum cable distance from PRI card to cross connect is 200 m (655 ft) .
Note 2: Maximum cable distance from PRI card to repeater is 229 m (750 ft).
Note 3: QPC720 does not interface with NT8D04 Superloop Network Card.

553-1391.1

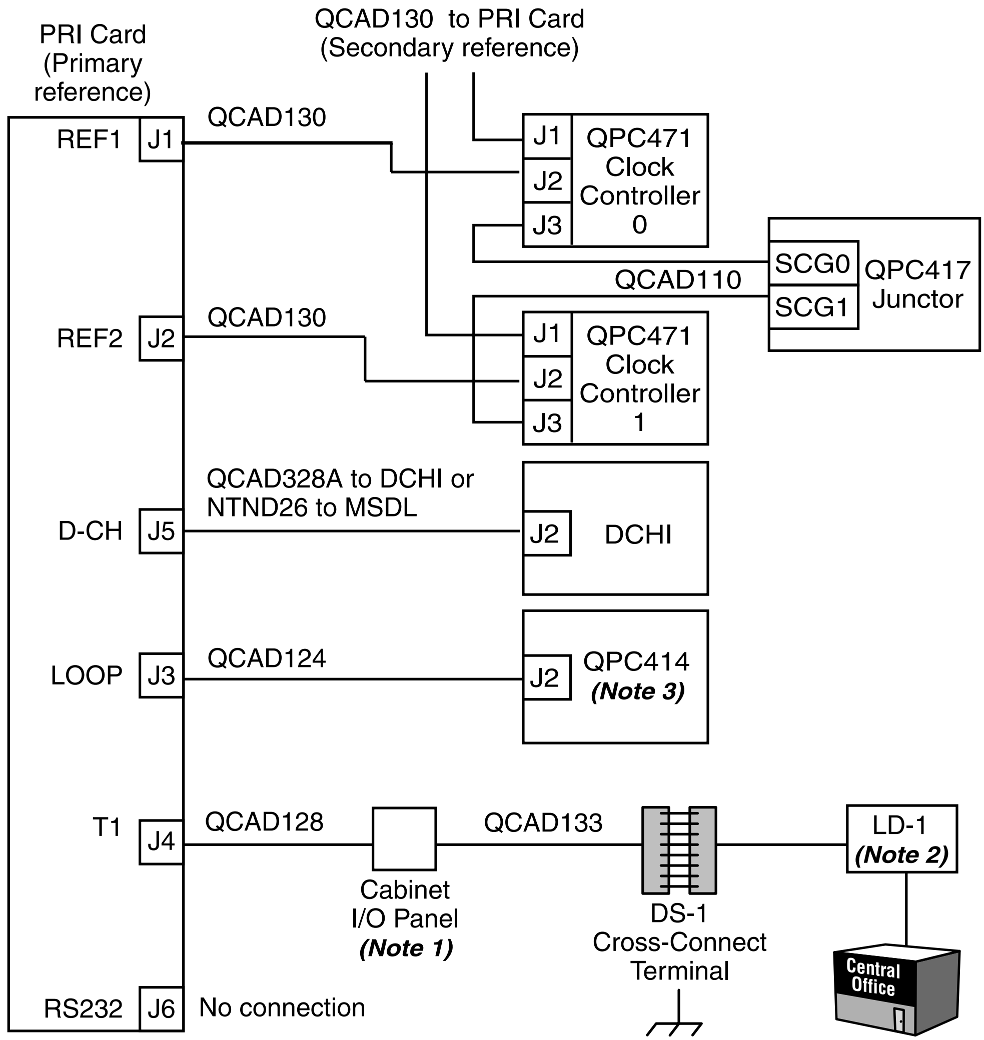
Figure 50
QPC720 (Single Group cabling) for Multi Group systems with an echo canceller



Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 200 m (655 ft).
Note 2: Maximum cable distance from PRI card to LD-1 is 229 m (750 ft).
Note 3: QPC720 does not interface with NT8D04 Superloop Network Card.

553-1392

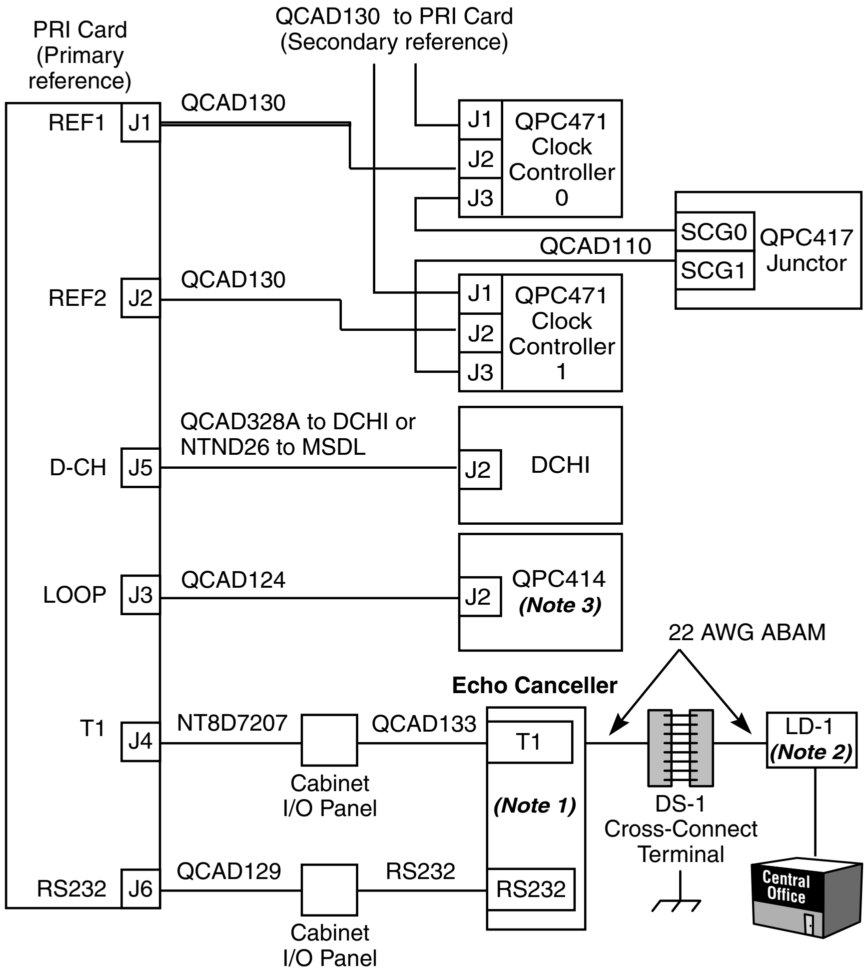
Figure 51
QPC720 Multi Group cabling without an echo canceller



Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 200 m (655 ft).
Note 2: Maximum cable distance from PRI card to LD-1 is 229 m (750 ft).
Note 3: QPC720 does not interface with NT8D04 Superloop Network Card.

553-7366.1

Figure 52
QPC720 Multi Group cabling with an echo canceller



Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 200 m (655 ft).
Note 2: Maximum cable distance from PRI card to LD-1 is 229 m (750 ft).
Note 3: QPC720 does not interface with NT8D04 Superloop Network Card.

553-7367.1

Table 29
Cable for the NT8D72 PRI card for Half and Single Group systems (Part 1 of 2)

Cable	From	Des	Con	To	Des	Con	To
NTND26	PRI card		J5	MSDL			
NT8D79AA	PRI card		J1	Clock controller	CC-0	J2	Only when primary clock source.
NT8D79AA	PRI card		J1	Clock controller	CC-0	J1	Only when secondary clock source.
For single-group only							
NT8D79AA	PRI card		J2	Clock controller	CC-1	J2	Only when primary clock source.
NT8D79AA	PRI card		J2	Clock controller	CC-1	J1	Only when secondary clock source.
QCAD125	Clock controller	CC-0	J3	Clock controller	CC-1	J3	Clock Controller back-up.
NT8D85AB	PRI card		J3	Network			Run directly to Network pack.
QCAD328A	PRI card		J2	DCHI		J2	Run directly to DCHI card.
NTND26	PRI card		J5	MSDL			
NT8D7207	PRI card		J4	I/O Panel			
RS-232	I/O Panel			Echo canceller			
RS-232	PRI card		J6	Echo canceller			

Table 29
Cable for the NT8D72 PRI card for Half and Single Group systems (Part 2 of 2)

Cable	From	Des	Con	To	Des	Con	To
NT8D7205	I/O Panel			cross connect			Run via cabinet I/O panel to cross-connect terminal from switch.

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

Table 30
Cable for the NT8D72 PRI card for Multi Group systems (Part 1 of 2)

Cable	From	Des.	Con.	To	Des.	Con.	Notes
QCAD130	PRI card			J1	Clock controller	CC-0	1
QCAD130	PRI card			J1	Clock controller	CC-0	2
QCAD130	PRI card			J2	Clock controller	CC-1	1
QCAD130	PRI card			J2	Clock controller	CC-1	2
QCAD110	Clock controller	CC-0	J3	Junctor board	JCTR	J11	3
QCAD110	Clock controller	CC-1	J3	Junctor board	JCTR	J12	
QCAD124	PRI card		J3	Network			4
QCAD328A	PRI card		J5	DCHI card		J2	5
NTND26	PRI card	J5		MSDL			
QCAD128	PRI card		J4	I/O Panel			6

Table 30
Cable for the NT8D72 PRI card for Multi Group systems (Part 2 of 2)

QCAD133	I/O Panel		Patch Panel	6
QCAD129	PRI card	J6	I/O Panel	6
RS-232	I/O Panel		Echo Canceller	
RS-232	PRI card	J6	Echo Canceller	7
QCAD133	PRI card	J4	Patch Panel	7
RS-232	PRI card	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.

Note 8: No additional cabling is required for multiple PRIs. The D-channel is associated through software in LD17, prompt PRI.

Table 31
Cable for the QPC720 PRI card for Half and Multi Group systems (Part 1 of 3)

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.

Table 31
Cable for the QPC720 PRI card for Half and Multi Group systems (Part 2 of 3)

Cable	From	Des.	Con.	To	Des.	Con.	Comments
QCAD130 NT8D79xx	QPC720		J1	QPC471/ QPC775	CC-0	J1	Only when secondary clock source.
NTND26	QPC720		J5	NT6D80			
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			
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			

Table 31
Cable for the QPC720 PRI card for Half and Multi Group systems (Part 3 of 3)

Cable	From	Des.	Con.	To	Des.	Con.	Comments
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.

Table 32
Cable for the QPC720 PRI card on Multi Group systems (Part 1 of 3)

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	

Table 32
Cable for the QPC720 PRI card on Multi Group systems (Part 2 of 3)

Cable	From	Des.	Con.	To	Des.	Con.	Notes
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			
QCAD128 NT8D83xx	QPC720		J4	I/O Panel			Run via cabinet I/O panel to CSU, Echo Canceller, or cross-connect terminal
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

Table 32
Cable for the QPC720 PRI card on Multi Group systems (Part 3 of 3)

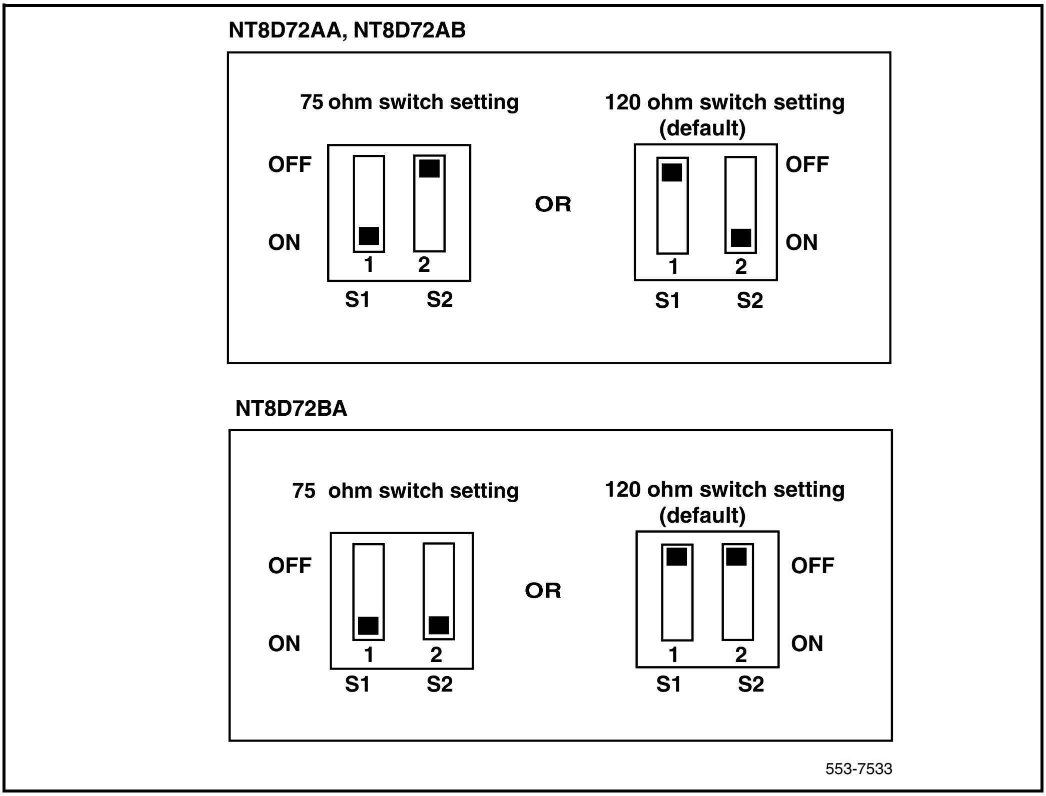
Cable	From	Des.	Con.	To	Des.	Con.	Notes
QCAD133 NT8D83xx	QPC720		J4	Patch Panel			Run via cabinet I/O panel to Echo Canceller or cross-connect terminal from non-shielded system
RS-232	QPC720		J6	Echo Canceller			Run via cabinet I/O panel to Echo Canceller or cross-connect terminal from non-shielded system

Switch settings

Figure 53 on page 150 shows the NT8D72AA, NT8D72AB, and NT8D72BA PRI DIP switch settings for Large Systems. Figure 54 on page 151 shows the QPC720 PRI switch settings for Large Systems.

Table 33 on page 151 indicates the Transmission equalization switch settings for the NT8D72 and QPC720 PRI cards for Large Systems.

Figure 53
NT8D72AA, NT8D72AB, NT8D72BA PRI DIP switch settings for Large Systems



Note: For EuroISDN applications, use the default setting (120 ohms).

Figure 54
QPC720 switch settings for Half and Single Group systems

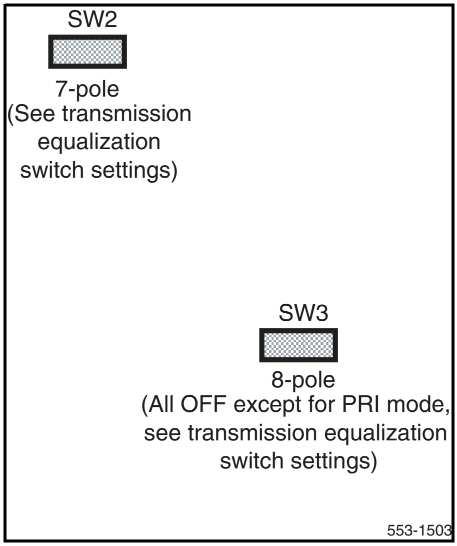


Table 33
NT8D72 and QPC720 PRI transmission equalization switch settings for Large Systems (Part 1 of 2)

Switch S2 settings	To repeater 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)

Table 33
NT8D72 and QPC720 PRI transmission equalization switch settings for Large Systems (Part 2 of 2)

Switch 3 options for PRI with ESF	
SW3-1	on = extended superframe format (ESF) off = superframe format (SF)

Note 1: All positions on S2 (location B22) are OFF except as shown under the column labeled “Switch S2 settings.” The 8-pole SW3 (location E37) positions are OFF except for SW3-1 as shown for “Switch 3 option for DTI with ESF.”

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

Note 3: For the DTI with ESF option, you must set the framing format as ESF with the DLOP prompt in LD17 before you set SW3-1 on the card.

Install NT8D72 and QPC720 PRI cards on Large Systems

Use Procedure 11 to install the NT8D72 and QPC720 PRI cards on Large Systems.

Procedure 11
Install the NT8D72 and QPC720 PRI on Large Systems

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 34
Shelf and slot location of NT8D72 and QPC720 for Half Group and Single Group systems

System	Shelf	Slot
Half Group, Single Group	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
Multi Group	Core	0-3
	Network Module	5–10, 13–14

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 the PRI cards.

3 Set the option switches on the PRI circuit cards.

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

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

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

7 Run and connect the PRI cables.

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.

End of Procedure

Remove NT8D72 and QPC720 PRI cards from Large Systems

Use Procedure 12 to remove the NT8D72 and QPC720 PRI cards from Large Systems.

Procedure 12
Remove NT8D72 and QPC720 PRI cards from Large Systems

1 Disable the D-channel in LD 96.

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

3 Remove the data from memory if the circuit card is being completely removed, not replaced.

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.

End of Procedure

Install an additional network shelf

Use Procedure 13 to install an additional network shelf, when additional shelf space is required for PRI cards on Half Group and Single Group systems. A QUD15 cooling unit is required for each additional shelf installed.

CAUTION
Do not place the circuit packs in the shelf until Step 7 is completed.

Procedure 13
Install an additional network shelf on Half Group and Single Group systems

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

2 Unpack and inspect the shelf.

3 Remove the existing left or right rear Peripheral Equipment (PE) shelf (if required).

4 Install the additional Network shelf in the PE (Step 3) location.

5 Install a QUD15 cooling unit directly below the Network shelf and secure with four mounting screws.

6 Install and connect the QCAD172A power cable to the added QUD15 cooling unit as follows:

- If the added QUD15 is located below the left Network shelf, unplug the C11 connector from the QCAD111 power harness that connects to the existing left side QUD15.
- If the added QUD15 is located below the right Network shelf, unplug the C21 connector from the QCAD111 power harness instead of the C11.

7 Plug the C11 or C21 connector into the single-ended connector of the QCAD172A power cable.

8 Plug one of the two connectors at the other end of the C11 or C21 connector that was removed.

9 Plug the remaining connector of the QCAD172A power cable into the added QUD15.

10 Adjust the QCAD111 power wiring harness, untie and then connect:

- the C17 power connection cable to the ***right*** rear Network shelf
- the C19 power connection cable to the ***left*** rear Network shelf

11 Install PRI trunks and enter related shelf and PRI office data into switch memory.

End of Procedure

NT5D97 Dual-port DTI2/PRI2 installation and removal

Contents

The section contains information on the following topics:

Introduction

This section contains information required to install the NT5D97 Dual-port DTI2/PRI2 (DDP2) card on Large Systems.

For installation and removal procedures for the NTBK51AA Downloadable D-channel daughterboard, prefer to the section “NTBK51 DDCH installation and removal” on page 117.

NT5D97 circuit card locations

Each NT5D97 card requires one slot on a shelf. NT5D97 cards can be placed in any card slot in the network bus.

Port definitions

Since the NT5D97 card is a dual-card, it equips two ports; these ports can be defined in the following combinations:

Table 35
NT5D97AA/AB loops configuration

		Loop 0		
		not configured	DTI2	PRI2
Loop 1	not configured	V	V	V
	DTI2	V	V	V
	PRI2	V	V	V

Table 36
NT5D97AD loops configuration

		Loop 0			
		not configured	DTI2	PRI2	DDCS
Loop 1	not configured	V	V	V	V
	DTI2	V	V	V	V
	PRI2	V	V	V	X
	DDCS	V	V	X	V

Note: Each loop DPNSS can be defined in Normal or Extended addressing mode.

Case Scenarios for replacing a digital trunk NT8D72BA, QPC536E, or NTCK43 by a DDP2 card

The following discussion describes possible scenarios when replacing a digital trunk NT8D72BA PRI2 card or QPC536E DTI2 card or NTCK43 Dual PRI card configuration with a NT5D97 DDP2 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 DDP2 card, which is plugged into the network 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 a network loop location.

In this case, the QPC414 should not be removed. The digital trunk is removed and the DDP2 card is plugged into one of the two empty slots.

Case 3 - The network 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 can then be replaced by the NT5D97 DDP2.

> ***Note:*** If an NT8D72BA/NTCK43 card is being replaced by a DDP2 card, the D-channel Handler can be reconnected to the DDP2 card, or removed if an onboard NTBK51DDCH card is used. Also, DIP Switches in the NT5D97 must be set properly before insertion. NT5D97 has a different DIP Switch setting from NTCK43AB. Refer to "NT5D97AA/AB DIP switch settings" on page 160 for DIP switch setting).

NT5D97AA/AB DIP switch settings

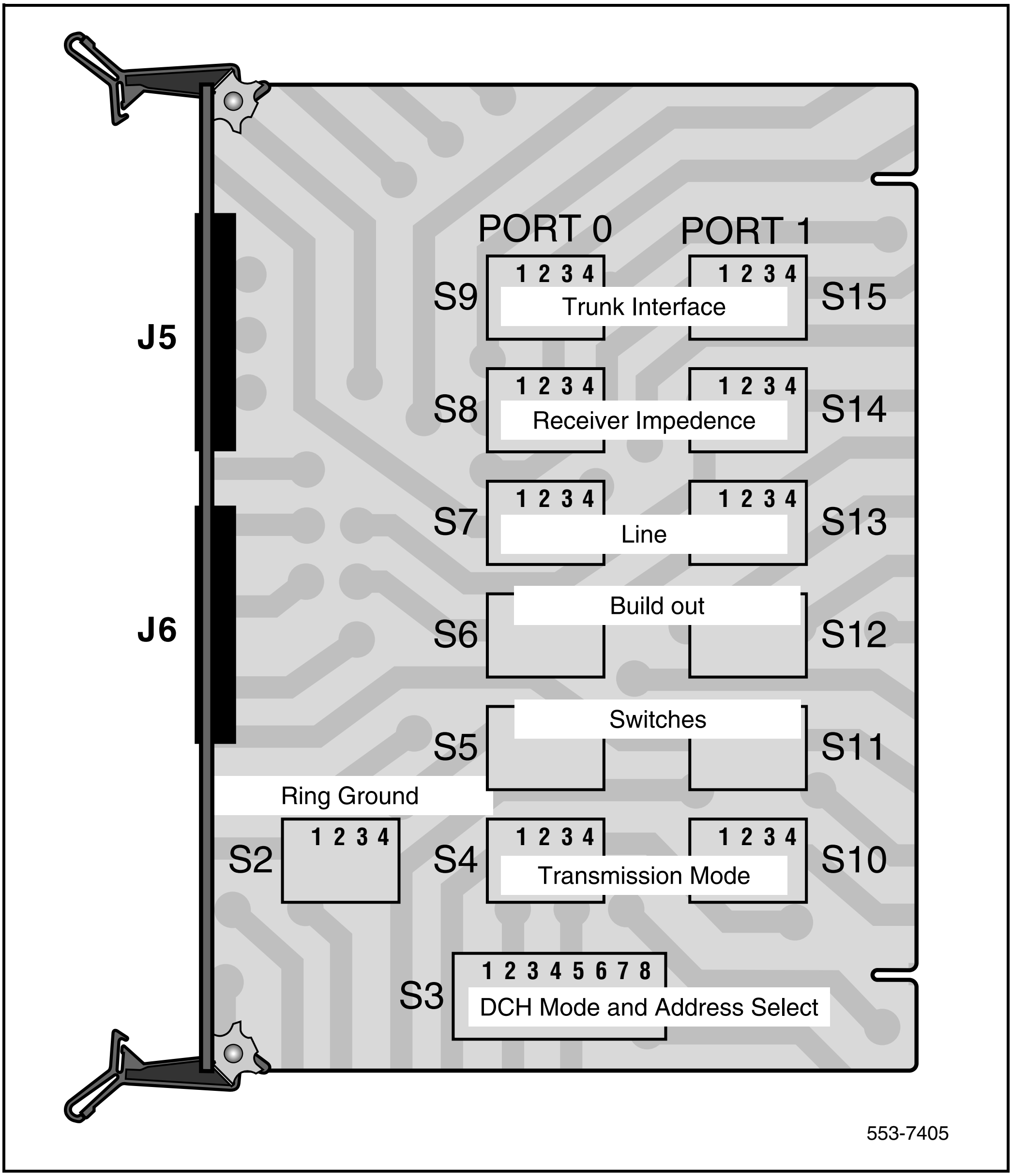
The NT5D97 DDP2 card is equipped with 6x2 sets of DIP switches for trunk parameters settings for port0 and port1 respectively. Additionally, the DDP2 card is equipped with one set of four DIP switches for the Ring Ground setting. The NT5D97AA/AB has one set of eight DIP switches and NT5D97AD has two sets of ten DIP switches for the D-channel Handler parameters setting.

The DIP switches are used for the setting of default values of certain parameters. Firmware reads the general purpose switches, which sets the default values accordingly.

Table 37
DIP switch settings for NT5D97AA/AB

	Card	Trunks 0 and 1	Port 0	Port 1	Trunk 0	Trunk 1
ENB/DSB mounted on the face plate	S1					
Ring Ground		S2				
MSDL			S3			
Tx Mode					S4	S10
LBO Setting					S5	S11
					S6	S12
					S7	S13
Receiver Interface					S8	S14
General Purpose					S9	S15

Figure 55
DIP switches for NT5D97AA/AB



The following parameters are set by DIP switches. The boldface font shows the factory set-up.

Trunk interface switches for NT5D97AA/AB

Impedance level and unit mode

The S9/S15 switch selects the impedance level and loop operation mode on DEI2 OR PRI2. Refer to Table 38 on page 162.

Table 38
Impedance level and loop mode switch settings

Switch	Description	S9/S15 Switch Setting
1	Impedance level	**OFF - 120 ohm** ON - 75 ohm
2	Spare	X
3	Spare	X
4	Unit mode	**OFF - Loop operates in the DTI2 mode** ON - Loop operates in the PRI2 mode

Transmission mode

A per-trunk switch (S4/S10) provides a selection of the digital trunk interface type. Refer to Table 39 on page 162.

Table 39
Impedance level and loop mode switch settings

Description	S4/S10 switch settings
E1	**OFF**
Not used	

Line build out

A per-trunk set of three switches (S5/S11, S6/S12 and S7/S13) provides the dB value for the line build out. Refer to Table 40 on page 163.

> ***Note:*** Do not change this setup.

Table 40
Trunk interface line build out switch settings

Description	Switch setting		
	S5/S11	**S6/S12**	**S7/S13**
0dB	**OFF**	**OFF**	**OFF**

Receiver impedance

A per-trunk set of four DIP switches (S8/S14 provides selection between 75 or 120 ohm values. Refer toTable 41 on page 163.

Table 41
Trunk interface impedance switch settings

Description	S8/S14 switch setting			
75 ohm	OFF	OFF	ON	OFF
120 ohm	**OFF**	**OFF**	**OFF**	**ON**

Ring ground switches for NT5D97AA/AB

A set of four DIP switches (S2) selects which Ring lines are connected to the ground. Refer to Table 48 on page 169.

Table 42
Ring ground switch settings

Switch	Description	S2 switch settingS
1	Trunk 0 Transit	**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 Address select switch for NTBK51AA daughter board for NT5D97AA/AB

In case of an on-board NTBK51AA D-channel daughterboard, a set of four switches (S3) provide the daughterboard address. Refer to Table 50 on page 169.

> ***Note:*** Switch 8 of S3 (S3-8) does not require a switch setting to select between the on-board NTBK51AA D-channel daughterboard and an external DCHI/MSDL. The NT5D97 detects when the on-board NTBK51AA D-channel daughterboard is used.

Table 43
DCH mode and address switch settings

Switch	Description	S3 switch setting
1-4	D-channel daughterboard address	See table
5-8	For future use	OFF

Table 51 on page 170 shows the possible selections of the NTBK51AA D-channel.

Table 44
NTBK51AA daughterboard address select switch settings

Device Address	**Switch Setting**			
0	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 system contains a maximum number of 16 DCHI, MSDL, and DDCH devices. The Device Addresses are equivalent to the MSDL DNUM designations.

Note 2: Device address 0 is commonly assigned to the System TTYD Monitor.

NT5D97AD DIP switch settings

The NT5D97 DDP2 card is equipped with 6x2 sets of DIP switches for trunk parameters settings for port 0 and port 1 respectively. Additionally, the DDP2 card is equipped with one set of four DIP switches for the Ring Ground setting. The NT5D97AA/AB has one set of eight DIP switches and NT5D97AD has two sets of ten DIP switches for the D-channel Handler parameters setting.

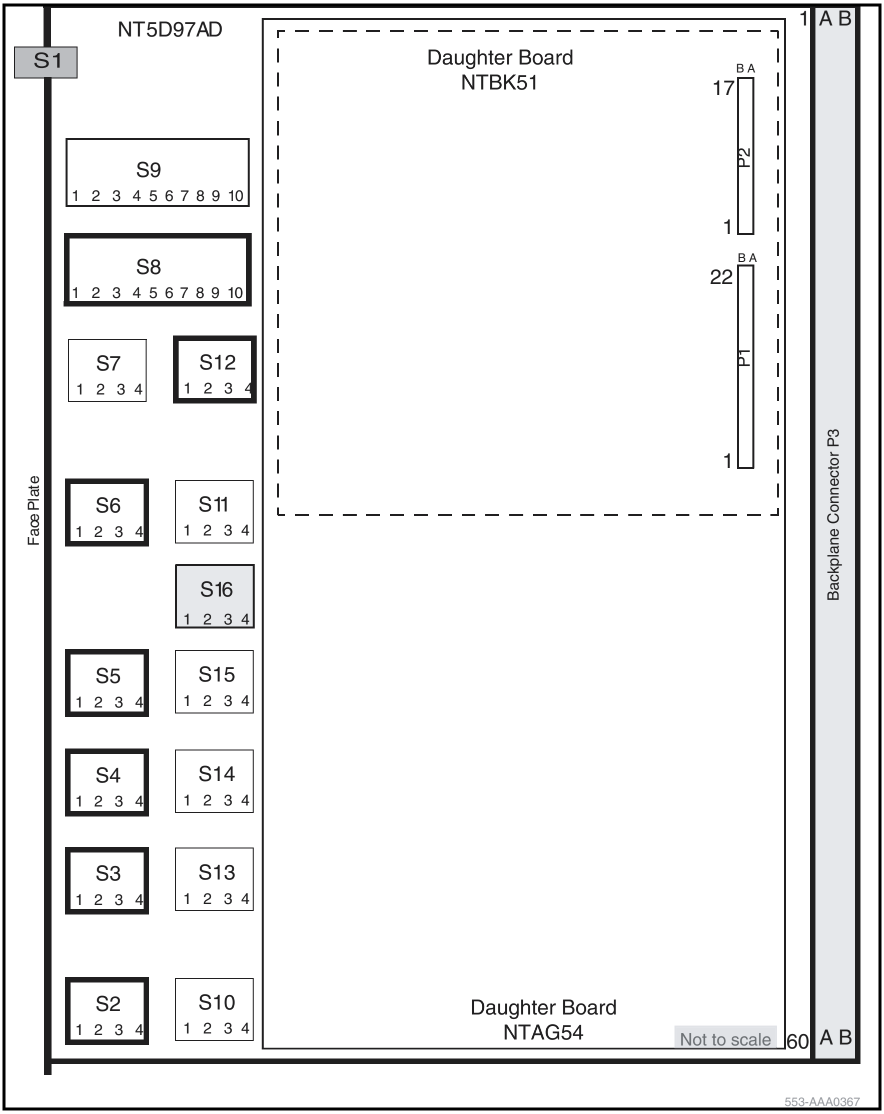
The DIP switches are used for the setting of default values of certain parameters. Firmware reads the general purpose switches, which sets the default values accordingly.

Table 45
DIP switch settings for NT5D97AD

<table>
<tr><th></th><th>Card</th><th>Trunks 0 and 1</th><th>Port 0</th><th>Port 1</th><th>Trunk 0</th><th>Trunk 1</th></tr>
<tr><td>ENB/DSB
mounted on the face plate</td><td>S1</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Ring Ground</td><td></td><td>S16</td><td></td><td></td><td></td><td></td></tr>
<tr><td>DPNSS</td><td></td><td></td><td>S8</td><td>S9</td><td></td><td></td></tr>
<tr><td>MSDL</td><td></td><td></td><td colspan="2">S9</td><td></td><td></td></tr>
<tr><td>TX Mode</td><td></td><td></td><td></td><td></td><td>S2</td><td>S10</td></tr>
<tr><td rowspan="3">LBO Setting</td><td></td><td></td><td></td><td></td><td>S3</td><td>S13</td></tr>
<tr><td></td><td></td><td></td><td></td><td>S4</td><td>S14</td></tr>
<tr><td></td><td></td><td></td><td></td><td>S5</td><td>S15</td></tr>
<tr><td>Receiver Interface</td><td></td><td></td><td></td><td></td><td>S6</td><td>S11</td></tr>
<tr><td>General Purpose</td><td></td><td></td><td></td><td></td><td>S12</td><td>S7</td></tr>
</table>

Refer to DIP switch locations in Figure 56 on page 167.

Figure 56
Dip switches locations for NT5D97AD



The following parameters are set by DIP switches. The boldface font shows the factory set-up.

Trunk interface switches for NT5D97AD

Trunk 0 switches

Switch **S12** gives the MPU information about its environment as shown in Table 46.

Table 46
General purpose switches for NT5D97AD

Switch	Description	S9/S15 Switch Setting
S12_1	Impedance level	**OFF - 120 ohm** ON - 75 ohm
S12_2	Spare	For future use
S12_3	Spare	For future use
S12_4	Unit mode	**OFF - Unit operates in the DTI2 mode** ON - Unit operates in the PRI2 mode

Switch **S2** selects the Transmission mode as shown in Table 47.

Table 47
TX mode switches for NT5D97AD

TX mode	S2
E1	**OFF**
Not used	ON

Switch **S3**, **S4**, and **S5** select LBO function as is Table 48.

Table 48
LBO switches for NT5D97AD

LBO setting	S3	S4	S5
0dB	**OFF**	**OFF**	**OFF**
7.5dB	ON	ON	OFF
15dB	ON	OFF	ON

Switch **S6** selects the Receiver interface as in Table 49.

Table 49
Receiver interface switches for NT5D97AD

Impedance	S6-1	S6-2	S6-3	S6-4
75 ohm	OFF	OFF	ON	OFF
120 ohm	**OFF**	**OFF**	**OFF**	**ON**

Trunk 1 switches for NT5D97AD

Table 50
Trunk 1 switches

Switch	Function
S7	**General Purpose**...See Table 46 on page 168
S10	**TX Mode**...See Table 47 on page 168
S13, S14 & S15	**LBO**...See Table 48 on page 169
S11	**RX Impedance**...See Table 49 on page 169

Ring ground switches for NT5D97AD

Switch **S16** selects which ring lines connect to ground. When set to ON, the ring line is grounded as shown in Table 51.

Table 51
Ring ground switch for NT5D97AD

Switch	Line
S16_1	Trunk 0 Transmit
S16_2	Trunk 0 Receive
S16_3	Trunk 1 Transmit
S16_4	Trunk 1 Receive

DCH Address select switch for NTBK51AA daughter board for NT5D97AD

Switch **S9** selects the NTBK51AA DCH daughterboard address.

Switch **S8** is not used when the NTBK51AA daughterboard is used. S8_1-10 can be set to OFF position as in Table 52.

Table 52
NTBK51AA DCH switches for NT5D97AD

Switch number	Function
S9_1-4	DCH daughter card address
S9_5-8	Set to OFF
S9_9	Set to ON (NTBK51AA Mode)
S9_10	Set to ON (NTBK51AA Mode)

MSDL external card

Table 53 lists the switch numbers assigned for future use on the MSDL external card.

Table 53
Switch settings for MSDL external card

Switch number	Function
S9_1-10	For future use
S8_1-10	For future use

Use Table 54 to set the card address.

Table 54
Switch setting for MSDL external card (Part 1 of 2)

	Switch Setting			
DNUM (LD 17)	**1**	**2**	**3**	**4**
0	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

Table 54
Switch setting for MSDL external card (Part 2 of 2)

	Switch Setting			
DNUM (LD 17)	**1**	**2**	**3**	**4**
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

Install the NT5D97 DDP2

Use Procedure 14 to install the NT5D97 on Large 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 14
Install the NT5D97 on Large Systems

1 Determine the cabinet and shelf location where the NT5D97 is to be installed. The NT5D97 can be installed in any card slot in the Network bus.

2 Unpack and inspect the NT5D97and cables.

3 If a DDCH is installed, refer to the section “NTBK51 DDCH installation and removal” on page 117.

4 Set the option switches on the NT5D97 card before installation. Refer to “NT5D97AA/AB DIP switch settings” on page 160.

The ENB/DIS (enable/disable faceplate switch) must be OFF (DIS) when installing the NT5D97, otherwise a system initialize can occur. The ENB/DIS on the NT5D97 corresponds to the faceplate switch on the QPC414 Network card.

5 Install NT5D97 card in the assigned shelf and slot.

6 Set the ENB/DIS faceplate switch to ON.

If the DDCH is installed, the DDCH LED should flash three times.

7 If required, install the I/O adapters in the I/O panel.

8 Run and connect the NT5D97 cables.

CAUTION
Clock Controller cables connecting the Clock Controller and NT5D97 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 the MDF or wall mounted cross-connect terminal.

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

11 If required, install a Network Channel Terminating Equipment (NCTE). or Line Terminating Unit (LTU).

12 Add related office data into switch memory.

13 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.

14 Run the PRI/DTI Verification Test.

15 Run the PRI status check.

End of Procedure

Remove the NT5D97 DDP2

Use Procedure 15 to remove the NT5D97 from Large 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 15
Remove the NT5D97 from Large Systems

1 Determine the cabinet and shelf location of the NT5D97 card to be removed.

2 Disable the Network Loop using LD 60. The command is DISL "loop number."

The associated DCHI might have to be disabled first. The faceplate switch ENB/DIS should not be disabled until both PRI2/DTI2 loops are disabled first.

3 Remove data from memory, if the NT5D97 card is being completely removed, not replaced.

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

5 Tag and disconnect cables from the card.

6 Rearrange Clock Controller cables if required.

> **CAUTION**
> Clock Controller cables connecting the Clock Controller and DDP2 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 Remove the DDP2 card only if both loops are disabled. If the other circuit of a DDP2 card is in use, **DO NOT** remove the card. The Faceplate switch ENB/DIS must be in the OFF (DIS) position before the card is removed, otherwise the system will initialize.

8 Pack and store the NT5D97 card and circuit card.

End of Procedure

Configure the NT5D97 DDP2

After the NT5D97 DDP2 is installed, configure the system using the same procedures as the standard NT8D72BA PRI2.

Consider the following when configuring the NT5D97 DDP2 card:

- The system 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 NT5D97 DDP2 card, and Port 1 of the NTBK51AA can only be defined to work with Loop 1 of the NT5D97. This relationship must be reflected when configuring a new DCH in LD 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 DDP2 loops for the NTBK51AA DDCH, and the other loop for the NT6D11AF, NT5K75AA, and NT5K35AA DCH card or the NT6D80 MSDL.
- When configuring the NT5D97 DDP2 in DTI2 outgoing dial pulse mode, a Digit Outpulsing patch is required.

NT5D12 Dual-port DTI/PRI card installation

Contents

The section contains information on the following topics:

Introduction

This section contains information required to install the NT5D12 1.5 Mb DTI/PRI Dual-port (DDP) card on Large Systems.

For installation and removal procedures for the NTBK51AA Downloadable D-channel daughterboard, refer to the section "NTBK51 DDCH installation and removal" on page 117.

NT5D12 circuit card locations

Each NT5D12 circuit card requires one slot on a shelf. NT5D12 cards can be placed in any card slot in the network bus, subject to the cautionary note below.

Port definitions

Since the NT5D12 card is dual-card, it equips two ports. These ports are defined in the following combinations:

Port 0	Port 1
DTI	DTI
DTI	PRI
PRI	DTI
PRI	PRI
DTI	Not configured
PRI	Not configured
Not configured	PRI
Not configured	DTI

Replacement scenarios 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 the 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 can 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 can be either reconnected to the DDP card, or removed if an onboard NTBK51AA DDCH card is used.

NT5D12 switch settings

The NT5D12 card is equipped with 6x2 sets of DIP switches for trunk parameters settings for port0 and port1 respectively. Additionally, the NT5D12 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. Refer to Table 55'.

Table 55
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. See Table 56.

Table 56
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 a selection between 0, 7.5 or 15 dB values. See Table 57.

Table 57
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 a selection between 75, 100 or 120 Ω values. See Table 58.

Table 58
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 the ground. See Table 59.

Table 59
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 the case of an on-board NTBK51AA D-channel daughterboard, four of the switches provide the daughterboard address. See Table 60.

Table 60
DCH mode and address select switch settings

Switch	Description	S3 Switch Setting
1-4	D-channel daughterboard Address	See Table 61
5-7	For future use.	OFF
8	External DCH or Onboard DDCH	**OFF - MSDL or DCHI card** ON - Onboard DDCH daughterboard

Table 61
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.

Note 1: The Device Addresses are equivalent to the MSDL DNUM designations.

Note 2: Device address 0 is commonly assigned to the System Monitor.

Figure 57
Switch functional areas on the NT5D12

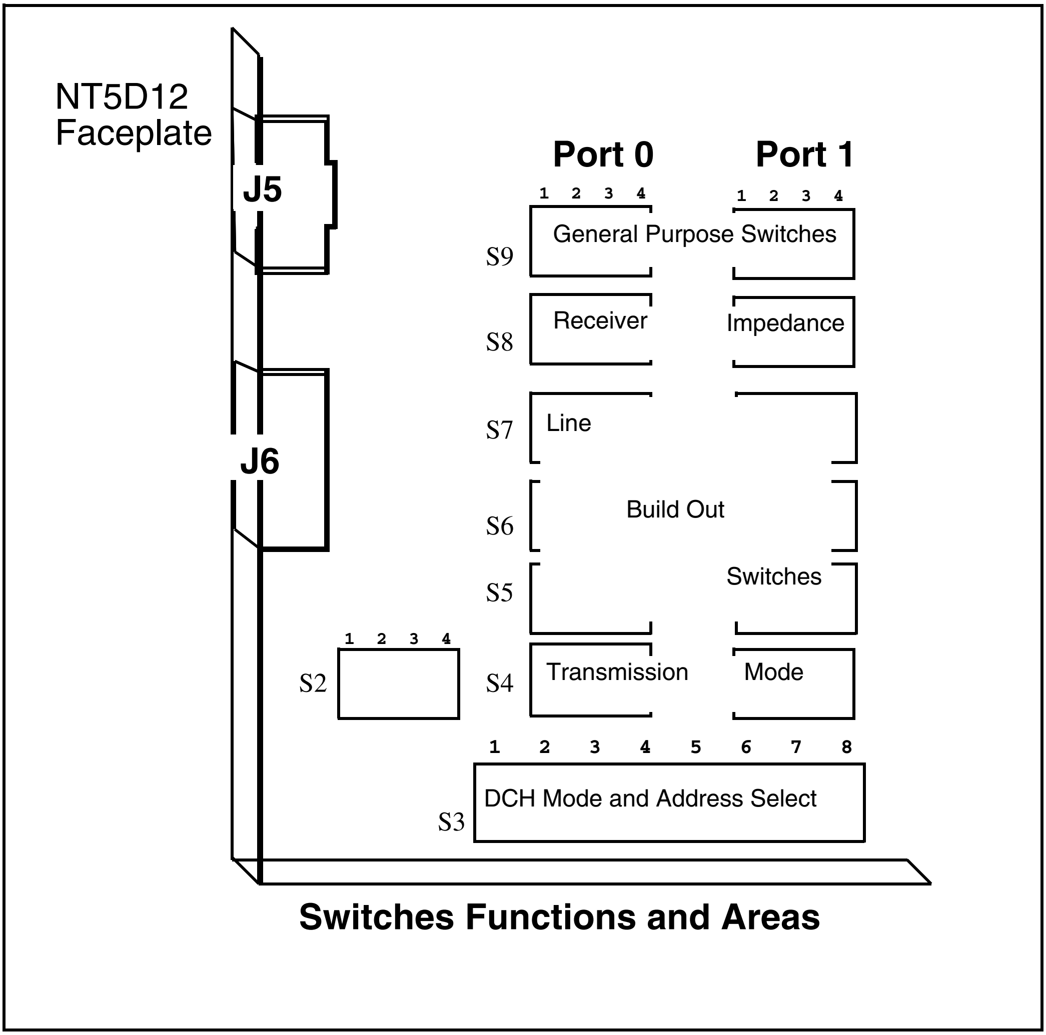
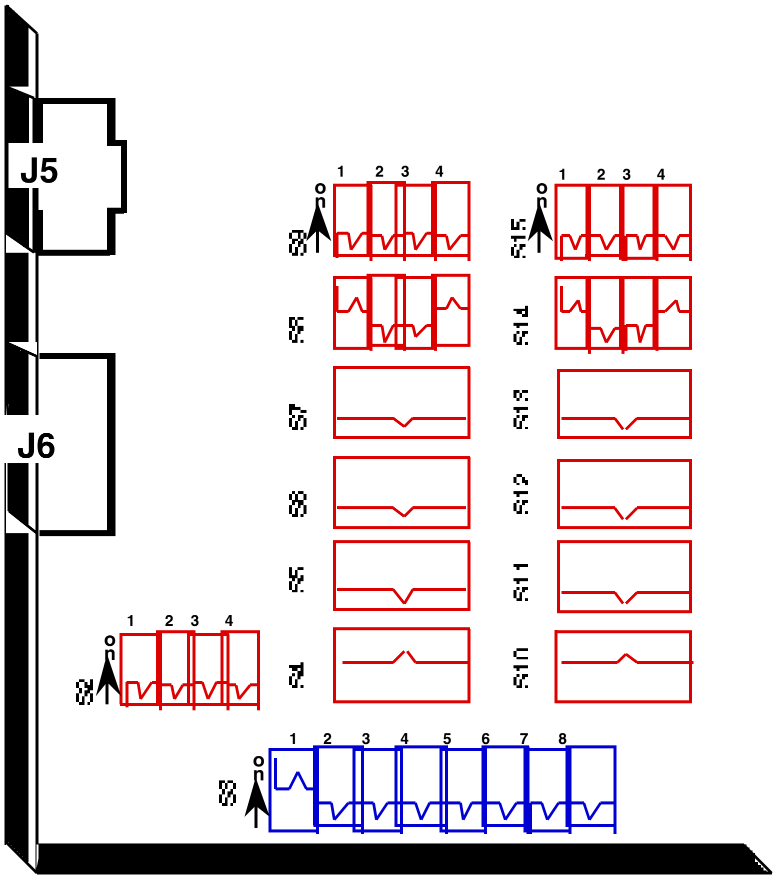


Figure 58
NT5D12 switch default settings



Switch Default Setting

Install the NT5D12 DDP

Use Procedure 16 to install the NT5D12 on Large 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 16
Install the NT5D12 on Large Systems

1 Determine the cabinet and shelf location where the NT5D12 card is to be installed. The NT5D12 can be installed in any card slot in the Network bus, subject to the cautionary note below.

> **CAUTION**
> Some installed-based systems can have a Bus Terminating Unit (BTU) already installed. This can interfere with a selected NT5D12 card location. In such cases, the NT5D12 should be installed in an alternate network bus card slot location.

2 Unpack and inspect circuit cards and cables.

3 If a DDCH is to be installed, refer to "NTBK51 DDCH installation and removal" on page 117.

4 Set the option switches on the NT5D12 circuit card before installation. Refer to "NTBK51 DDCH installation and removal" on page 117.

S1 (faceplate switch) must be OFF (DIS) when installing the NT5D12. S1 on the NT5D12 corresponds to the faceplate switch on the QPC414 Network card.

5 Install the NT5D12 circuit card in the assigned shelf and slot.

6 Add related office administration data into the system memory.

7 If required, install the I/O adapters in the I/O panel.

8 Run and connect the NT5D12 cables.

> **CAUTION**
> Clock Controller cables connecting the Clock Controller and NT5D12 card must **NOT** be routed through the center of the cabinet past the power harness. Instead, route them around the outside of the equipment shelves.

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

10 If required, designate connecting blocks at the 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.

14 Run PRI status check.

End of Procedure

Remove the NT5D12 DDP

Use Procedure 17 to remove the NT5D12 from Large Systems.

> **CAUTION**
> A static discharge bracelet must be worn before handling circuit cards. Failure to wear the bracelet can result in damage to the circuit cards.

Procedure 17
Remove the NT5D12 DDP

1 Determine the cabinet and shelf location of the NT5D12 card to be removed.

2 Disable Network Loop using LD 60. The command is DISL “loop number.”

The associated DCHI might have to be disabled first. The faceplate switch S1 should not be disabled until both PRI loops are disabled first.

3 Remove data from memory, if the NT5D12 card is being completely removed, not replaced.

4 Remove cross connections at the 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 NT5D12 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 Determine if the other circuit of a NT5D12 card is in use.**DO NOT** remove the card if in use.

8 Remove the NT5D12 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 NT5D12 card and circuit card.

End of Procedure

Configure the NT5D12 DDP

After the NT5D12 DDP has been installed, it can be configured using the same procedures as for the standard QPC720 PRI card.

Consider the following when configuring the NT5D12 DDP card:

- The system 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 LD 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 NT5D12 loops for the NTBK51AA DDCH, and the other loop for the QPC757 DCHI or the NT6D80 MSDL.

Clock Controller description and installation

Contents

The section contains information on the following topics:

Introduction

This chapter introduces the NTRB53 Clock Controller, and provides procedures on how to install this clock controller on Large Systems.

The NTRB53 Clock Controller replaces the QPC471H and QPC775F in new systems. QPC471H and QPC775F Clock Controllers continue to be supported.

> ***Note 1:*** The NTRB53 Clock Controller cannot be combined with a QPC775 or a QPC471 card in one system
>
> The illustrations used in the description section depict a Small System. However, the system can also be representative of a Large System.

Description

This section provides an overview on the use of clock controllers. For Large Systems, the following clock controllers are supported:

- NTRB53
- QPC471
- QPC775

> ***Note:*** Clock controllers cannot be mixed in one system.

The NTRB53 Clock Controller is available for all markets. The QPC471 Clock Controller is available for U.S. markets. 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.

The QPC775E Clock Controller card is available for only Canadian and International markets.

Need for synchronization

Digital trunking requires synchronized clocking so that a shift in one clock source will result in an equivalent shift of the same size and direction in all parts of the network.

When digital signals are being transported over a communication link, the receiving end must operate at the same frequency (data rate) as the originating end to prevent loss of information. This is referred to as link synchronization. If both ends of a communication link are not in synchronization, data bit slips occur and therefore a loss of data results. In general, accurate timing is very important, but more importantly synchronized timing is a must for reliable data transfer.

When only two switches are interconnected, synchronization can be achieved by operating the two systems in a master/slave mode whereby one system derives its timing from the other. However, in a network of digital systems, slips can be better prevented by forcing all digital systems to use a common reference clock (see Figure 59 on page 197).

Supported Clock Controllers

For Large Systems, the following clock controllers are supported:

- NTRB53
- QPC471
- QPC775

NTRB53 Clock Controller

The NTRB53 Clock Controller is a replacement for the QPC471 and QPC775 Clock Controllers. The NTRB53 clock controller retains existing functionality.

Software configuration of the clock remains unchanged. A PSDL object allows field upgrades of the clock's firmware. Overlay changes allow for force download and status checking. Support for the IDC command and hardware inventory are also included.

System Initialization

During system initialization, the system software will verify if the clock controllers equipped in the system are the downloadable clock controllers (NTRB53) or not. If the clock controllers are identified as the downloadable clock controller cards, then both downloadable clock controller cards will be checked for the software version number they are running with. This is compared with the version number of the PSDL file stored in the system software database.

If there is a mismatch between the two version numbers and the system database has the higher version number, the card will be put in the PSDL downloading tree. Once the entry is added in the PSDL tree, the preprocess step is done. The next step is for the system to initiate the downloading in the background, using the PSDL tree. As soon as the download complete message is received from the card, the CPU sends a message to reset the clock controller card so that it boots with the new software. Once a self-test is complete the core sends an enable base message to enable the card.

Maintenance Overlays

Downloading can be initiated from LD 60 for the inactive clock controller card as part of the enabling sequence of the card. A download can be forced by specifying the optional parameter FDL (Force Download) when enabling the card. At the prompt, enter:

ENL CC x FDL	Enable Clock in side x with the force download option

If the optional parameter is not specified, then downloading is conditional. This means that the version number of the loadware on the clock controller card will be checked against the version number stored on the system disk. If a mismatch is found and the version number in the system software database is higher, then downloading will be initiated for that card. The entry for the card is not added to the PSDL tree at this time. Instead, downloading is initiated on a single card and only that card will be allowed to perform the force download option.

QPC471 and QPC775 Clock Controllers

Clock Controllers QPC471 and QPC775 will continue to function with:

- Succession 1000M Half Group systems
- Succession 1000M Single Group systems
- Succession 1000M Multi Group systems

Note: See "Description" on page 192. for market and application availability information.

Synchronization methods

There are two common methods of operation for maintaining timing coordination between switching systems, Plesiosynchronous and Mesosynchronous.

Plesiosynchronous operation

In a Plesiosynchronous operation, nodal clocks run independently (free run) at the same nominal frequency. There are frequency differences between clocks resulting in frame slips (see "Frame slip" on page 198.) The magnitude of frame slips are directly proportional to the frequency difference. Slips are inevitable but can be minimized by using very stable clocks and elastic stores or buffers. These buffers are capable of absorbing a certain number of data bits to compensate for slight variances in clock frequencies.

Mesosynchronous operation

In a Mesosynchronous operation, nodal clocks are continuously and automatically locked to an external reference clock. With this method, frame slips can be eliminated if elastic stores are large enough to compensate for transmission variances. Mesosynchronous operation is virtually slip free.

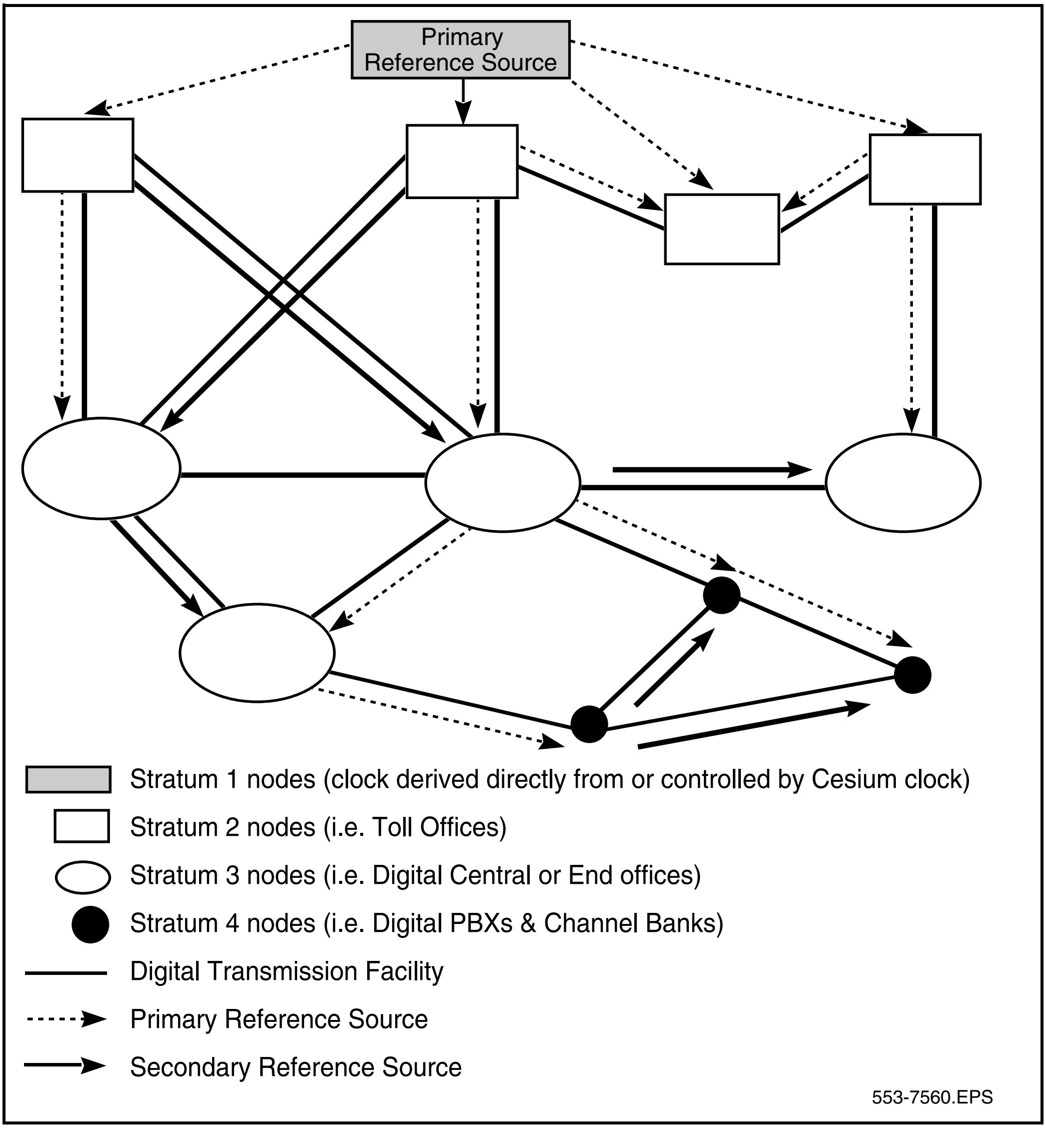
Whenever possible the system uses the Mesosynchronous mode of operation by using the clock controller circuit cards to lock onto an external reference source (such as the Central Office, another PBX, and so on). This statement is true unless the system is used as a Master in an independent/private network (no digital links to a higher Node Category).

In an isolated private network, the clock controller can operate in free run mode and act as a master clock to be tracked by other PBX systems in the private network.

Hierarchical synchronization

Figure 59 on page 197 provides a general view of the Digital Network Clock Synchronization including the four stratum level Node Categories. Stratum 1 being the most accurate and Stratum 4 being the least accurate. System clocking meets Node Category E Stratum 4 requirements. Also shown are ways of providing a Secondary Clock Source while preventing timing loops.

Figure 59
Hierarchical Synchronization



Stratum levels

In a digital network, nodes are synchronized using a priority master/slave method. Digital nodes are ranked in Stratum levels 1 to 5. Each node is synchronized to the highest ranking node in its neighborhood with which it has a direct link. Refer to Table 62.

Table 62
Node categories and stratum levels

	Stratum 2	Stratum 3	Stratum 4
Accuracy	+/- 1.6 * 10^{-8} Hz	+/- 4.6 * 10^{-6} Hz	+/- 3.2 * 10^{-5} Hz
Holdover	1 * 10^{-10} per day	<= 255 frame slips in 1st 24 hours	Not Required
Hardware Duplication	Required	Required (Note 1)	Not Required
MTIE During Rearrangement	MTIE <= 1 usec Phase Change Slope: <= 81 ns in any 1.326 msec	MTIE <= 1 usec Phase Change Slope: <= 81 ns in any 1.326 msec	No Requirement (Note 2)
Pull-in Range	3.2 * 10^{-8} Hz	9.2 * 10^{-6} Hz	6.4 * 10^{-5} Hz
Dedicated Timing Required	Required	Required	Not required

Note 1: Non-duplicated clock hardware that meets all other stratum 3 requirements is referred to as stratum 3ND.

Note 2: Stratum 4 clock hardware that meets MTIE requirements during rearrangements is referred to as 4E.

Frame slip

Digital signals must have accurate clock synchronization for data to be interleaved into or extracted from the appropriate timeslot during multiplexing and demultiplexing operations. A Frame Slip is defined (for 2 Mbyte links) as the repetition of, or deletion of the 256 data bits of a CEPT frame due to a sufficiently large discrepancy in the read and write rates at the buffer (clocks are not operating at exactly the same speed).

When data bits are written into (added to) a buffer at a slightly *higher* rate than that at which they are being read (emptied), sooner or later the buffer overflows This is a slip-frame deletion.

In the opposite situation, when data bits are written (added) into a buffer at slightly *lower* rate than that at which they are being read (emptied), eventually the buffer runs dry or underflows. This is also a slip-frame repetition.

A 1.5 Mbyte PRI contains a buffer large enough to hold about 2 full DS-1 frames (193 x 2 = 386). A 2 Mbyte PRI contains a buffer large enough to contain 2 full frames (256 x 2 = 512 bits). The buffer is normally kept half full (1 frame).

Slippage has impact on the data being transferred, as is shown in Table 63. All of the degradations shown in the table can be controlled or avoided with proper clock synchronization.

Table 63
Performance impact of one slip on service type

Service	Potential Impact
Encrypted Text	Encryption key must be resent.
Video	Freeze frame for several seconds. Loud pop on audio.
Digital Data	Deletion or repetition of data. Possible misframe.
Facsimile	Deletion of 4 to 8 scan lines. Dropped call.
Voice Band Data	Transmission Errors for 0.01 to 2 s. Dropped call.
Voice	Possible click.

Guidelines

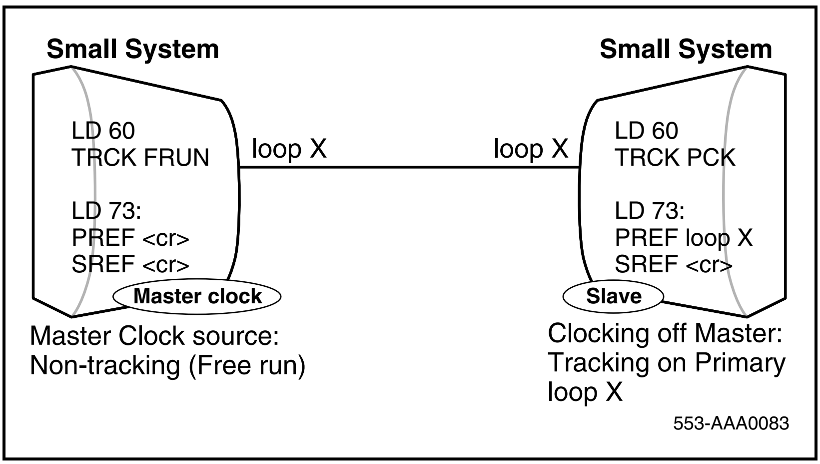
Some key points to keep in mind when designing Network Synchronization:

- Where possible, the Master Clock Source should always be from a Node Category/Stratum with higher clock accuracy, that is, a PBX connected to the Central Office (CO.) The CO is the Master and the PBX is the Slave.

- The source should not be in free-run itself (providing its own clock) unless it is operating in a fully independent network where the source acts as a Master (see “Plesiosynchronous operation” on page 195.)
- When connecting two PBXs together (no CO connections), the most reliable PBX should be the Master. Reliability here refers to Dual CPU/Dual Clock, battery back-up or stratum level of the clock controller.
- Avoid timing loops. A timing loop occurs when a clock using as its reference frequency a signal that it itself traceable to the output of that clock. The formation of such a closed timing loop leads to frequency instability and is not permitted. Timing loops are sometimes unavoidable on the secondary clock reference source.
- Ensure all CO/PBX links used as clock references have a traceable path back to the same stratum 1 clock source.

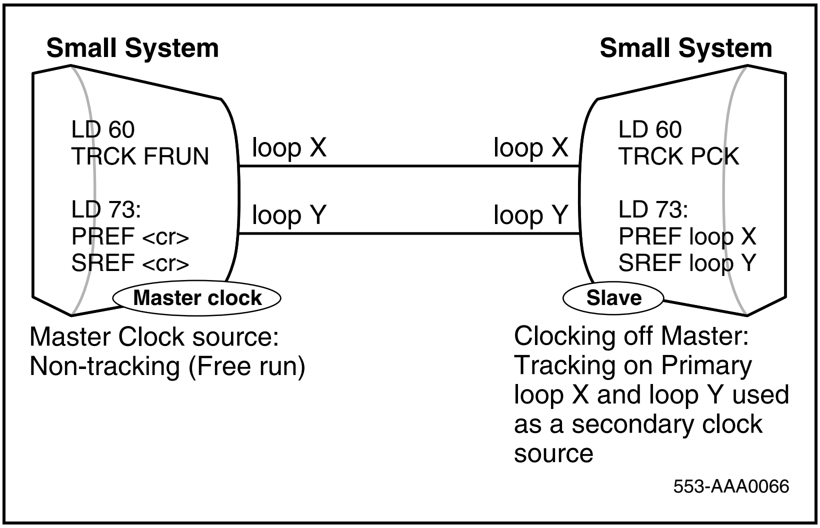
While it is beyond the scope of this discussion to provide detailed Network Synchronization, the following examples illustrate some of the basic concepts to achieve stable clocking.

Figure 60
Example 1, Isolated Private Network



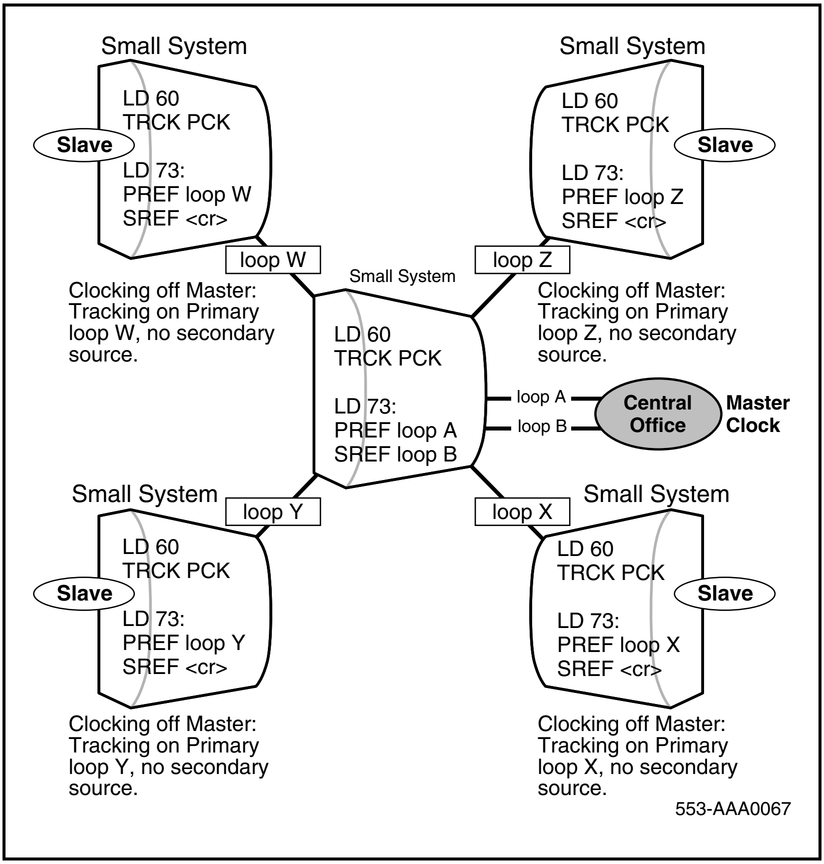
In this example, there is no digital connection to the Central Office.

Figure 61
Example 2, Isolated Private Network with Secondary Reference Clock



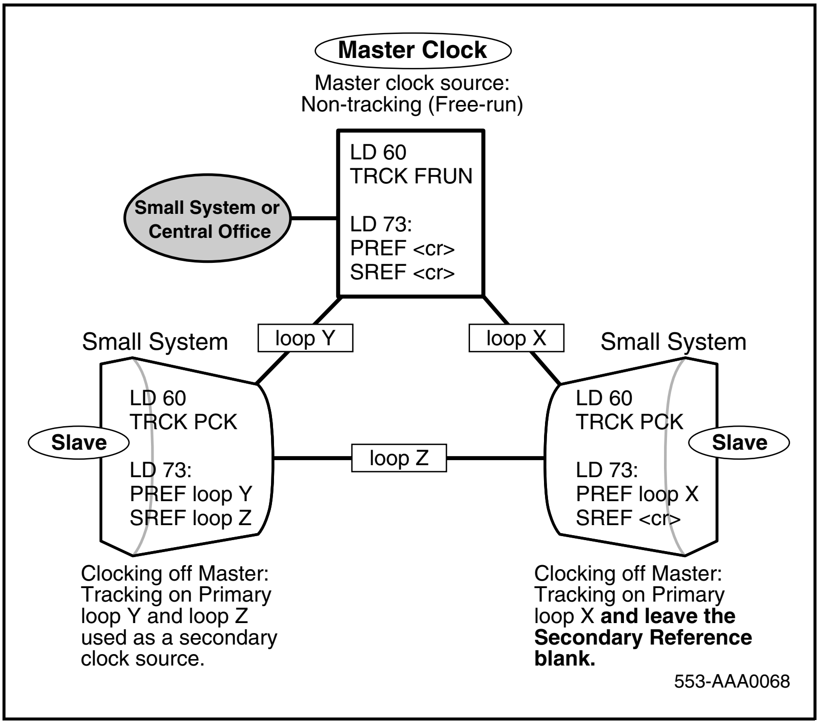
In this example, there is no digital connection to the Central Office. For tie lines between PBXs facilitated by a central office, clocking is derived from the PBX, not the CO. When a second Digital loop is available, it can be used as a Secondary Clock source in case the Primary Source fails.

Figure 62
Example 3, Clocking Hierarchy referenced to a Public Network Master Clock



This is an example of a “STAR” arrangement— one Hub PBX is linked to the Central Office and all other PBXs are connected as slaves. When a second Digital loop from the system which forms the hub of this network becomes available, it can be used as a Secondary Clock Source in case the Primary Source fails.

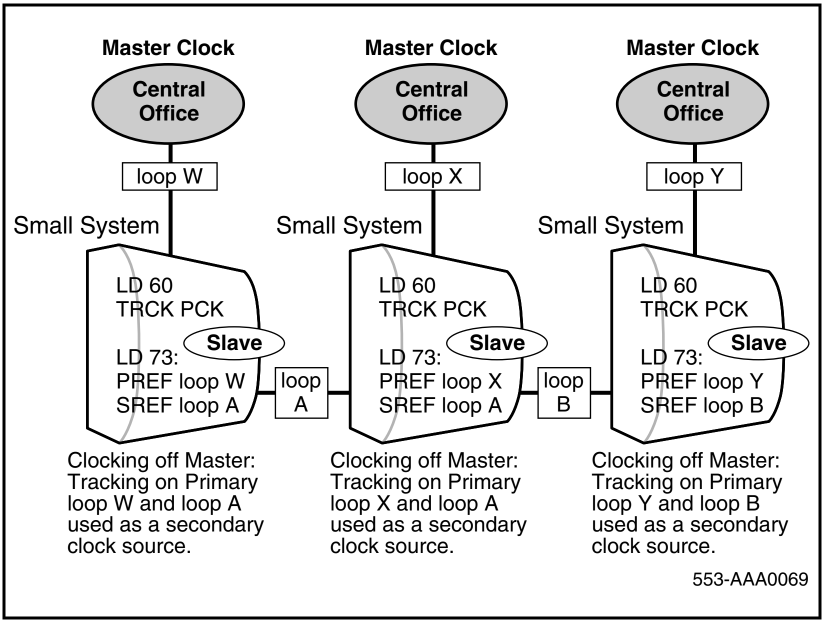
Figure 63
Example 4, Alternate Clocking from the same CO



In this case, a digital connection to the Central Office can exist (i.e. Loops X and Y). When a second Digital loop from the CO or Master M-1 becomes available, it can be used as a Secondary Clock Source in case the Primary Source fails.

To avoid timing loops, in example 4-4 the most reliable slave system should not have a Secondary Clock Source (SREF= <cr>). In this example, this is illustrated by the node which supports loops X and Z.

Figure 64
Example 5, digital connection to the CO

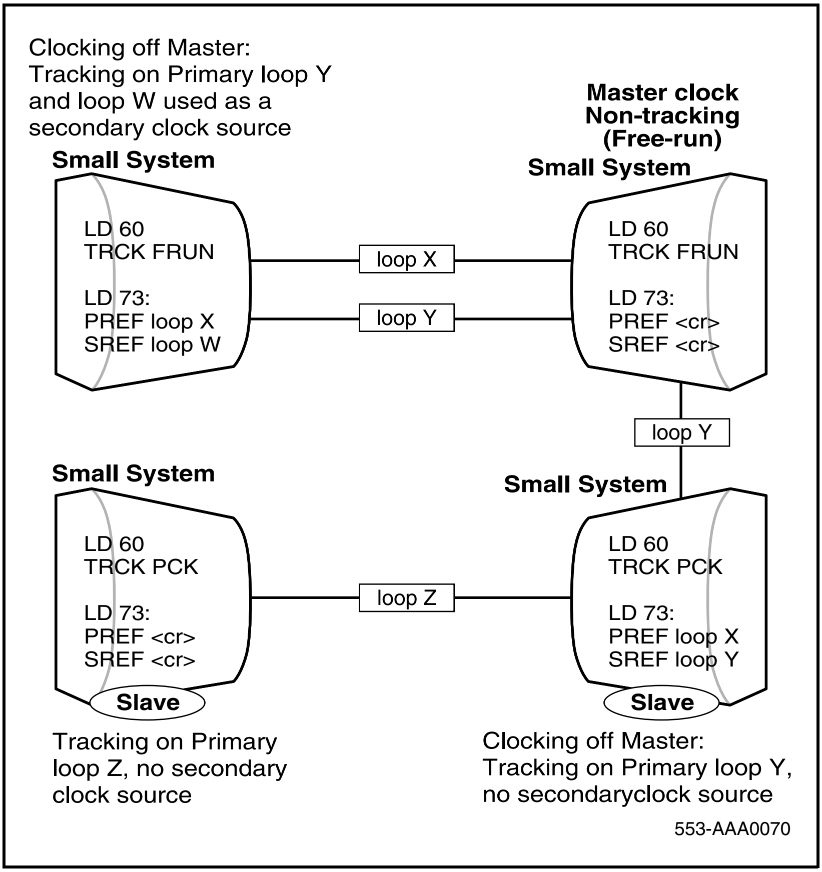


In this example, digital connections to the Central Office do exist. When a second Digital loop from the CO becomes available, it can be used as a Secondary Clock Source in case the Primary Source fails.

Slaves can track on each other as a secondary source since the chances of both links to the Central Offices going down at the same time are minimal.

All Central Offices must have a path back to the same stratum 1 source.

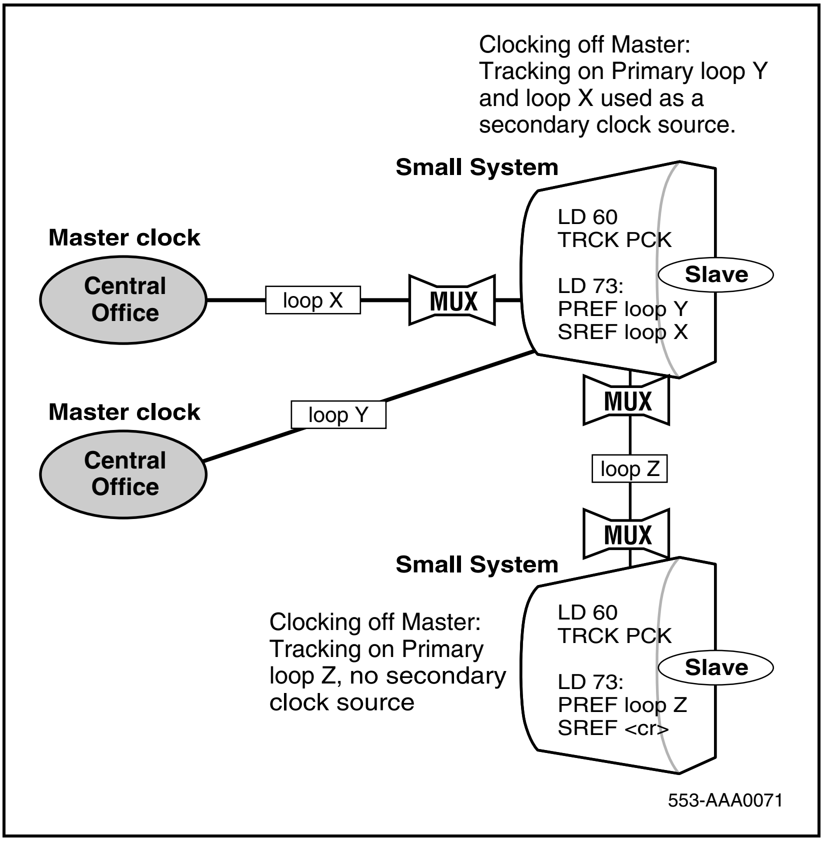
Figure 65
Example 6, Complex Isolated Private Network



Digital connections to the Central Office do not exist in this example. If it does, the PBX connected to it will track off the CO and will in turn be used as a clock source to other nodes.

When a second Digital loop from the Master system becomes available, it can be used as a Secondary Clock Source in case the Primary Source fails.

Figure 66
Example 7, Network Clocking with MUX



In this example, the direct connection to the CO (without a MUX) should be used as a primary clock reference because this is where the least amount of hardware is involved. The MUX must pass the clock and not generate its own clock; in other words, it must be a slave (not Free Run). Synchronized clocking is required.

Modes of operation

There are two modes of operation, tracking mode and free run (non-tracking) mode.

Tracking mode

In tracking mode, the Primary Rate Interface (PRI) or Digital Trunk Interface (DTI) loop supplies an external clock reference to the on-board clock controller. Two PRI or DTI packs can operate in tracking mode, with one defined as the primary reference source for clock synchronization, the other defined as a secondary reference source. The secondary reference acts as a back-up to the primary reference.

Free run (non-tracking) mode

The clock synchronization for a PRI loop can operate in free-run mode if:

- 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 a local alarm state

Small System Clock Controller daughterboard

The Small System and Succession 1000 supports a single on-board clock controller daughterboard, the NTAK20, located on either:

- the NTRB21 1.5 Mbyte DTI/PRI card
- the NTAK09 1.5 DTI/PRI card
- the NTAK10 2 Mbyte DTI card
- the NTAK79 2 Mbyte PRI card
- the NTBK50 2 Mbyte PRI card

The clock controller circuitry synchronizes to an external reference clock and generates and distributes the clock to the system. This enables the system to function either as a slave to an external clock or as a clocking master.

> ***Note:*** When configuring ISL over analog trunks, clock controllers are not required.

Installation procedures

This section provides procedures on how to install a clock controller on Large Systems.

CAUTION
Do not deviate from the procedures described in this section. Call processing can stop if procedural steps are not followed properly.

Determine slots and shelves

Table 64 shows the systems, the shelves and available slots.

Table 64
Clock Controller shelves and slots

System	Shelf	Slot(s)
Half Group, Single Group	NT6D39 CPU/NET	9
Multi Group	NTDA35 Network Module	13

Set switches

Before installing a clock controller, set the switches as shown in Table 65, Table 66, and Table 67. Table 65 on page 209 displays the settings for different vintages of the QPC471. Table 66 on page 209 shows the settings for the QPC775. Table 67 on page 210 shows settings for the NTRB53.

Table 65
Clock Controller switch settings for QPC471 vintage H

System	SW1				SW2				SW4			
	1	2	3	4	1	2	3	4	1	2	3	4
Half Group, Single Group	on	on	on	on	off	off	off	off	off	on	*	*
Option 81	off	off	off	off	off	off	off	off	off	on	*	*
Multi Group (with the exception of Option 81)	on	off	off	off	off	off	off	off	**	on	*	*
Multi Group with Fiber Network	on	off	off	off	off	off	off	off	**	on	*	*
					*Cable length between the J3 faceplate connectors:							
					0–4.3 m (0–14 ft)						off	off
					4.6–6.1 m (15–20 ft)						off	on
					6.4–10.1 m (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, determine the total cable length between the J3 connectors (no single cable can exceed 25 ft.) and set these two switch positions for this cable length, as shown above. The maximum total (combined) length is 50 ft. Set the switches on both cards to the same settings.

** Set to ON for clock controller 0. Set to OFF for clock controller 1.

Note: FNF based-systems the total clock path length is equal to the length of the NTRC49 cable used to connect between the two clock controller cards.

Table 66
Clock Controller switch settings for QPC775

System	SW2	SW3	SW4
Half Group, Single Group	ON	OFF	ON
Multi Group	OFF	OFF	ON

Table 67
Clock Controller switch settings for NTRB53

Multigroup/ Single group	Machine Type # 1	Faceplate Cable Length (CC to CC)			Side Number	Machine Type #2
1	2	3	4		5	6
Multigroup = Off Single group = On	61, 51C, 61C 71, 81, 81C = On	Off	Off	0-14 ft	Side 0 = On Side 1 = Off	81 = Off 51, 51C 61, 61C, 81C = On
		Off	On	15-20 ft		
		On	Off	21-33 ft		
		On	On	34-50 ft		

Note: Switches 7 and 8 are not used.

Start 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 using LD 60.

All clock controllers begin tracking within approximately 15 minutes.

Clock Controller commands

During the installation procedure you will use some of the clock controller commands available in LD 39 and LD 60. Refer to *Software Input/Output Guides* (553-3001-511).

LD 39 commands with the NTRB53 Clock Controller

Command	Description
DIS SCG x	Disable SCG card x (0 or 1). Not applicable for NTRB53 Clock Controller. Use LD 60 instead.
ENL SCG x	Enable SCG x (0 or 1). Not applicable for NTRB53 Clock Controller. Use LD 60 instead.
SCLK	Switch clock to other SCG. Functions with NTRB53 Clock Controller
STAT SCG x	Print status of SCG x (0 or 1). Prints normal status of NTRB53 (not full status)

Install or replace a Clock Controller on a Half Group and Single Group system

Procedure 18 outlines the steps to install a clock controller on Half Group and Single Group systems.

Procedure 18
Install a clock controller for Half Group and Single Group Systems.

1. Unpack and inspect the circuit card.
2. Determine the cabinet and shelf location. Refer to Table 64 on page 208.
3. Set the clock controller switch. Refer to Table 65 on page 209, Table 66 on page 209, or Table 67 on page 210.
4. Set the ENL/DIS toggle switch to DIS (disable).

5 Replacing a clock controller, 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.

Note: ERR20 messages can 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.

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

b. Disconnect the cables from the old clock controller card and remove the card from the shelf.

6 Adjust the 3PE switches to recognize the clock controller card.

7 Set faceplate ENL/DIS switch to DIS.

8 Install the clock controller in the selected slot.

9 Run and connect cables

a. Connect the primary reference to J2.

b. If available, connect the secondary reference to J1.

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

10 Set the faceplate ENL/DIS switch to ENL.

Note: Verify that the faceplate LED flashes three times to ensure the clock controller self test passed.

11 Enable the clock controller by entering ENL CC x in LD 60.

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

13 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)

14 Issue the status check command, SSCK.

Note: In order for the clock enhancement feature in the clock controller (NTRB53) to be fully functional, the user must issue a manual INI to activate the clock enhancement feature.

End of Procedure

Install or replace a Clock Controller on a Single Group and Multi Group System

Procedure 19 outlines the steps to install a clock controller on Single Group and Multi Group systems.

Procedure 19
Install a Clock Controller on a Single Group and Multi Group System

1 Unpack and inspect the circuit card.

2 Determine the cabinet and shelf location. Refer to Table 64 on page 208.

3 Set the clock controller switch. Refer to Table 65, Table 66, or on page 209.

4 Set the ENL/DIS toggle switch to DIS (disable).

5 If replacing a clock controller, 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.
- Use LD 135 to STAT the CPU and switch if necessary
- Disable the old card using LD 60.

Note 1: Do not disable an active clock or a clock associated with an active CPU.

Note 2: ERR20 messages can 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.

- **a.** Set the old card's faceplate ENL/DIS switch to DIS.
- **b.** Disconnect the cables from the old clock controller card and remove it from the shelf.

6 Install the new clock controller in the selected slot.

7 Run and connect the cables

- **a.** Connect the primary reference to J2.
- **b.** Connect the secondary reference to J, if available.
- **c.** Connect the cable from J3 on each controller card to the junctor group connector.

8 Set the faceplate ENL/DIS switch to ENL.

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

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

11 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)

12 Issue the status check command, SSCK.

13 (Optional) Wait two minutes before activating the newly installed clock controller with the LD 60 SWCK command.

Note: This allows a smooth transition of the clock controller upgrade.

14 Repeat for the second clock controller, if necessary.

End of Procedure

Upgrade to an NTRB53 Clock Controller on a Single Group and Multi Group System

Follow these procedures to replace the existing clock controller with the NTRB53 Clock Controller on Large Systems.

> ***Note:*** The NTRB53 Clock Controller cannot be combined with a QPC775 or a QPC471 card in one system.

Procedure 20
Remove old equipment

1 Ensure the clock controller card being removed for dual core systems is on the inactive core. If you need to switch cores go to LD 135 and enter:

LD 135	
SCPU	Switch cores
****	Exit the overlay

2 Disable the QPC775 or QPC471 Clock Controller card. At the prompt, enter:

LD 60	Load the program
SSCK x	Get status of system clock where x = 0 or 1

Switch clocks if the clock is active at the prompt, enter:

SWCK	Switch system clock from active to standby
SSCK x	Get status of system clock where x = 0 or 1

Ensure the other clock controller is active and in the free run mode. At the prompt, enter:

SSCK x	Get status of system clock where x = 0 or 1
TRCK FRUN	Set clock controller tracking to free run

3 Disable the clock controller card you are removing. At the prompt, enter:

DIS CC x	Disable system clock controller where x = 0 or 1

4 Set the ENL/DIS switch to DIS on the card you are removing.

5 Tag and disconnect the cables to the card you are removing.

6 Unhook the locking devices on the card and pull it out of the card cage.

End of Procedure

Follow these procedures to install new equipment with Clock Controller on Large Systems.

Procedure 21

Installing new equipment

1 Set the ENB/DIS switch to DIS on the replacement card.

2 Set the option switches on the replacement card (NTRB53). Refer to Table 67 on page 210.

3 Insert the replacement card into the vacated slot and hook the locking devices.

4 Connect the reference cables (J1 and J2) to the replacement card.

CAUTION
Clock-to-Clock cable J3 should never be connected between the old clock (QPC471 or QPC775) and the new clock (NTRB53).

5 Set the ENB/DIS switch to ENB on the replacement card.

6 Software enable the card. At the prompt, enter:

LD 60	
ENL CC x	Enable clock controller card, where x = 0 or 1

7 Verify that the card is active. At the prompt, enter:

SSCK x	Get status of system clock where x = 0 or 1
****	Exit the overlay

8 Switch to the core with the new clock. At the prompt, enter:

LD 135	
SCPU	Switch CPU

Note: Wait two minutes before proceeding to the next step.

CAUTION
The following procedure to faceplate disable the active clock controller could impact service.

9 Disable the faceplate of the active clock controller to force the newly installed clock controller to activate.

10 Disconnect the Clock-to-Clock faceplate cable to J3 of the new clock controller card in the active CPU side.

CAUTION
Active calls will experience noise over local and trunk calls

11 Verify that the clock controller is active. At the prompt, enter:

LD 60	
SSCK	Get status of the new system clock, where x = 0 or 1
TRCK PCK	Track primary clock, where x = 0 or 1
RCNT	Resets all alarm counters of all digital cards
****	Exit the overlay

Note: Replacing the clock controller will generate errors on the network equipment. It is recommended that all counters be reset.

12 Replace the remaining QPC775 or QPC471 clock controller card, tag and disconnect the cables to the card you are removing.

13 Unhook the locking devices on the card and pull it out of the card cage.

14 Set the ENB/DIS switch to DIS on the replacement card.

15 Set the option switches on the replacement card (NTRB53). Refer to Table 67 on page 210.

16 Insert the replacement card into the selected slot and hook the locking devices.

17 Connect the reference cables (J1 and J2) and the clock-to-clock cable (J3) to the replacement card.

18 Set the ENB/DIS switch to ENB on the replacement card.

19 Disable the software and enable the card. At the prompt, enter:

LD 60	
DID CC x	Disable clock controller card, where x=0 or 1
ENL CC x	Enable clock controller card, where x=0 or 1

20 Verify that the card is active. At the prompt, enter:

SSCK x	Get status of system clock, where x=0 or 1
****	Exit the overlay

Note: Wait two minutes before proceeding to next step.

21 Activate the new card and verify that it is active. At the prompt enter:

LD60	
SWCK	Switch system clock from active to standby
SSCK x	Get status of system clock, where x = 0 or 1
TRCK PCK	Track primary clock, where x = 0 or 1
RCNT	Reset alarm counters of all digital cards
****	Exit the overlay

22 Set the clock source to the status it was in before the replacement procedure.

23 Verify clock switch-over and tracking. At the prompt, enter:

SWCK	Switch system clock from active to standby
SSCK x	Get status of system clock, where x = 0 or 1
****	Exit the overlay

End of Procedure

ISL installation

Contents

The section contains information on the following topics:

ISL configurations

The ISDN Signaling Link (ISL) is used on PRI/DTI connections. The ISL feature operates in two modes, shared and dedicated.

Shared mode

The DCHI supports ISDN PRI signaling for both PRI and ISL trunks.

Dedicated mode

In this mode, the DCHI supports 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.

DCHI switch settings

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

- RS-232 for 19.2 Kbps and below
- HS (RS-422) for speeds above 19.2 Kbps
- External clock (in LD 17) provided by modem, ADM, or ASIM, otherwise DCHI will be running at 64 Kbps
- DTE device configuration

Figure 67 on page 221 shows the ISL high-speed programming jumper settings for the NT6D11AB, NT6D11AE DCHI, and Figure 68 on page 222 shows the ISL low-speed programming jumper settings for the NT6D11AB, NT6D11AE/AF DCHI.

Figure 67
NT6D11AB, NT6D11AD DCHI with ISL high-speed programming jumper settings

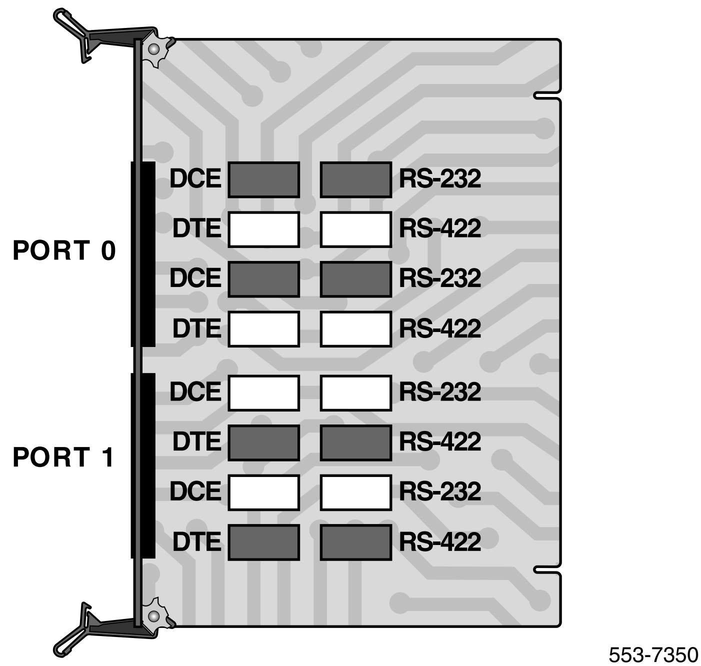
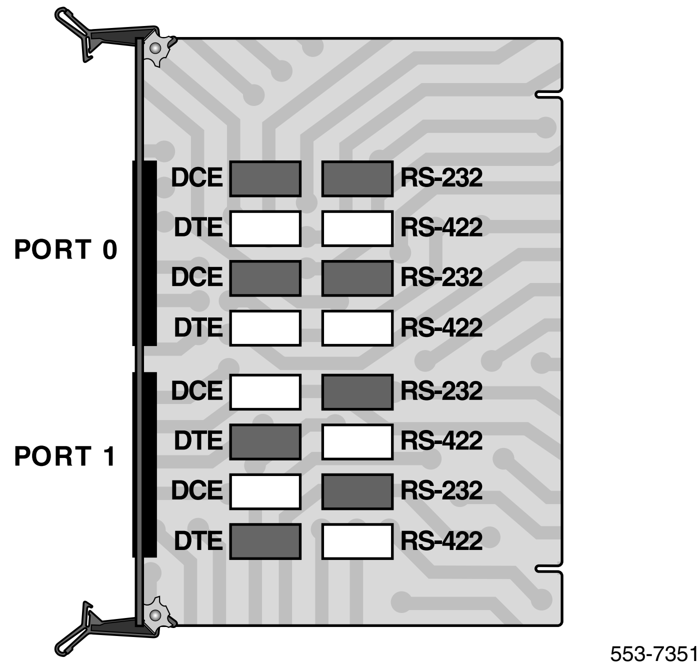


Figure 68
NT6D11AB, NT6D11AD DCHI with ISL low-speed programming jumper settings

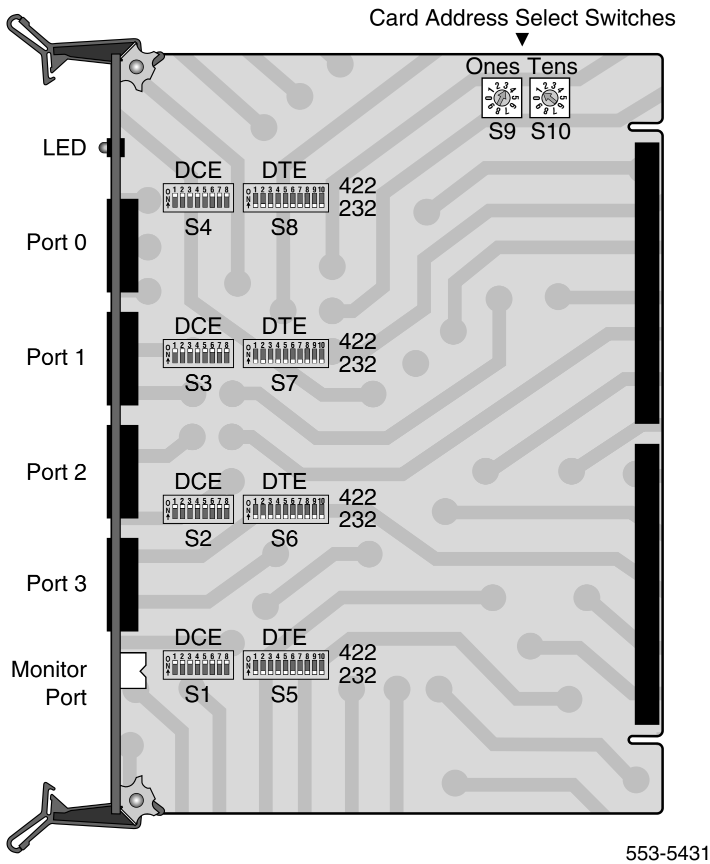


MSDL switch settings

For ISL functions, use the following switch settings.

- DTE for high speed programming;
- RS-232 for 19.2 Kbps and below;
- External clock (in LD17) provided by modem, ADM, or ASIM, HSDM: otherwise, DCH runs at 64 Kbps. Refer to Figure 69 on page 223.

Figure 69
MSDL/ISL settings



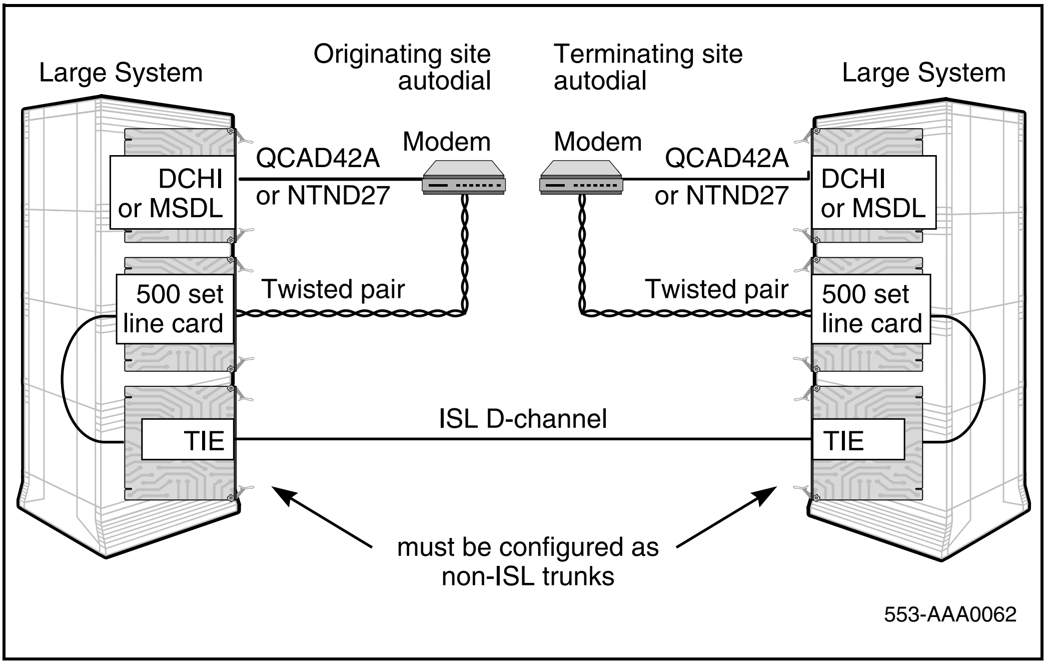
Shared mode

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 70 on page 224.

Shared mode is established through service change in LD17, prompt USR, with the response SHA.

In the shared mode, the DCH can share signaling for no more than 382 (T1) or 480 (E1) trunks, including digital and analog.

Figure 70
ISL in shared mode

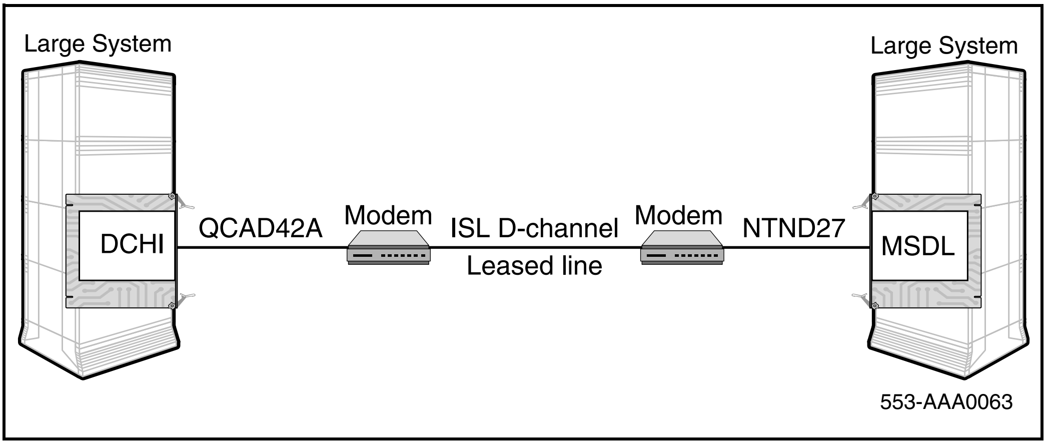


Dedicated mode using leased line

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 71 on page 225. A 2400 baud D-channel can support signaling for approximately 382 (T1) or 480 (E1) trunks without non-call associated messages.

Both modems should be set in the synchronous mode.

Figure 71
ISL dedicated mode, using leased line



Dedicated mode using dial-up modem

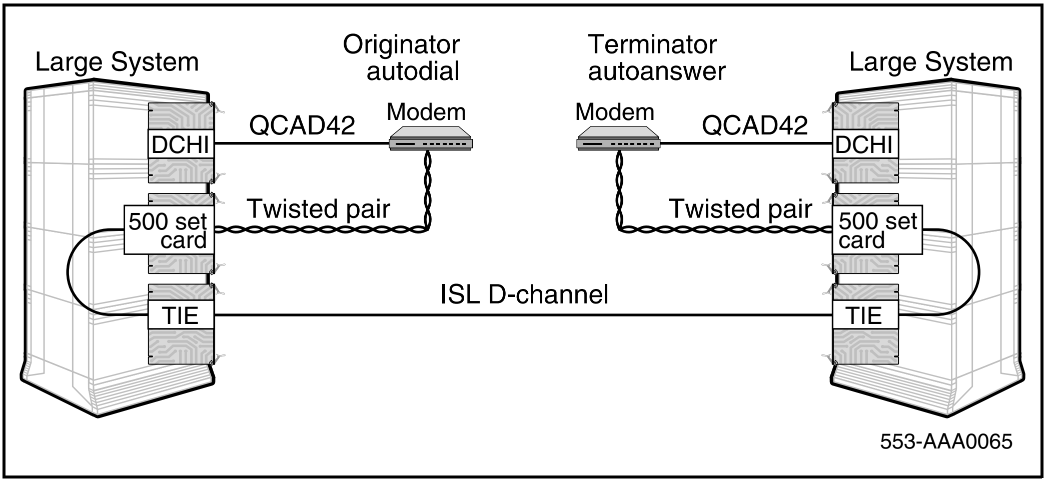
In this configuration, the DCHI or MSDL is connected to a modem which is connected to a 500 set line card. See Figure 73 on page 228. The call is connected to the far end through the analog (500/2500 type set)-to-TIE trunk path.

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 auto-dial DN must be coordinated with personnel at the far end switch.

Install a modem for ISL applications

The modem software and hardware must be installed sequentially. The modem software must be defined before the hardware connection between the modem and the system can be made. Within the software installation, either the auto-dial or the auto-answer software can be set up first. Figure 72 on page 226 shows the hardware configuration between two PBXs and their corresponding modems.

Figure 72
ISL dedicated mode: using dial-up Hayes Smartmodem 2400



Examples of parameters used for actual auto-answer and auto-dial sites are shown in the following tables (note that the Hayes Smartmodem has been used.) Table 68 on page 226 shows the active and stored profiles of the auto-dial site (or the originating modem). Table 69 on page 227 shows the active and stored profiles of the auto-answer site (or the terminating modem). The Hayes Smartmodem User Guide contains explanations of the parameters used in Table 68 and Table 69.

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

Table 68
Active and stored profiles of the autodial or originating modem

Active profile:
B1 E0 L2 M1 Q1 V1 X4 Y0 &C1 &D0 &G0 &J0 &L0 &P0 &Q2 &R0 &S0 &X0 &Y0 S00:000 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002 S07:030 S08:002 S09:006 S10:014 S12:050 S14:ACH S16:00H S18:000 S21:20H S22:76H S23:15H S25:005 S26:001 S27:42H

Table 68
Active and stored profiles of the autodial or originating modem

Stored profile 0:
B1 E0 L2 M1 Q1 V1 X4 Y0 &C1 &D0 &G0 &J0 &L0 &P0 &Q2 &R0 &S0 &X0 S00:000 S14:ACH S18:000 S21:20H S22:76H S23:17H S25:005 S26:001 S27:42H **Stored profile 1:**
B1 E1 L2 M1 Q0 V1 X4 Y0 &C0 &D0 &G0 &J0 &L0 &P0 &Q0 &R0 &S0 &X0 S00:00 S14:AAH S18:000 S21:00H S22:76H S23:17H S25:005 S26:001 S27:40H **Telephone numbers:**
&Z0=ATDT7414011 &Z1= &Z2= &Z3=

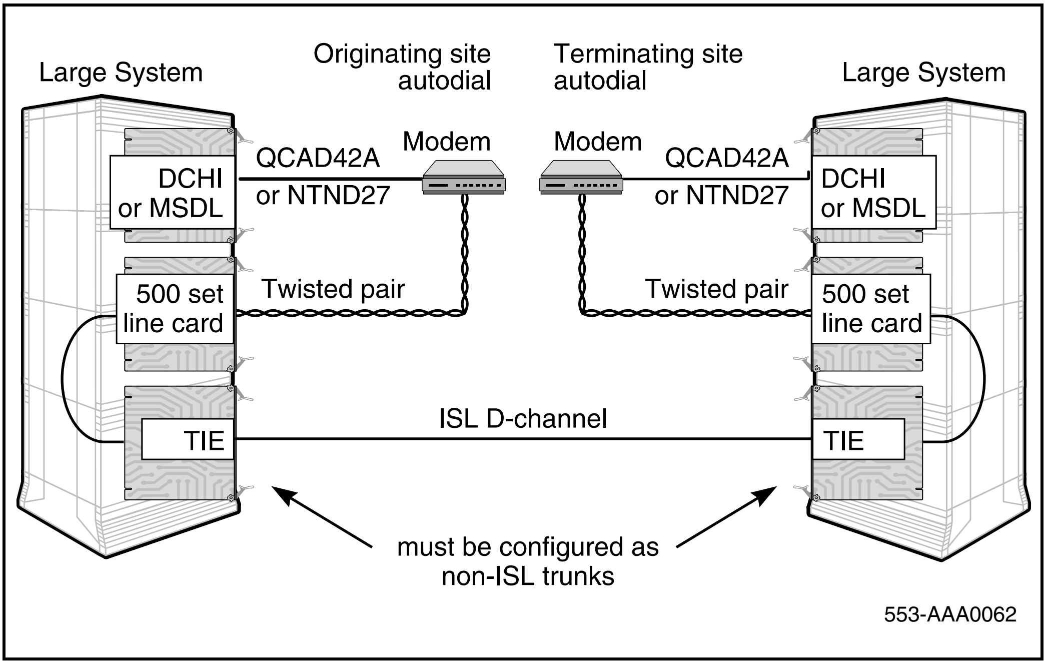
Table 69
Active and stored profiles of the auto answer or terminating modem

Active profile:
B1 E0 L2 M1 Q1 V1 X4 Y0 &C1 &D2 &G0 &J0 &L0 &P0 &Q1 &R0 &S1 &X2 &Y0 S00:001 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002 S07:030 S08:002 S09:006 S10:014 S12:050 S14:ACH S16:00H S18:000 S21:70H S22:76H S23:15H S25:005 S26:001 S27:61H **Stored profile 0:**
B1 E0 L2 M1 Q1 V1 X4 Y0 &C1 &D2 &G0 &J0 &L0 &P0 &Q1 &R0 &S1 &X2 S00:001 S14:ACH S18:000 S21:70H S22:76H S23:17H S25:005 S26:001 S27:61H **Stored profile 1:**
B1 E1 L2 M1 Q0 V1 X4 Y0 &C0 &D0 &G0 &J0 &L0 &P0 &Q0 &R0 &S0 &X0 S00:000 S14:AAH S18:000 S21:00H S22:76H S23:17H S25:005 S26:001 S27:40H

Table 69
Active and stored profiles of the auto answer or terminating modem

Telephone numbers:
&Z0= &Z1= &Z2= &Z3=

Figure 73
ISL dedicated mode, using dial-up Hayes Smartmodem 2400



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 74 on page 230. 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.

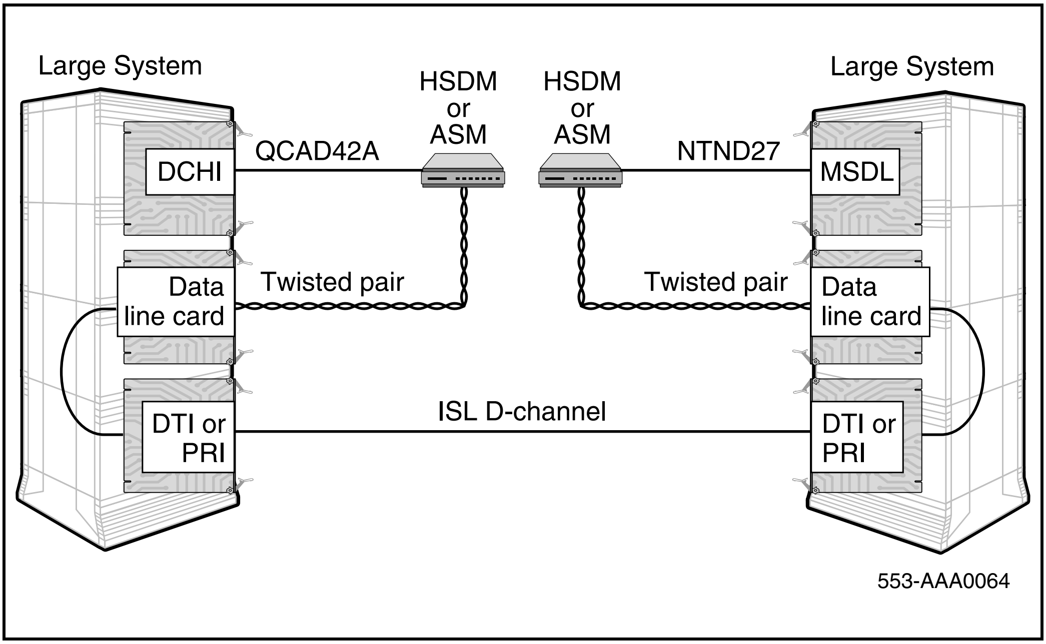
To establish the D-channel in this configuration, set up the HSDM or ASIM at one end in hot line mode. The hot line DN must be coordinated with personnel at the far end, then programmed in LD11. The preprogrammed hot line DN is dialed by the system. If the call cannot be established, the system continues to dial the hot line number continuously until the call is connected.

Set the HSDM or ASIM must be 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 1:*** This configuration is the least reliable due to the lockup problems inherent in Smart Modems from power splices and noisy lines. To increase the reliability on this configuration, a constant power source can be used when powering the modems. Also ensure that the TIE lines meet data grade specifications.

> ***Note 2:*** Nortel Networks takes no responsibility for ISL D-channel outages due to modem lockup.

Figure 74
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.

QMT8 switch settings

If the QMT8 Asynchronous Data Module (ADM) is used, set the switches as follows:

Switch 1:	Switch 3:		Switch 4:	
set to zeros (no VFDN)	1	not used	1	on
	2	not used	2	on (hot line*)
	3	FDX (full duplex)	3	off (DTR-data terminal ready-required)
	4	modem	4	on (synchronous) U5 and U7 must be jumpered
	5	internal clock		
	6	no echo		
	7	auto answer		
	8	off (no loopback)	* Only one side of the interface should be set to originate the hot line.	

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

Use Procedure 22 to install ISL in dedicated mode. Use Procedure 23 to install ISL in shared mode.

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

Install ISL in dedicated mode (digital and analog)

DTI or PRI should already be up and running.

Procedure 22
Install ISL in dedicated mode

1. In LD17, configure ISL for dedicated mode.
   USR = ISLD
   ISLM = Number of trunks handled by this D-channel (1-382)
2. In LD16, configure the Route Data Block to map out the software parameters for these trunks.
3. Install the modem with leased line functionality.
4. In LD14, reassign old trunks to the routes just built in LD16.
5. In LD16, out the old DTI route. A separate Route Data Block should be built for Leased Line, or to accommodate the dialing plan for a dedicated modem.

End of Procedure

Install ISL in shared mode

DTI or PRI should already be up and running.

Procedure 23
Install ISL in shared mode

1 In LD14, remove the PRI trunks.

2 In LD17, configure ISL for dedicated mode.
USR = SHA
ISLM = Number of trunks handled by this D-channel (1-382)

3 In LD16, build a PRI route data block. This is the same route you just removed in step 1.
ISDN = YES

4 In LD16 build another route data block to correspond to the IAS routes.

5 In LD14, assign trunks to the newly configured routes.

End of Procedure

Echo canceller installation

Contents

The section contains information on the following topics:

Introduction

Echo cancellers are required only in cases where satellite transmission is being used. The echo canceller detects the length of the loop, and cancels out transmission reflections (which result in audible echoes of voices on satellite-carried calls).

Echo canceller operating parameters

The operational parameters of the echo canceller must be:

- Data transfer rate: 4800 baud
- System unit number: 1
- Display time-out: active
- Failures before alarm: 3

Echo canceller initialization procedures

Each of the 24 channels on the echo canceller must be initialized as shown here:

- Bypass: OFF
- Off-hook: ON
- Canceller only: OFF
- H reset: OFF
- H hold: OFF

PRI to Echo canceller pin assignments

The echo canceller is controlled by an RS-232 port on the PRI circuit pack. The following tables give the echo canceller pin assignments, operating parameters and initialization procedures.

See Table 70 for PRI-to-Echo canceller pin assignments; refer to Figure 75 for a PRI-to-Echo-canceller cabling schematic.

Table 70
PRI-to-Echo canceller – pin assignments (Part 1 of 2)

Signal	PRI pin	Echo canceller pin	EIA RS-232-C circuit designator
TXD (Transmitted Data)	5	2	BA
RXD (Received Data)	2	3	BB
RTS (Request to Send)	—	4	CC
CTS (Clear to Send)	—	5	CB

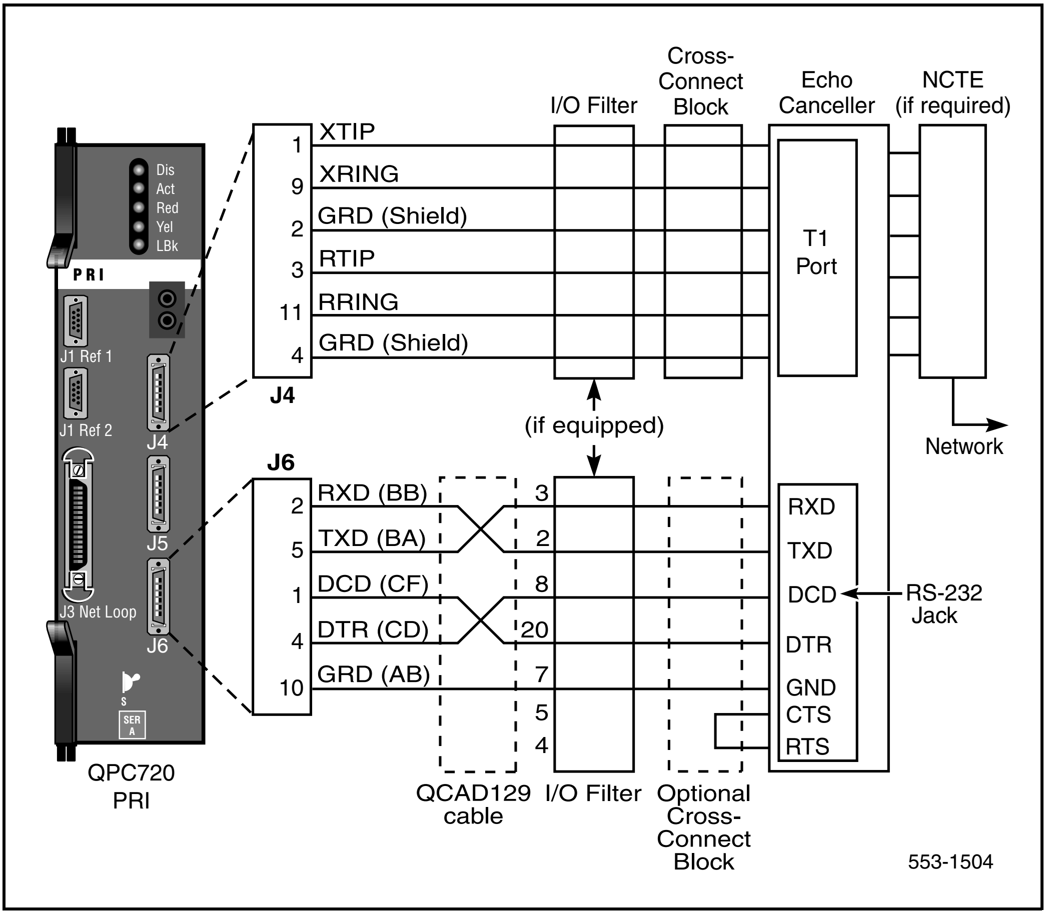
Table 70
PRI-to-Echo canceller – pin assignments (Part 2 of 2)

Common Return (signal ground)	10	7	AB
DCD (received line signal detector)	1	8	CF
DTR (data terminal ready)	4	20	CD

Electromagnetic Interference

The Electromagnetic Interference (EMI) filter assembly for PRI is PO643763. The system 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 system cabinet type.

Figure 75
PRI to echo canceller cabling



1.5 Mb PRI implementation

Contents

This section contains information on the following topics:

Overview

Digital trunks are supported in the Small System cabinet, the IP expansion cabinet, and the Succession Media Gateway chassis.

This chapter provides the following information required to install PRI on a system:

- hardware and software installation
- implementation procedures for basic call service

While either the hardware or software can be installed first, the PRI cannot be enabled and tested until both are completed.

Hardware requirements

Circuit cards

To implement PRI on the system, the hardware shown in Table 71 is required.

Table 71
Required circuit cards

Circuit card	Description
NTRB21	DTI/PRI TMDI card (recommended for Succession 1000).
NTAK09	DTI/PRI circuit card.
NTAK20	Clock-controller daughterboard. Small Systems supports only one active clock controller per system or IP expansion cabinet. *Note:* Every cabinet/Succession Media Gateway that contains a digital trunk must contain a clock controller. Succession 1000 supports only one active clock controller per Succession Media Gateway.
NTAK93	D-channel-handler (DCH) interface daughterboard.
NTBK51BA	Downloadable D-channel daughterboard (DDCH). Connects to the NTAK09 DTI/PRI card.

Cables

The following cables are required for PRI connections:

- PRI to external T1 cable
- NTBK04 carrier cable
- NT8D97 50-foot extension (if needed)

Channel Service Units (CSU)

When connecting the DTI/PRI to the public network, CSUs are required by most operating companies. One CSU is required per PRI. Suitable CSUs which support 64 Kbps clear and Bipolar 8 Zero Substitution (B8ZS) are available from vendors such as Verilink, Digitalink, Kentrox, and Tellabs.

> ***Note:*** Contact your Nortel Networks Sales representative for specific local CSU requirements.

Hardware description

Succession Media Gateway/Succession Media Gateway Expansion

The Succession Media Gateway and Succession Media Gateway Expansion contain physical card slots, numbered 1 to 10. When configuring the Succession 1000 system, the physical card slot numbers must be transposed to logical card slot numbers. For example, to configure a card physically located in slot two of the Succession Media Gateway one, use logical slot 12. To configure a card physically located in slot two of the Succession Media Gateway two, use logical Slot 22.

Table 72 on page 242 maps physical card slot numbers to logical card numbers for the Succession Media Gateway and Succession Media Gateway Expansion and reflects added support for the Succession Media Gateway and Succession Media Gateway Expansion physical card slot 4.

Table 72
Succession Media Gateway and Succession Media Gateway Expansion slot assignments

	Succession Media Gateway/Succession Media Gateway Expansion							
	First		Second		Third		Fourth	
	Physical card slot	Logical card slot	Physical card slot	Logical card slot	Physical card slot	Logical card slot	Physical card slot	Logical card slot
Succession Media Gateway	1	11	1	21	1	31	1	41
	2	12	2	22	2	32	2	42
	3	13	3	23	3	33	3	43
	4	14	4	24	4	34	4	44
	5	*	5	*	5	*	5	*
	6	*	6	*	6	*	6	*
Succession Media Gateway Expansion	7	17	7	27	7	37	7	47
	8	18	8	28	8	38	8	48
	9	19	9	29	9	39	9	49
	10	20	10	30	10	40	10	50
Legend * Not supported.								

NTRB21 TMDI card

The NTRB21 TMDI card provides 1.5 MBit/s Digital Trunk Interface or Primary Rate Interface functionality on the system. The NTRB21 has a built-in, downloadable D-channel.

The NTRB21can be equipped with the NTAK09 DTI/PRI card (with the NTBK51 downloadable D-channel daughterboard) and the NTAK93 DCHI daughterboard.

> ***Note 3:*** A TMDI D-channel programmed as a backup D-channel against a non-TMDI primary D-channel is not supported. Backup D-channels are supported only when programmed against TMDI primary D-channels.

Figure 76 on page 244 shows a faceplate of the NTRB21 TMDI card.

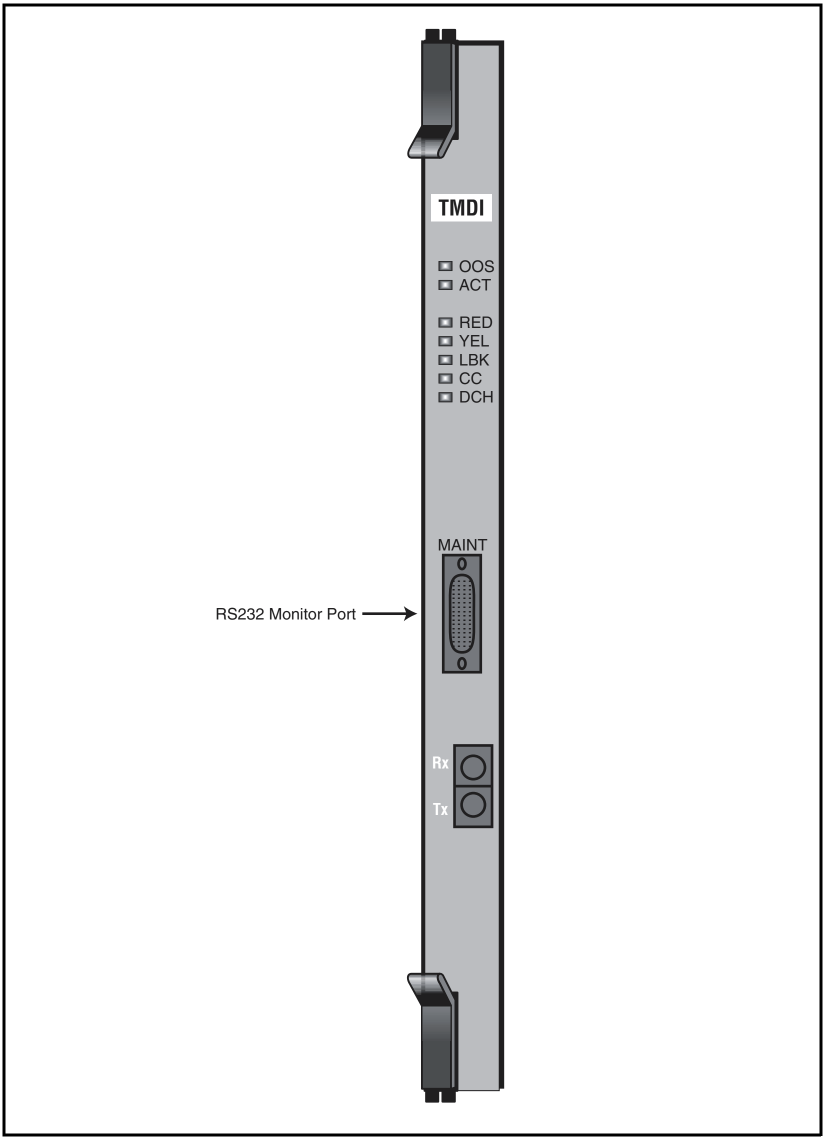
Shelf slot assignments

For Small Systems, the NTRB21 can be placed in main and expansion cabinets in any single card slot given in Table 74 on page 250.

For Succession 1000, the NTRB21 can be placed in Succession Media Gateways in the slots given in Table 74 on page 250.

The Succession Media Gateway Expansion does not support digital trunks (DTI/PRI).

Figure 76
NTRB21 TMDI card faceplate



NTAK09 DTI/PRI circuit card

The NTAK09 Digital Trunk Interface/Primary Rate Interface (DTI/PRI) card provides the physical interface for the DS-1 facility T-1 carrier on the system. It is required for PRI and DTI operation and is also used for ISL shared-mode applications.

Figure 77 on page 246 shows the faceplate layout, the location of the switch and the position of the daughterboards and connectors.

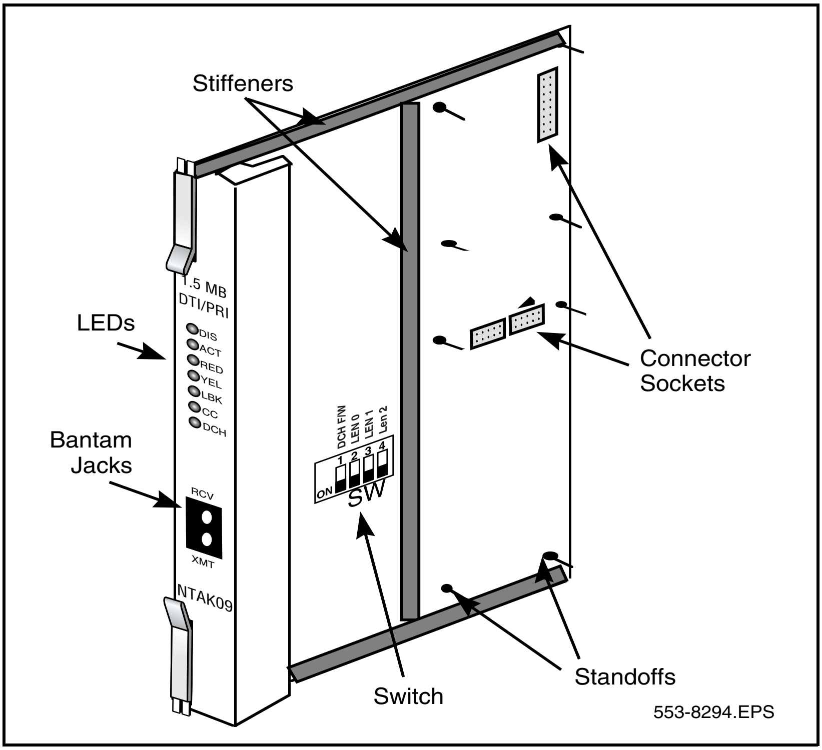
Shelf slot assignments

For cabinet systems, the NTAK09 DTI/PRI card can be placed in main and expansion cabinets in any single card slot given in Table 74 on page 250.

For Succession 1000, the NTAK09 can be placed in Succession Media Gateways in the slots given in Table 74 on page 250.

Digital trunk cards are not supported in the Succession Media Gateway Expansion.

Figure 77
NTAK09 DTI/PRI circuit card



NTAK20 Clock Controller (CC) daughterboard

Digital Trunking requires synchronized clocking so a shift in one clock source results in an equivalent shift of the same size and direction in all parts of the network. Synchronization is accomplished with the NTAK20 clock controller circuit card in each Main and IP expansion cabinet/Succession Media Gateway.

IMPORTANT!

Every Small System cabinet or Succession Media Gateway chassis that contains a digital trunk must contain a clock controller.

If a Small System is equipped with digital trunks, it is recommended that at least one digital trunk be placed in the main cabinet. For Succession 1000 systems, the digital trunk must be placed in the Succession Media Gateway.

> ***Note:*** Clocking slips can occur between systems that are clocked from different COs, if the COs are not synchronized. The slips can degrade voice quality.

The Clock Controller circuitry synchronizes the system to an external reference clock, and generates and distributes the clock to the system. A Small System can function either as a slave to an external clock or as a clocking master.

The NTAK20AA version of the clock controller meets AT&T Stratum 3 and Bell Canada Node Category D specifications. The NTAK20BA version meets CCITT stratum 4 specifications.

Clocking modes

The system supports a single clock controller that can operate in one of two modes - tracking or non-tracking (also known as free-run).

Tracking mode

In tracking mode, one or possibly two DTI/PRI cards supply a clock reference to a clock controller daughterboard. One DTI/PRI is defined as the primary reference source for clock synchronization, while the other is defined as the secondary reference source (PREF and SREF in LD 73).

There are two stages to clock controller tracking, as follows:

- tracking a reference
- locked onto a reference

When tracking a reference, the clock controller uses an algorithm to match its frequency to the frequency of the incoming clock. When the frequencies are very nearly matched, the clock controller locks onto the reference. The clock controller makes small adjustments to its own frequency until incoming and system frequencies correspond.

If the incoming clock reference is stable, the internal clock controller tracks it, locks onto it, and matches frequencies exactly. Occasionally, however, environmental circumstances cause the external or internal clocks to drift. When this happens, the internal clock controller briefly enters the tracking stage. The green LED flashes momentarily until the clock controller locks onto the reference once again.

If the incoming reference is unstable, the internal clock controller is continuously in the tracking stage, with the LED flashing green all the time. This condition does not present a problem, instead it shows that the clock controller is continually attempting to lock onto the signal. However, if slips are occurring, there is a problem with the clock controller or the incoming line.

Free-run (non-tracking)

In free-run mode, the clock controller does not synchronize on any source, it provides its own internal clock to the system. This mode can be used when the system is used as a master clock source for other systems in the network. Free-run mode is undesirable if the system is intended to be a slave. It can occur, however, when both the primary and secondary clock sources are lost due to hardware faults, or when invoked by using software commands.

Shelf slot assignment

For cabinet systems, the NTAK09 DTI/PRI card can be placed in main and expansion cabinets in any single card slot given in Table 74 on page 250.

For Succession 1000, the NTAK20 can be placed in Succession Media Gateways in the slots given in Table 74 on page 250.

Clock controller LED states

The clock controller LED, on the NTAK09 or NTRB21 faceplates, is in various states depending on the status of the clock controller.

Table 73
Clock controller LEDs

LED	Clock controller
On (Red)	NTAK20 is equipped and disabled.
On (Green)	NTAK20 is equipped and is either locked to a reference or in free run mode.
Flashing (Green)	NTAK20 is equipped and attempting to lock (tracking mode) to a reference. If the LED flashes continuously over an extended period of time, check the CC STAT in LD 60. If the CC is tracking this can be an acceptable state. Check for slips and related clock controller error conditions. If none exist, then this state is acceptable, and the flashing is identifying jitter on the reference.
Off	NTAK20 is not equipped.

Shelf slot assignments for NTRB21, NTAK09 and NTAK20

Table 74 on page 250 provides the shelf slot assignments for the NTRB21 TMDI card, NTAK09 DTI/PRI card, and NTAK20 Clock Controller daughterboard in Small Systems and Succession 1000 systems. The NTAK 93 DCH and NTBK51BA DDCH daughterboards are not included in this table since they are mounted on the NTAK09 DTI/PRI circuit card and not on a shelf.

Table 74
Shelf slot assignments for NTRB21, NTAK09, and NTAK20

		NTRB21 TMDI card	NTAK09 DTI/PRI circuit card	NTAK20 Clock controller daughterboard	
				CISPR B cabinets	Non-CISPR B cabinets
Small System	Main	1 – 9	1 – 9	1 – 3	1 – 9 (see Note 2)
	Expansion 1	11 – 19	11 – 19	11 – 13	11 – 19
	Expansion 2	21 – 29	21 – 29	21 – 23	21 – 29
	Expansion 3	31 – 39	31 – 39	31 – 33	31 – 39
	Expansion 4	41 – 49	41 – 49	41 – 43	41 – 49

Table 74
Shelf slot assignments for NTRB21, NTAK09, and NTAK20

		NTRB21 TMDI card	NTAK09 DTI/PRI circuit card	NTAK20 Clock controller daughterboard	
				CISPR B cabinets	Non-CISPR B cabinets
Succession 1000 (see Note 1)	Succession Media Gateway 1	11 – 14	11 – 14	11 – 14	
	Succession Media Gateway 2	21 – 24	21 – 24	21 – 24	
	Succession Media Gateway 3	31 – 34	31 – 34	31 – 34	
	Succession Media Gateway 4	41 – 44	41 – 44	41 – 44	

Note 1: For Succession 1000, physical card slots are numbered 1 – 4 on each Succession Media Gateway (see Table 72 on page 242).

Note 2: On cabinets NTAK11Dx and NTAK11Fx, the active card must be placed in slots 1 – 3 (slots 4 to 10 cannot be used).

NTAK93 D-channel Handler Interface (DCHI) daughterboard

The NTAK93 DCHI daughterboard interfaces with the system Central Processing Unit (CPU) and mounts on the NTAK09 DTI/PRI circuit card for PRI or ISL shared mode applications. The DCHI is responsible for performing the Q.921 layer 2 protocol information. It transfers layer 3 signaling information between two adjacent network switches.

The NTAK93 DCH daughterboard, when installed on the NTAK09 circuit card, is addressed in the same slot as the NTAK09. The NTAK93 can use SDI I/O addresses 0 to 79 and port 1.

> ***Note:*** I/O addresses 0, 1, 2, 8 and 9 are preconfigured on the Small System and must not conflict with the I/O addresses on the NTAK93 card.

A minimum of one NTAK93 is required for each PRI link. If more than one PRI link connects to the same end location, a single DCHI circuit card can support up to a maximum of sixteen PRI connections for the Small System and Succession 1000 system. This allows a total of 382 B-channels or PRI trunks to be supported if a backup D-channel is also used. A total of 383 B-channels or PRI trunks are supported if a backup channel is not used.

NTBK51BA Downloadable D-channel (DDCH) daughterboard

The NTBK51BA DDCH daughterboard interfaces with the Small System Central Processing Unit (CPU) and mounts on the NTAK09 DTI/PRI circuit card for PRI D-channel applications. The DDCH is equivalent to the MSDL card used on a Large System, but it only supports D-channel applications (no SDI or ESDI).

The NTBK51BA DDCH daughterboard, when installed on the NTAK09 circuit card, is addressed in the same slot as the NTAK09.

A minimum of one NTBK51BA is required for each PRI link. If more than one PRI link connects to the same end location, a single DDCH circuit card can support up to a maximum of sixteen PRI connections for the Small Systems and Succession 1000 systems. This allows a total of 382 B-channels or PRI trunks to be supported if a backup D-channel is also used. A total of 383 B-channels or PRI trunks are supported if a backup channel is not used.

For more information on expansion daughterboards, refer to *Small System: Planning and Engineering* (553-3011-120).

Install PRI hardware

Install/remove daughterboard on the NTRB21 TMDI card

Procedure 24
Mounting the NTAK20 daughterboard on the NTRB21

Work on a flat surface when mounting or removing daughterboards.

1. Visually inspect the connector pins on the underside of the daughterboard. Straighten and re-align any bent pins prior to mounting.

2. Place the NTRB21 down flat on an anti-static pad.

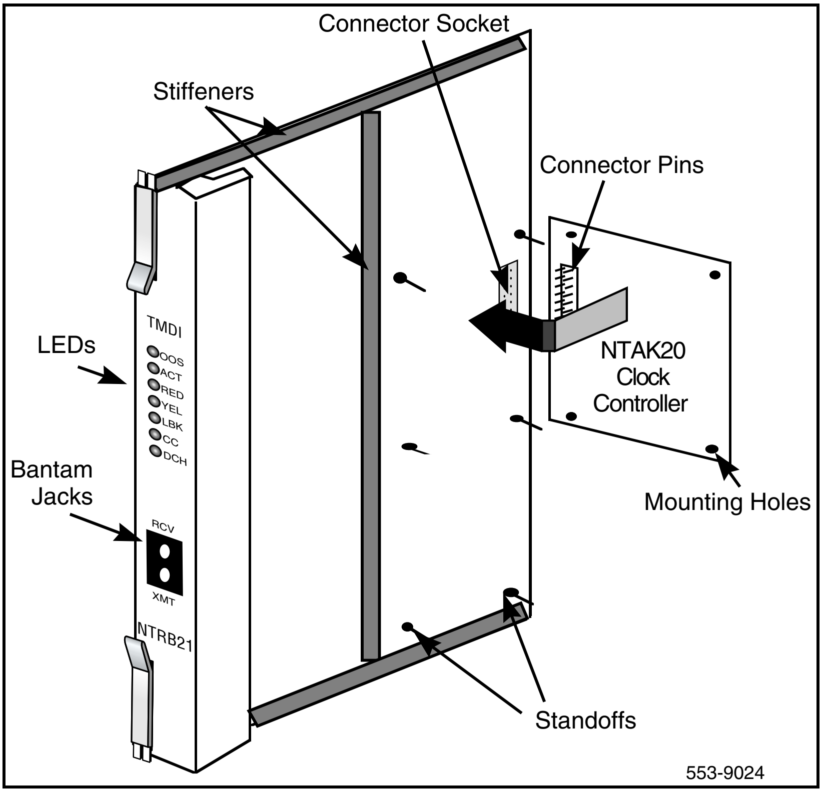
3. From an overhead view, with the daughterboard parallel above the NTRB21 and the connector pins aligned over the connector sockets, line up the mounting holes on the daughterboard (Figure 78 on page 254) with the tops of the standoffs on the NTRB21.

4. Slowly lower the daughterboard towards the NTRB21, keeping the standoffs in line with all four holes, until the holes are resting on the tops of the four standoffs.

   If more than a very slight amount of pressure is required at this point, the connector pins cannot be aligned with the connector socket. If so, lift the daughterboard off the NTRB21 and return to step 2.

5. Gently apply pressure along the edge of the board where the connector is located until the standoffs at the two corners adjacent to the connector snap into a locked position. Then press down on the two corners on the opposite side until they also lock into place.

Figure 78
NTAK20 daughterboard installation on the NTRB21



End of Procedure

Insert/remove the NTRB21 TMDI card

Refer to Table 74 on page 250 to determine the slot assignment for the NTRB21 TMDI circuit card appropriate to the system.

The NTRB21 card is installed only in the Succession Media Gateway. It is not supported in the Succession Media Gateway Expansion.

Procedure 25
Inserting the NTRB21 TMDI card

1 Check for available card slots in the base cabinet and print the configuration record to determine which slots can be used. To do this, enter the following command in LD 22:

`PRT CFN` in LD 22

2 If in PRI mode, enter the following command in LD 96 to software disable the D-channel:

`DIS DCH x`

where x is the DCH port number that was assigned in LD 17.

3 If the Clock Controller is enabled, enter the following command in LD 60 to software disable it:

`DIS CC 0`

4 Hold the NTRB21 by the lock latch, unlock the latch, and slide the card into the cabinet.

Note 1: Refer to Table 74 on page 250 to determine the correct slot in which to insert the card.

Note 2: For Succession 1000, the NTRB21 is installed only in the Succession Media Gateway. It is not supported in the Succession Media Gateway Expansion.

5 Enter the following command in LD 96 to enable the TMDI card:

`ENL TMDI x ALL`

where x is the NTRB21 TMDI card number (DLOP). The card number associated with an NTRB21 TMDI card is based on the slot in which the card is installed.

6 Within about 30 seconds, the D-channel layer 3 should be established. To confirm, enter the following command in LD 96 to request the current status of the D-channel:

`STAT DCH (N)`

The system response is:

`DCH N EST OPER`

This means that the D-channel is established and operational.

End of Procedure

Procedure 26
Removing the NTRB21 TMDI card

1 If in PRI mode, enter the following command in LD 96 to software disable the D-channel:

`DIS DCH x`

where x is the DCH port number that was assigned in LD 17.

2 If the Clock Controller is enabled, enter the following command in LD 60 to software disable it:

`DIS CC 0`

3 Enter the following command in LD 96 to disable the NTRB21 TMDI card:

`DIS TMDI x All`

where x is the NTRB21 TMDI card number (DLOP). The card number associated with a NTRB21 TMDI card is based on the slot in which the card is installed.

4 Hold the NTRB21 by the lock latch, unlock the latch, and slide the card out from the cabinet.

End of Procedure

Install/remove daughterboards on the NTAK09 DTI/PRI card

Procedure 27
Mounting the daughterboards on the NTAK09

Use these guidelines to mount the NTAK20 CC and the NTAK93 DCHI or NTBK51 DDCH daughterboards on the NTAK09 DTI/PRI card. Because of the physical layout of the mother and daughterboards, the NTAK93 or NTBK51 should be mounted before the NTAK20. Work on a flat surface when mounting or removing daughterboards.

1 Visually inspect the connector pins on the underside of the daughterboard. Straighten and re-align any bent pins prior to mounting.

2 Place the NTAK09 down flat on an anti-static pad.

3 From an overhead view, with the daughterboard parallel above the NTAK09 and the connector pins aligned over the connector sockets, align the mounting holes on the daughterboard (Figure 79 on page 259) with the tops of the standoffs on the NTAK09.

4 Slowly lower the daughterboard toward the NTAK09, keeping the standoffs in line with all four holes, until the holes rest on top of the four standoffs.

Note: If more than a very slight amount of pressure is required at this point, the connector pins are not aligned with the connector socket. If so, lift the daughterboard off the NTAK09 and return to step 2.

5 Gently apply pressure along the edge of the board where the connector is located until the standoffs at the two corners adjacent to the connector snap into a locked position. Then press down on the two corners on the opposite side until they also are locked into place.

End of Procedure

Procedure 28
Removing the daughterboards from the NTAK09

Use these guidelines to remove the NTAK20 Clock Controller (CC) and the NTAK93 DCHI or NTBK51 DDCH daughterboards from the NTAK09 DTI/PRI card. Because of the physical layout of the mother and daughterboards, the NTAK20 should be removed before the NTAK93 or NTBK51.

1 Starting at the two corners opposite the connector, gently lift each corner out of the locking groove of the standoff.

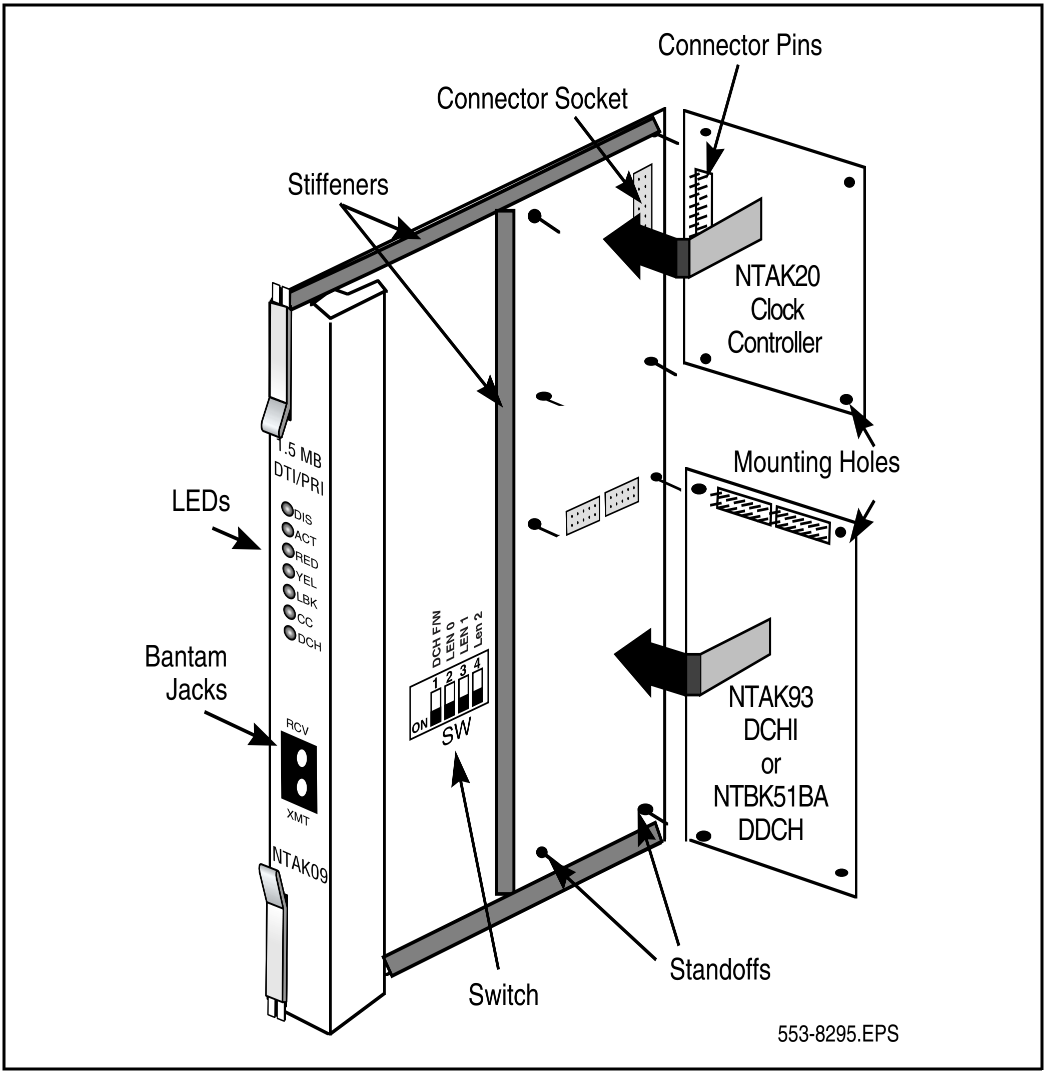
2 At the two corners adjacent to the connector, gently lift the entire side until the mounting holes are clear of the locking groove of the standoff.

3 To remove the connector pins, grasp the edge of the board adjacent to the connector and lift gently.

If more than one NTAK09 card is installed, the additional cards might not carry daughterboards, depending on the system configuration. At least one NTAK20 (per system) is always required.

End of Procedure

Figure 79
Daughterboard installation on the NTAK09



Set switches on NTAK09 DTI/PRI card

Set the switches on the NTAK09 DTI/PRI card according to Table 75.

Table 75
NTAK09 switch settings

Distance to digital cross-connect	1 DCH F/W	2 (LEN 0)	3 (LEN 1)	4 (LEN 2)
0 - 133 feet	Off	Off	Off	On
133 - 266 feet	Off	On	On	Off
266 - 399 feet	Off	Off	On	Off
399 - 533 feet	Off	On	Off	Off
533 - 655 feet	Off	Off	Off	Off

Installing the NTAK09

Refer to Table 74 on page 250 to determine the slot assignment for the NTAK09 DTI/PRI circuit card appropriate to the system.

The NTAK09 DTI/PRI card is installed only in the Succession Media Gateway. It is not supported in the Succession Media Gateway Expansion.

Procedure 29
Installing the NTAK09

1 Check for available card slots in the base and expansion cabinets, and Succession Media Gateways and print the configuration record to determine which slots can be used. To do this, enter the following command in LD 22:

```
PRT CFN
```

2 Hold the NTAK09 by the lock latch, unlock the latch, and slide the card into the cabinet.

Note 1: Refer to Table 74 on page 250 to determine the correct slot in which to insert the card.

Note 2: For Succession 1000, the NTAK09 is installed only in the Succession Media Gateway. It is not supported in the Succession Media Gateway Expansion.

End of Procedure

Procedure 30
Connecting the cables

The only cable required to support the NTAK09 DTI/PRI circuit card is the NTBK04 cable. The cable is twenty feet long. If additional distance is required, the NT8D97AX fifty-foot extension is available up to a 600 foot maximum. Table 76 on page 262 gives pinout information for the NTBK04.

1 Connect the NTBK04 cable to a 50-pin Amphenol connector on the cabinet or chassis.

For a Small System, the Amphenol connector is located below the card slot in which the NTAK09 circuit card is installed.

For a Succession 1000 system, the Amphenol connector is located on the rear of the Succession Media Gateway chassis. The Amphenol connectors are labelled with the card slot numbers to which they correspond.

2 Connect the other end of the cable to the CSU or DSX-1 cross connect.

Table 76
DS-1 line interface pinout for NTBK04 cable

From 50-pin MDF connector	to DB-15	Signal name	Description
pin 48	pin 1	T	transmit tip to network
pin 23	pin 9	R	transmit ring to network
pin 25	pin 2	FGND	frame ground
pin 49	pin 3	T1	receive tip from network
pin 24	pin 11	R1	receive ring from network

End of Procedure

Procedure 31
Enabling the NTRB21 TMDI card

1 Enter the following command in LD 96 to enable the NTRB21 TMDI card:

ENL TMDI x ALL

where x is the NTRB21 TMDI card number (DLOP). The card number associated with a NTRB21 TMDI card is based on the slot in which the card is installed.

2 If in PRI mode, enter the following command in LD 96 to software enable the D-channel:

ENL DCH y

where y is the DCH port number that was assigned in LD 17.

3 Within about 30 seconds, the D-channel layer 3 should be established. To confirm, enter the following command in LD 60 to request the current status of the D-channel:

STAT DCH (N)

The system response is:

`DCH N EST OPER`

This means that the D-channel is established and operational.

End of Procedure

Procedure 32
Enabling the NTAK09 DTI/PRI card

Note: The DCHI and PRI cards must be configured prior to software enabling the NTAK09. Refer to the procedure “Implementing basic PRI” on page 264 for further information.

1 Enter the following command in LD 60 to software enable all NTAK09 DTI/PRI cards:

`ENLL C`

where C is the DTI/PRI card number (DLOP). The card number associated with a DTI/PRI card is based on the slot in which the card is installed.

Under normal conditions, this step enables the clock controller and D-channel interface. If enable fails, enter the following command in LD 60 to software enable clock tracking on the primary digital card:

`ENL CC 0`

2 Enter the following command in LD 96 to software enable the NTAK93 (DCHI) daughterboard:

`ENL DCHI N`

where N is the DCHI I/O address.

3 Within about 30 seconds, the D-channel layer 3 should be established. To confirm, enter the following command in LD 60 to request the current status of the D-channel:

`STAT DCH (N)`

The system response is:

`DCH N EST OPER`

This means that the D-channel is established and operational.

End of Procedure

Procedure 33
Implementing basic PRI

Use this procedure to configure the PRI cards, DCHI interface, DCH link and ISDN trunk route and trunks (B-channels) that are required to implement PRI between systems. No feature applications other than Basic Call Service are included in the implementation.

PRI cards must be configured before defining the DCH links or PRI applications.

Prompts which do not show a response can be left as default. For more information on any of these prompts, refer to *Software Input/Output: Administration* (553-3001-311).

Before installing PRI cards in an IP expansion cabinet/Succession Media Gateway, first configure the expansion cabinet/Succession Media Gateway for IP connectivity. Refer to LD 117 in the *Software Input/Output: Maintenance* (553-3001-511) for further information.

To implement PRI on the system:

1. Add a PRI card. See “Define clock synchronization. See “LD 73 — Defining system timers and clock controller parameters” on page 272.” on page 264.
2. Add a DCHI card. See “LD 17— Adding a PRI card” on page 265.
3. Define a PRI customer. See “LD 15 — Defining a PRI customer” on page 267.
4. Define a PRI service route. See “LD 16 — Configuring an ISDN service route” on page 270.
5. Define service channels (B-channels) and PRI trunks. See “LD 14 — Defining service channels and PRI trunks” on page 271.
6. Define clock synchronization. See “LD 73 — Defining system timers and clock controller parameters” on page 272.

End of Procedure

LD 17— Adding a PRI card

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	CFN	Configuration data block.
CEQU	YES	Changes to common equipment.
PRI	loop x	For Large Systems
	card x	For Small Systems and Succession 1000 Systems
TMDI	(Yes) No	TMDI Card (Mode set to PRI OR TRK) Option 11C Cabinet Other card

LD 17 — Adding a D-channel interface (Part 1 of 3)

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	ADAN	Action Device And Number.
- ADAN	NEW DCH xx CHG DCH xx OUT DCH xx	Add a primary D-channel (any unused SDI port.) Change a primary D-channel. Remove the primary D-channel, where: xx =0-79.
- CTYP	DCHI	DCHI = D-channel configuration for the NTAK09 card or NTAK93.
	MSDL	MSDL = NTBK51 Downloadable D-channel daughterboard.
	TMDI	TMDI = D-channel configuration on TMDI (NTRB21) card.

LD 17 — Adding a D-channel interface (Part 2 of 3)

Prompt	Response	Description
- CDNO	1-50	Card slot number to be used as the primary DDCH/DCHI. Card slots 10, 20, 30, 40, and 50 are only applicable for D-channel configuration of ISL or VNS.
- PORT	1	PORT must be set to 1.
- DES	<CR>	Designator.
- USR	PRI	D-channel is for ISDN PRI only.
- IFC	xx	Interface type.
- - DCHL	xx	PRI loop number.
- OTBF	1-(16)-127	Number of output request buffers. ***Note:*** For a single PRI link, leave this prompt at default (16). Add 5 output request buffers per additional link.
- DRAT	64KC	D-channel transmission rate.
- SIDE	NET (USR)	Prompted only if IFC is set to SL1. NET = network, the controlling switch. USR = slave to the controller.
- RLS	xx	Release ID of the switch at the far-end of the D-channel.
- RCAP	ND2	Remote capability.
- OVLR	YES (NO)	Allow or disallow overlap receiving on a D-channel. Default is NO. Enter carriage return if settings are to be left at default.
- LAPD	YES (NO)	Change LAPD parameters. Enter carriage return if timers are to be left at default. The following timers are prompted only if LAPD is set to YES. (They can all be left at default during initial set-up.)

LD 17 — Adding a D-channel interface (Part 3 of 3)

Prompt	Response	Description
- - T23	1-(20)-31	Interface guard timer checks how long the interface takes to respond. In units of 0.5 seconds (default 20 = 10 seconds).
- - T200	2-(3)-40	Retransmission timer in units of 0.5 seconds (default 3 = 1.5 seconds).
- - N200	1-(3)-8	Maximum number of retransmissions.
- - N201	4(260)	Maximum number of octets in information field.
- - K	1-(7)-32	Maximum number of outstanding unacknowledged frames (NAKS).

LD 15 — Defining a PRI customer (Part 1 of 3)

Prompt	Response	Description
REQ:	NEW CHG	Add new data. Change existing data.
TYPE:	NET	Networking Data.
CUST	 0-99 0-31	Customer number For Large Systems For Small Systems and Succession 1000 systems
LDN0	xxxx	Listed Directory number 0 must be defined for ISDN PRI DID service. The length of LDN0 determines the number of trailing digits translated as the dialed DN on PRI DID routes. Up to seven digits can be entered if DNXP option 150 is equipped. Otherwise, up to four digits can be entered.

LD 15 — Defining a PRI customer (Part 2 of 3)

Prompt	Response	Description
AC2		ESN Access Code 2. Enter incoming ISDN call types (NARS network translation types) for which AC2 must be inserted when INAC = YES in LD 16. Multiple responses are allowed. Prompted only if NARS is equipped. If a NARS call type is not entered here, it is defaulted to AC1.
	NPA NXX INTL SPN LOC	E.164 National. E.164 Subscriber. International. Special Number. Location Code
ISDN	YES	Customer is equipped with ISDN.
- PNI	(0) 1-32700	Private Network Identifier. Each customer data block must have a unique PNI when multi-customer option is equipped. PNI = 1 is typical for CUST = 0. It must be matched by the PNI in the far-end RDB. ***Note:*** Using the default value of PNI = 0 prevents operation of features like NRAG, NACD and NMS.
- HNPA	NPA	Telephone area code for this system. Sent as part of setup message as calling line identification.
- HNXX	NXX	Telephone local exchange code for this system. Sent as part of setup message as calling line identification.

LD 15 — Defining a PRI customer (Part 3 of 3)

Prompt	Response	Description
- - HLOC	XXX	Home location code (NARS), prompted when PRA = YES.
- - LSC	1-9999	One to four digit Local Steering Code, if required in the Coordinated Dialing Plan (CDP). LSCs are required only if the CDP DNs are longer than the local PDNs. The CLID sent for a CDP call is composed of the LSC defined in LD 15 plus the PDN of the calling set. Various ISDN network features depend on the CLID as the “return address” for sending feature control messages. Multiple LSCs can be defined in LD 87 for CDP, but only one LSC can be defined here for CLID.

LD 16 — Configuring an ISDN service route (Part 1 of 2)

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	RDB	Route data block.
TKTP	xxx	Trunk type.
DTRK	YES	Digital trunk route.
- DGTP	PRI	1.5 Mb PRI. Prompted only if PRA = YES in LD15.
ISDN	YES	ISDN option.
- MODE	PRA	Route used for PRA only.
- - PNI	(0) 1-32700	Private Network Identifier. Each customer data block must have a unique PNI when multi-customer option is equipped. PNI = 1 is typical for CUST = 0. It must be matched by the PNI in the far-end RDB. ***Note:*** Using the default value of PNI = 0, prevents operation of features like NRAG, NACD and NMS.
IFC	xx	Interface type.
- CHTY	BCH	Signalling type - prompted if DTRK is YES. D-channel signalling for B-channels.
- CTYP	<CR>	Call Type. Enter the call type to be associated with the outgoing route for direct dialing using the trunk access code (instead of NARS access code). See the *Software Input/Output: Administration* (553-3001-311) for a listing of possible responses.

LD 16 — Configuring an ISDN service route (Part 2 of 2)

Prompt	Response	Description
- INAC	YES	Insert ESN Access Code based on NARS/BARS call type for incoming calls on TIE routes only. If NARS is equipped, this feature inserts AC1 or AC2, depending on the responses to AC2 in LD 15 Customer Data Block. For NARS/BARS call types, INAC bypasses incoming digit insertion specified by INST in LD 16 Route Data Block. Unknown call types, including CDP steering codes, are not affected by INAC, and do not bypass digit insertion specified by INST. INAC must be set to YES to support features such as Network ACD and Network Message Services, which depend on non-call associated TCAP facility messages.

LD 14 — Defining service channels and PRI trunks

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data. When assigning several members at once use the multiple create command NEW XX.
TYPE	TIE	TIE Trunk only, allowed between MSL-1.
TN	l ch	Loop and channel for digital trunks
RTMB	 0-511 1-510 0-127 1-510	Route number and Member number For Large Systems For Small Systems and Succession 1000 systems

LD 73 — Defining system timers and clock controller parameters (Part 1 of 2)

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	PRI	1.5 Mb PRI.
FEAT	SYTI	System timers.
CCO	xx	Card slot number for Clock Controller 0.
PREF CCO	xx	Card number of PRI/DTI/SILC containing the primary clock reference for the main cabinet
SREF CCO	xx	Card number of PRI/DTI/SILC containing the primary clock reference for the main cabinet
CC1	xx	Card number for Clock Controller 1.
PREF CC1	xx	Primary Reference DTI/PRI loop for Clock controller one.
SREF CC1	xx	Secondary Reference DTI/PRI loop for Clock controller one.
CC2	xx	Card number for Clock Controller 2.
PREF CC2	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
SREF CC2	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
CC3	xx	Card number for Clock Controller 3.
PREF CC3	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
SREF CC3	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
CC4	xx	Card number for Clock Controller 4.

LD 73 — Defining system timers and clock controller parameters (Part 2 of 2)

Prompt	Response	Description
PREF CC4	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
SREF CC4	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
CCAR	0-(15)	Clock Controller Audit Rate. Enter the time (in minutes) between normal CC audits.

1.5 Mb DTI implementation

Contents

This section contains information on the following topics:

Overview

This chapter provides the information required to install DTI on a system, including:

- hardware and software installation
- implementation procedures for basic call service

This chapter covers the most common type of Nortel Networks DTI installation – a 24-channel Digital Trunk Interface (DTI) installation between two systems, or between a system and a central office.

Digital trunks are supported in Small System IP expansion cabinets.

Hardware requirements

To implement DTI on the system, the hardware listed in Table 77 is required:

Table 77
DTI hardware

Item	Description
NTRB21	DTI/PRI TMDI card
NTAK09	DTI/PRI Circuit card
NTAK20	Clock Controller Daughter board. Option 11C Cabinet support only one active Clock Controller per IP Expansion cabinet. Succession 1000 supports only one active clock controller per Succession Media Gateway.
NTBK04	Carrier Cable

Cables

The following cables are required for DTI connections:

- DTI to external T1 cable
- NTBK04 carrier cable
- NT8D97 50-foot extension (if needed)

Channel Service Units (CSU)

When connecting the DTI/PRI to the public network, Channel Service Units (CSUs) are required by most operating companies. One CSU is required per DTI. Suitable CSUs which support 64 Kbps clear and Bipolar 8 Zero Substitution (B8ZS) are available from vendors such as Verilink, Digitalink, Kentrox and Tellabs.

Contact your Nortel Networks Sales representative for specific local CSU requirements.

Hardware description

Refer to “Hardware description” on page 241.

Install DTI hardware

Refer to “Install PRI hardware” for information on installing DTI hardware. Specifically:

- To install the NTRB21 DTI/PRI card, see “Insert/remove the NTRB21 TMDI card” on page 254.
- To install the NTAK09 DTI/PRI card, see “Installing the NTAK09” on page 260.
- To install the NTAK20 Clock Controller, see “Install/remove daughterboards on the NTAK09 DTI/PRI card” on page 257.

Set the switches

Set the switches on the NTAK09 DTI/PRI card according to Table 78.

Table 78
NTAK09 switch settings

Distance to digital cross-connect	1 DCH F/W	2 (LEN 0)	3 (LEN 1)	4 (LEN 2)
0 - 133 feet	Off	Off	Off	On
133 - 266 feet	Off	On	On	Off
266 - 399 feet	Off	Off	On	Off
399 - 533 feet	Off	On	Off	Off
533 - 655 feet	Off	Off	Off	Off

Connect the cables

For Small Systems, connect the NTBK04 cable to the 50-pin amphenol connector below the card slot in which the NTAK09 circuit card is installed. Connect the other end of the cable to the CSU or DSX-1 cross connect.

For Succession 1000, connect the NTBK04 cable to a 50-pin amphenol connector on the rear of the Succession Media Gateway chassis. The amphenol connectors are labelled with the card slot numbers to which they correspond.

The NTBK04 is twenty feet long. If additional distance is required, the NT8D97AX 50-foot extension is available up to a 600-foot maximum. The only cable required to support the NTAK09 circuit card is the NTBK04.

Pinout information on the NTBK04 cable is given in Table 79.

Table 79
DS-1 line interface pinout for NTBK04 cable

From 50-pin MDF connector	to DB-15	Signal name	Description
pin 48	pin 1	T	transmit tip to network
pin 23	pin 9	R	transmit ring to network
pin 25	pin 2	FGND	frame ground
pin 49	pin 3	T1	receive tip from network
pin 24	pin 11	R1	receive ring from network

Software enable the DTI/PRI cards

Procedure 34
Enabling the NTRB21 TMDI card

1 Enter the following command in LD 96 to enable the NTRB21 TMDI card:

```
ENL TMDI x ALL
```

where x is the NTRB21 TMDI card number (DLOP). The card number associated with a NTRB21 TMDI card is based on the slot in which the card is installed.

2 If in DTI mode, enter the following command in LD 96 to software enable the D-channel:

ENL DCH y

where y is the DCH port number that was assigned in LD 17.

3 Within about 30 seconds, the D-channel layer 3 should be established. To confirm, enter the following command in LD 60 to request the current status of the D-channel:

STAT DCH (N)

The system response is:

`DCH N EST OPER`

This means that the D-channel is established and operational.

End of Procedure

Procedure 35
Enabling the NTAK09 card

The DCHI and DTI cards must be implemented prior to software enabling the NTAK09. Refer to the section "Implementing basic PRI" on page 264 for further information.

1 Enter the following command in LD 60 to software enable all NTAK09 DTI/PRI cards:

ENLL C

where C is the DTI/PRI card number (DLOP). The card number associated with a DTI/PRI card is based on the slot in which the card is installed.

Under normal conditions, this step enables the clock controller and D-channel interface. If enable fails, go to step 2.

2 **Optional:** Enter the following command in LD 60 to enable clock tracking on the primary digital card:

ENL CC 0

3 Enter the following command in LD 96 to software enable the NTAK93 (DCHI) daughterboard:

ENL DCHI N

where N is the DCHI I/O address.

4 Within about 30 seconds, the D-channel layer 3 should be established. To confirm, enter the following command in LD 60 to request the current status of the D-channel:

STAT DCH (N)

The system response is:

```
DCH N EST OPER
```

This means that the D-channel is established and operational.

End of Procedure

Procedure 36
Implementing DTI

Use this procedure to implement the DTI software interface between systems or between a system and a central office.

1 Add a DTI card. See “LD 17 — Adding a DTI card” on page 281.

2 Configure a DTI trunk route. See “LD 16 — Configuring a DTI trunk route” on page 282.

3 Configure the trunks. See “LD 14 — Configuring the trunks” on page 282.

4 Assign clock’s reference source. See “LD 73 — Assigning a clock's reference source” on page 283.

LD 17 — Adding a DTI card

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	CFN	Configuration data block.
...		
PARM	YES	
...		
PCML	(MU) A	System PCM law. Default is MU law.
...		
CEQU	YES	Changes to common equipment.
DLOP	ll dd ff	Digital Trunk Interface Loop or Loops
MODE	TRK	Select Digital Trunk Interface mode.
TMDI	(YES) NO	Whether the card is a TMDI card.
YALM	DG2 (FDL)	Yellow alarm method — prompted only if the frame format is ESF — **Must match the far end.** Use FDL with ESF and use DG2 with non-ESF. If not prompted then DG2 is set automatically.
TRSH	0-15	The maintenance and threshold table to be used for this DTI card, as configured in LD 73.
T1TE	0 1 2	T1 Transmit Equalization (0=0-200 ft., 1=200-400 ft, 2=400-700 ft). Only for TMDI = YES.

LD 16 — Configuring a DTI trunk route

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	RDB	Route data block.
TKTP		Create a trunk route.
	COT WAT DID TIE FEX	Central Office Trunk data block WATS Trunk data block Direct Inward Dial Trunk data block TIE Trunk data block Foreign Exchange
DTRK	YES	Digital trunk route.

LD 14 — Configuring the trunks

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	xxx	Trunk type
TN	l ch	Loop and channel for digital trunks
RTMB		Route number and Member number
	0-511 1-510 0-127 1-510	For Large Systems For Small Systems and Succession 1000 systems

LD 73 — Assigning a clock's reference source (Part 1 of 2)

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	DDB	Digital Data Block.
CCO	xx	Card slot number for Clock Controller 0.
PREF CCO	xx	Card number of PRI/DTI/SILC containing the primary clock reference for the main cabinet
SREF CCO	xx	Card number of PRI/DTI/SILC containing the primary clock reference for the main cabinet
CC1	xx	Card number for Clock Controller 1.
PREF CC1	xx	Primary Reference DTI/PRI loop for Clock controller one.
SREF CC1	xx	Primary Reference DTI/PRI loop for Clock controller one.
CC2	xx	Card number for Clock Controller 2.
PREF CC2	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
SREF CC2	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
CC3	xx	Card number for Clock Controller 3.
PREF CC3	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
SREF CC3	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
CC4	xx	Card number for Clock Controller 4.

LD 73 — Assigning a clock's reference source (Part 2 of 2)

Prompt	Response	Description
PREF CC4	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
SREF CC4	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.

1.5 Mb ISL implementation

Contents

This section contains information on the following topics:

Overview

This chapter contains the information required to implement ISL on the system. It describes:

- hardware and software installation
- hardware and software configuration for basic call service

Two modes of ISL are available: shared and dedicated. This chapter covers the most common type of Nortel Networks ISL installation, an ISDN Signaling Link (ISL) installation in dedicated mode using dedicated and leased lines.

Hardware requirements

To implement ISL regardless of operation mode, analog or digital TIE lines are used as B-channels:

- NT8D15 or NT8D14 Analog TIE Trunk cards

- NTAK09 Digital trunk cards (for shared mode)
- NTAK02 SDI/DCH card (for dedicated mode)

Shared mode

In shared mode, PRI hardware plus the existing TIE line interface card is required.

Dedicated mode

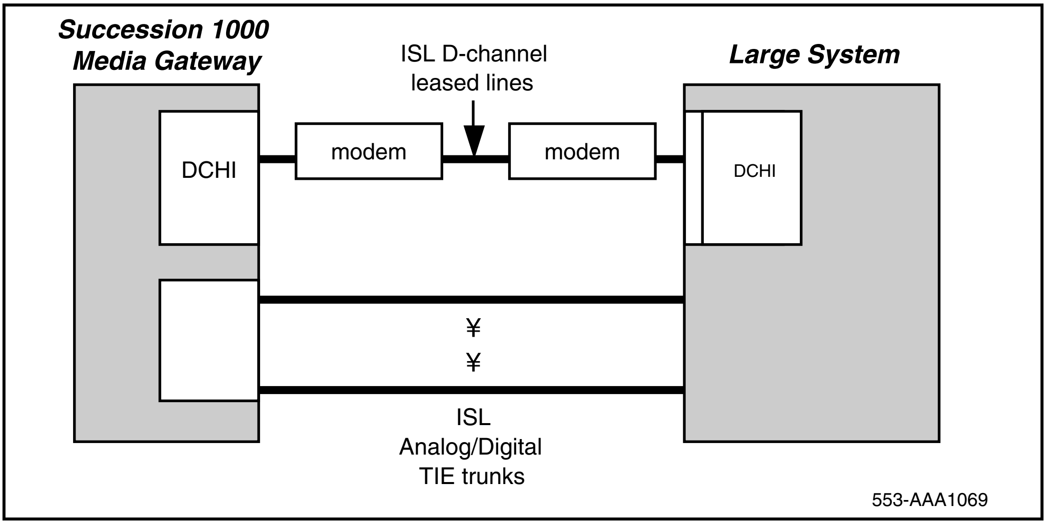
Dedicated mode requires modems. See Figure 80 on page 287 and Figure 81 on page 288 for details.

The requirements for using a leased line are

Table 80
Leased line requirements

Hardware	Comments
NTAK02	D-channel Handler Interface (DCHI) Card for ISL mode.
Modem	Modem capable of the following: (such as Ventel 2400-33 or 2400 Plus II) - minimum of 2400 baud - synchronous operation - must support leased line (also known as private line or point-to-point) operation
NTAK19BA	Four port break out cable.

Figure 80
ISL in dedicated mode using leased line



Using dial-up modems

The requirements for using a dial-up modem are:

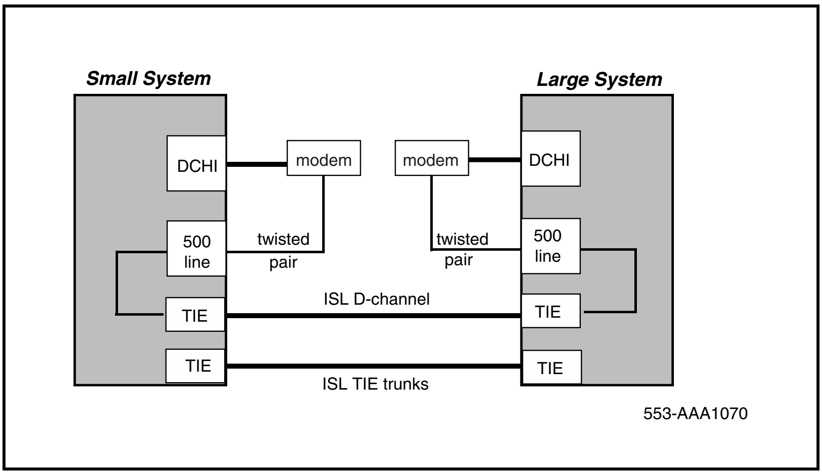
Table 81
Dial-up modem requirements (Part 1 of 2)

Hardware	Comments
NT8D09	500 set line card.
NTAK02	D-channel Handler Interface (DCHI) Card (for ISL mode).

Table 81
Dial-up modem requirements (Part 2 of 2)

Hardware	Comments
Modem	Modem capable of the following: (such as Ventel 2400-33 or 2400 Plus II) - minimum of 2400 baud - synchronous operation - modems are programmed such that one modem originates the call while the other auto-answers - auto-dial capability
NTAK19BA	Four port break out cable.

Figure 81
ISL in dedicated mode using dial-up modem



ISL hardware installation (dedicated mode)

Use Procedure 37 to install hardware for an ISDN Signaling Link (ISL) in dedicated mode using dedicated leased lines. For shared mode, hardware installation is identical to the PRI installation found in "1.5 Mb PRI implementation" on page 239, with the addition of analog or digital TIE Trunks or both.

The NTAK02 connects to a modem via the NTAK19BA four-port cable. Only ports 1 and 3 are available for use as DCHIs.

Procedure 37
Installing ISL hardware

1 Set option switches/jumpers on the NTAK02 card as shown in Table 82 and Table 83 on page 290 for mode of operation (RS232 or RS422 and DTE or DCE.)

Table 82
NTAK02 switch setting

Port 0	Port 1	SW 1-1	SW 1-2
SDI	DCH	OFF	OFF
SDI	DPNSS	OFF	ON
—	ESDI	ON	ON

Port 2	Port 3	SW 1-3	SW 1-4
SDI	DCH	OFF	OFF
SDI	DPNSS	OFF	ON
—	ESDI	ON	ON

Table 83
NTAK02 jumper settings

Unit	Jumper location	Strap for DTE	Strap for DCE
Unit 0	J10	C - B	B - A
Unit 1	J7 J6	C - B C - B	B - A B - A
Unit 2	J5	C - B	B - A
Unit 3	J4 J3	C - B C - B	B - A B - A

Unit	Jumper location	RS422	RS232
Unit 0	—	—	—
Unit 1	J9 J8	C - B C - B	B - A B - A
Unit 2	—	—	—
Unit 3	J2 J1	C - B C - B	B - A B - A

2 Install the NTAK02 in any available slot 1-10 of the Option 11C Cabinet or slot 11-14 of Succession Media Gateway 1.

Note: For Succession 1000, physical card slots are numbered 1-4 on the first, second, third and fourth Succession Media Gateways.

3 Install the NTAK19BA four-port cable on the 50-pin Amphenol connector associated with the slot the NTAK02 is installed in.

4 If the installation is a dedicated mode using leased line modem configuration, the D-channel connects the DCHI with the far-end modem over a dedicated leased line. The modems must have a minimum transmission rate of 2400 baud and must support leased line capability and synchronous mode, 2-wire or 4-wire operation.

Modems such as Ventel 2400 Plus II can be used. You must specify 4-wire operation when ordering. Otherwise, the modem is factory shipped for 2-wire operation.

Note: The Hayes Smart modem 2400 cannot be used on leased lines.

5 If the installation is a dedicated mode using dial-up modem (such as Hayes 2400, Ventel 2400 or Gandalf 2400) configuration, the DCHI is connected to a modem that is connected to a 500 set line card. The call is connected to the far-end via the 500 set-to-TIE Trunk path.

Note: Dedicated mode using leased line modems is the preferred method.

6 Set up the D-channel. Configure the modem at one end in the auto-dial mode so it automatically initiates a call to the other end at power-up. The auto-dial number must be coordinated with the far-end switch. The originating modem must have this auto-dial number stored internally as part of the modem configuration routine. The far-end modem must be configured for auto-answer.

End of Procedure

Basic ISL implementation

Implement dedicated mode

Use Procedure 38 to configure basic ISL capability. It applies to analog TIE Trunks that are used as B-channels. When DTI/PRI trunks are also used, LD 17 digital loop (DLOP) and LD 73 (digital data block-DDB) must also be configured with the appropriate clocking and threshold settings.

The DCHI in this case uses the NTAK02 circuit card and does not support ISDN PRI signaling. The DCHI is reserved for ISL use only. The D-channel can communicate with the far-end by means of a dedicated leased line modem or dial-up modem.

For ISL dedicated mode using a dial-up modem, a 500 set, TIE Trunk route and member have to be configured (used for D-channel).

Procedure 38
Implementing dedicated mode

Configuring dedicated mode involves four major steps:

1. Configure the D-channel for ISL (LD 17).
2. Enable ISDN option (LD 15).
3. Enable the ISL option on a per route basis, assigning a D-channel for each route (LD 16).
4. Assign a channel identification to each trunk with the ISL option (LD 17).

LD 17 — Configuring the D-channel for ISL (Part 1 of 2)

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	CFN	Configuration data block.
ADAN	NEW DCH 0-79	Add primary D-channel.
CTYP	DCHI	D-channel card type.
CDNO	1-9 11-19 21-29 31-39 41-49	Card slot in which the card supporting the DCHI resides.
PORT	1	Must be set to 1.
USR	PRI	D-channel for ISDN PRI only.
IFC	SL1	Interface type.
DCHL	1-9	PRI card number (Must match entry for CDNO).
SIDE	NET (USR)	Net: network, the controlling switch. User: slave to controller.

LD 17 — Configuring the D-channel for ISL (Part 2 of 2)

Prompt	Response	Description
RLS	XX	Software release of far-end. This is the current software release of the far-end. If the far-end has an incompatible release of software, it prevents the sending of application messages, for example, Network Ring Again.
CLOK		D-channel clock type for signaling.
	EXT	Source of D-channel clock is external to DCHI card (in this case, the DTI/PRI circuit card). Normally, EXT is used for PRI/ISL. Do not confuse this clock with the E1 span Clock Controller found on the NTAK10/79. This clock is in reference to the DCHI synchronous mode of operation. Note: If directly connecting two DCHI ports without modems, set “CLOK” to “EXT” on one side and “INT” on the other.
LAPD	YES (NO)	Change LAPD parameters. Enter <cr> to leave timers at default value. The following timers are prompted only if LAPD is set to YES. The following can all be left at default during initial set-up.
T23	1-(20)-31	Interface guard timer checks how long the interface takes to respond. In units of 0.5 seconds (default 20 = 10 seconds).
T200	2-(3)-40	Retransmission timer in units of 0.5 seconds (default 3 = 1.5 seconds).
N200	1-(3)-8	Maximum number of retransmissions.
N201	4(260)	Maximum number of octets in information field.
K	1-(7)-32	Maximum number of outstanding unacknowledged frames (NAKS).

LD 73 — Configuring the D-channel for ISL

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	DDB	Digital data block.
TRSH	0-15	Assign a threshold set or table.
RALM	1-(3)-128	Yellow alarm 24-hour threshold.
BIPC	1-(2)-128	24-hour bit rate violation threshold.
LFAC	1-(3)-128	24-hour loss of frame alignment threshold.
BIPV	1-(3)-4 1-(2)-4	Bit rate (bipolar violation and CRC) monitoring limits for maintenance and out-of-service thresholds.
SRTK	1-(5)-24 1-(30)-3600	Frame slip-tracking-monitoring limits (in hours).
SRNT	1-(15)1024 1-(3)-1024	Non-tracking slip-rate monitoring maintenance and out-of-service thresholds.
LFAL	1-(17)-10240 1-(511)-10240	Loss of frame alignment monitoring limits.
SRIM	(1)-127	Slip rate improvement timer.
SRMM	1-(2)-127	Maximum number of times the slip rate exceeds the maintenance limit.

LD 15 — Enabling ISDN option (Part 1 of 2)

Prompt	Response	Description
REQ:	NEW CHG	Add new data. Change existing data.
TYPE:	NET	Networking data.
CUST	 0-99 0-31	Customer number For Large Systems For Small Systems and Succession 1000 systems
ISDN	YES	Customer is equipped with ISDN.
PNI	1-32700	Customer private network identifier. This number MUST be unique to this customer in the private network. It is used to as part of the setup message for feature operation such as Network Ring Again and Network ACD.
HNPA	NPA	Telephone area code for this system. Sent as part of setup message as calling line identification.
HNXX	NXX	Telephone local exchange code for this system. Sent as part of setup message as calling line identification.
HLOC	XXX	Home location code (NARS).
LSC	1-9999	One to four digit Local Steering Code established in the Coordinated Dialing Plan (CDP). The LSC prompt is required for Calling Line I.D. and Network ACD.
AC2		Access Code 2. Enter call types (type of number) that use access code 2. Multiple responses are permitted. This prompt only appears on NARS equipped systems. If a call type is not entered here, it is automatically defaulted to access code 1.
	NPA	E.164 National.

LD 15 — Enabling ISDN option (Part 2 of 2)

Prompt	Response	Description
	NXX	E.164 Subscriber.
	INTL	International.
	SPN	Special Number.
	LOC	Location Code.

LD 16 — Enabling ISL option on a per-route basis, assigning a D-channel for each route (Part 1 of 2)

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	RDB	Route data block.
CUST	 0-99 0-31	Customer number For Large Systems For Small Systems and Succession 1000 systems
ROUT	 0-511 0-127	Route number For Large Systems For Small Systems and Succession 1000 systems
TKTP	TIE	TIE Trunk route.
DTRK	YES/NO	Enter YES if this is a Digital Trunk Interface (DTI or PRI).
ISDN	YES	ISDN option.
MODE	ISLD	Route for ISL application.

LD 16 — Enabling ISL option on a per-route basis, assigning a D-channel for each route (Part 2 of 2)

Prompt	Response	Description
DCHI	XX	DCHI port number in CFN which carries the D-channel for this TIE Trunk route.
PNI	1-32700	Customer private network identifier. Must be the same as the CDB PNI at the far-end.
IFC		Interface type.
	SL1	Interface type
CTYP	<CR>	Call Type. Enter the call type to be associated with the outgoing route for direct dialing using the trunk access code (instead of NARS access code). See the *Software Input/Output: System Messages* (553-3001-411) for a list of valid responses.
INAC	YES	Insert Access Code. Permits the NARS AC1 or AC2 access code to be re-inserted automatically on an incoming ESN call.

LD 14 — Assigning a channel identification to each trunk with the ISL option (Part 1 of 2)

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	TIE	TIE Trunk type.
TN	l ch	Loop and channel for digital trunks

LD 14 — Assigning a channel identification to each trunk with the ISL option (Part 2 of 2)

Prompt	Response	Description
RTMB		Route number and Member number
	0-511 1-510	For Large Systems
	0-127 1-510	For Small Systems and Succession 1000 systems
CHID	1-192	Channel identifier for ISL channels (remove with Xnn) must be coordinated with far-end (no default value).

Implement shared mode

The same DTI/PRI software implementation sequence can be used as for Dedicated mode with the following exceptions:

LD 17

Prompt	Response	Description
USR	SHA	D-channel for ISL in “shared” mode, used for both ISDN PRI and ISL.
ISLM	1-192	Number of ISL B-channel (trunks) controlled by the D-channel (no default value).

LD 16

Prompt	Response	Description
IFC	SL1	Interface type must be SL1 (this is the only type supported for ISL).
MODE	ISLD	TIE route used for ISL members.
DCHI	0-15	DCHI port number.

LD 14

Prompt	Response	Description
CHID	1-192	Channel identifier for ISL channels. Must be coordinated with the far-end.

2.0 Mb DTI implementation

Contents

This section contains information on the following topics:

Overview

This chapter provides the information required to install the 2.0 Mb Digital Trunk Interface (DTI) card in a system. It includes information for:

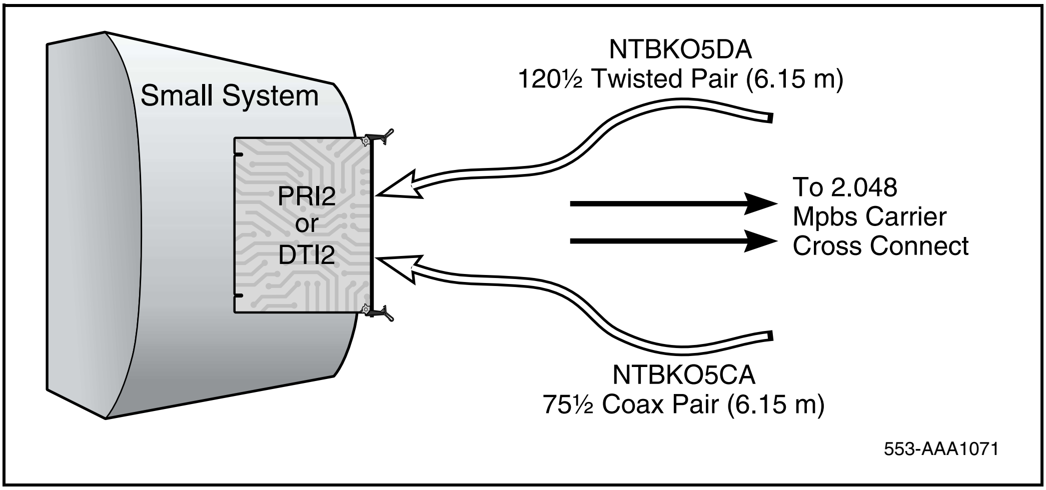
- hardware installation
- software implementation

Hardware requirements

Hardware requirements for 2.0 Mb DTI are as follows:

- 2.0 Mb DTI Circuit card - NTAK10
  (a Clock Controller is incorporated into the circuit card)
- CEPT Cable – NTBK05DA (120 ¾ twisted pair – 6.15 m length)
- CEPT Cable – NTBK05CA (75 ¾ coaxial – 6.15 m length)

Figure 82
2.0 Mb DTI cabling



NTAK10 2.0 Mb DTI card

The 2.0 Mb DTI card provides the physical interface for the digital E-1 carrier on the system. The card includes an on-board clock controller and is installed in slots 1 through 9 in the Option 11C Cabinet. On IP Expansion cabinets, it is placed in slots 11-19, 21-29, 31-39, 41-49 of the first, second, third, and fourth expansion cabinets, respectively.

For Succession 1000, it is placed in slots 11-14, 21-24, 31-34, 41-44 of the first, second, third and fourth Succession Media Gateways, respectively.

The NTAK10 2.0 Mb DTI card is also used for ISL shared mode applications.

For information on the NTAK10 faceplate LEDs, refer to *ISDN Primary Rate Interface: Maintenance* (553-3001-517).

Install DTI hardware

The NTAK10 circuit card is installed in card slot 1-9 in the Option 11C Cabinet. On IP Expansion cabinets, it is installed in slots 11-19, 21-29, 31-39, 41-49 of the first, second, third, and fourth expansion cabinets, respectively.

For Succession 1000, it is placed in slots 11-14, 21-24, 31-34, 41-44 of the first, second, third and fourth Succession Media Gateways, respectively.

The NTAK10 is installed only in the Succession Media Gateway. It is not supported in the Succession Media Gateway Expansion. Up to four digital trunk cards are supported in each Succession Media Gateway. The NTAK10 card is installed in Slots 1, 2, 3 and 4 of the Succession Media Gateway.

IMPORTANT!

Each Succession Media Gateway that has a digital trunk must have a clock controller set to an external reference clock.

Inspect the NTAK10 circuit card

Inspect the circuit card before installing it in the Option 11C Cabinet or Succession Media Gateway:

- Locate the NTAK10 2.0 Mb circuit card and carefully remove it from its packaging.
- Inspect the circuit card for any visible damage that occurred during shipping.

Set the switches

The NTAK10 incorporates four surface mounted dip switches. The following tables provide information on the various settings and related functions of these switches.

> ***Note:*** The ON position for all the switches is toward the bottom of the card. This is indicated by a white dot printed on the board adjacent to the bottom left corner of each individual switch.

Set the switches on the circuit card according to the requirements of your installation.

Switch S1 — Clock Controller (CC) configuration

This switch enables and disables the on-board Clock Controller (CC).

Table 84
Switch S1

Switch	Off (Up)	On (Down)
S1-1	Spare	Spare
S1-2	Clock Controller Enabled	Clock Controller Disabled

Switch S2 — Carrier impedance configuration

This switch sets the carrier impedance to either 120¾ or 75¾. Twisted pair cable is usually associated with 120¾. Coaxial cable is usually associated with the 75¾ setting.

Table 85
Switch S2

Switch	Off (Up)	On (Down)
S2-1	120¾	75¾
S2-2	75¾	120¾

Switch S3 — Mode of operation

This switch selects the operational mode for the NTAK10. The NTAK10 supports firmware that allows it to operate in the standard CEPT format mode or the modified CEPT format used in France.

Table 86
Switch S3

Switch	Off (Up)	On (Down)
S3-1	Non-French Firmware	French Firmware
S3-2	Spare	Spare

Switch S4 — Carrier shield grounding

This switch supports selective shield grounding of the Tx and/or Rx pairs of the carrier cable. Closing the switch (down position) applies Frame Ground (FGND) to the coaxial carrier cable shield, creating a 75¾ unbalanced configuration. The Tx and Rx pairs are referenced with respect to the 2.0 Mb DTI card that is, Rx is carrier received from the far-end device.

Table 87
Switch S4

Switch	Off (Up)	On (Down)
S4-1	Receive Shield Unconnected	Frame Ground on Receive Shield
S4-2	Transmit Shield Unconnected	Frame Ground on Transmit Shield

> ***Note:*** The usual method is to ground the outer conductor of the receive coax signal.

Insert the NTAK10

Install the circuit card in slots 1-9 in the Option 11C Cabinet, or in slots 11-19, 21-29, 31-39, 41-49 of the first, second, third, and fourth IP expansion cabinets, respectively.

For Succession 1000, it is placed in logical slots 11-14, 21-24, 31-34, 41-44 of the first, second, third and fourth Succession Media Gateways, respectively.

> ***Note:*** For Succession 1000, physical card slots are numbered 1-4 on the first, second, third and fourth Succession Media Gateways.

Secure the circuit card in the cabinet or Succession Media Gateway by locking the lock latch assemblies.

Procedure 39
Connecting the cables

1 In the cabling area, located directly below the card cage, remove the retaining bar that secures the MDF cables. Connect the NTBK05DA/CA interface cable to the 50-pin Amphenol connector below the card slot holding the NTAK10 2.0 Mb DTI circuit card. Re-install the retaining bar to secure the cable(s).

2 Terminate the NTBK05DA/CA carrier cable as required.

End of Procedure

NTBK05DA pinouts

The pinouts for the NTBK05DA cable are as follows:

Table 88
NTBK05DA pinouts

From: 50-pin MDF connector	To: 9-pin connector	Color	Signal
pin 23	pin 6	Black	R0
pin 48	pin 7	White	T0
pin 50	pin 9	Bare	R0/T0 FGND
pin 24	pin 2	Black	R1
pin 49	pin 3	Red	T1
pin 25	pin 5	Bare	R1/T1 FGND

NTBK05CA pinouts

The pinouts for the NTBK05CA cable are as follows:

Table 89
NTBK05CA pinouts

From: 50-pin MDF connector	To: Transmit coax connector	To: Receive coax connector	To: 50-pin MDF connector
pin 23	Inner conductor	—	—
pin 48	outer conductor	—	—
pin 24	—	Inner conductor	—
pin 49	—	outer conductor	—
pin 21	—	—	pin 49
pin 46	—	—	pin 48

DTI software implementation

The following procedure describes the process required to program basic 2.0 Mb DTI on the system main and IP expansion cabinets or Succession Media Gateways.

Task summary list

The following is a summary of the tasks in this section:

3 LD 17 — Adding a 2.0 Mb DTI card

4 LD 73 — Defining the 2.0 Mb DTI ABCD signaling bit tables

5 LD 73 — Defining the 2.0 Mb DTI pad tables

6 LD 73 — Defining the 2.0 Mb DTI timers

7 LD 73 — Defining the 2.0 Mb DTI system timers

8 LD 16 — Configuring the service routes

9 LD 14 — Defining the associated list of service trunks

LD 17 — Adding a 2.0 Mb DTI card

Prompt	Response	Description
REQ	CHG	Change.
TYPE	CEQU	Common equipment.
...		
DTI2	xx	Enter a card slot number for 2.0 Mb DTI.

LD 73 — Defining the 2.0 Mb DTI ABCD signaling bit tables (Part 1 of 8)

Prompt	Response	Description
REQ	NEW CHG	Add or change Digital Trunk Interface data block.
TYPE	DTI2	2.0 Mb/s DTI data block.
FEAT	ABCD	ABCD bit signaling category.
SICA	2-16	Signaling category.
...		
DFLT	(1)-16	Default signaling category used for default values JDMI defaults to 16 with <CR>[3].
Incoming/Outgoing Calls:		
IDLE(S)	abcd	(Send) idle signal bits.
IDLE(R)	abcd	(Receive) idle signal bits.
FALT(S)	abcd	(Send) bits. 2.0 Mb DTI out-of-service.

LD 73 — Defining the 2.0 Mb DTI ABCD signaling bit tables (Part 2 of 8)

Prompt	Response	Description
	N	If FALT (send) signal not required.
FALT(R)	abcd	(Receive) bits. 2.0 Mb DTI out-of-service.
	N	If FALT (receive) signal not required.
Incoming Calls:		
SEZ(R)	abcd	Seize signal (send or receive) for voice or data calls from or to a non-SL-1.
SEZD(R)	abcd	Seize signal (send or receive) for data calls between SL-1s.
	N	If SEZD(R) signal not required.
SEZV(R)	abcd	Seize signal (send or receive) for voice calls.
	N	If SEZV(R) signals not required.
P CALL(R)	abcd	(Receive) signal sent during seize by an incoming CO trunk.
TIME	ON OFF	Length of pulse time on, and time off. (default 2 seconds on, 8 seconds off)
SEZA(S)	abcd	Seize signal acknowledgment (send).
	N	If SEZA(S) signal not required.
P WNKS(S)	abcd	Wink start (corresponds to a pulsed seize acknowledgment). Prompted when SEZA(S) not required.
	N	If WNKS(S) signal not required.
TIME	10-(220)-630	Time for WNKS(S) signal in milliseconds.
P DIGT(R)	abcd	(Receive) decadic pulses.
	N	If DIGT(R) not required.
NRCV(S)	abcd	Number received signal (send).

LD 73 — Defining the 2.0 Mb DTI ABCD signaling bit tables (Part 3 of 8)

Prompt	Response	Description
	N	If NRCV(S) signal not required.
P EOSF(S)	abcd	End of selection free (send).
	N	If EOSF(S) not required.
TIME	(100)-150	Time for EOSF(S) in milliseconds.
P EOSB(S)	abcd	End of selection busy (send).
	N	If EOSB(S) not required.
TIME	(100)-150	Time for EOSB(S) in milliseconds.
P OPCA(R)	abcd	Operator calling time (receive) signal.
	N	If OPCA(R) not required.
TIME	64-(128)-192	Time of OPCA(R) pulse in milliseconds.
REPT	(1)-5	Number of OPCA(R) pulses.
CONN(S)	abcd	Connect send.
CONN(R)	abcd	Connect receive.
P RRC(S)	abcd	Register recall (send) signal. Activated by Malicious Call Trace.
	N	If RRC(S) not required.
TIME	10-(100)-150	Time of RRC(S) signal in milliseconds.
P BURS(S)	abcd	Bring up receiver (send). Uses switch-hook flash timer for timer.
	N	If BURS(S) not required.
P BURS(R)	abcd	Bring up receiver (receive). Uses switch-hook flash timer for timer.

LD 73 — Defining the 2.0 Mb DTI ABCD signaling bit tables (Part 4 of 8)

Prompt	Response	Description
	N	If BURS(R) not required.
TIME	64-(128)-192	Length of BURS(R) pulse in milliseconds.
P CAS(S)	abcd	CAS Flash. Same timing as analogue trunks. ***Note:*** Prompted for JDMI only. Operational only if CASM package equipped.
	N	If CAS(S) not required.
CLRB(S)	abcd	Clearback (send) signal.
	N	If CLRB(S) not required (IDLE signal is used).
P RCTL(S)	abcd	Release control (send) signal.
	N	If RCTL(S) not required. ***Note:*** Prompted only when CLRB is unused or is defined the same as IDLE.
TIME	100-(150)-300	Time value is stored in multiples of 10 milliseconds.
R RCOD(S)	abcd	Release Control Originating party Disconnect. This signal is another pulsed SL-1 signal sent on incoming trunks when the originating party disconnects first.
	N	If RCOD(S) not required.
TIME	150	Timer value in milliseconds is fixed.
P OPRS(R)	abcd	Operator (receive) manual recall signal.
	N	If OPRS(R) not required.

LD 73 — Defining the 2.0 Mb DTI ABCD signaling bit tables (Part 5 of 8)

Prompt	Response	Description
TIME	xxx yyy	Minimum and maximum time range for OPRS(R) in milliseconds. xxx = 8-(48)-2040 yyy = xxx-(128)-2040
P NXFR(S)	abcd	Network transfer signal (send) pulse. Pulse time not variable.
	N	If NXFR(S) not required.
P ESNW(S)	abcd	ESN wink signal (send) pulse. Pulse time not variable.
	N	If ESNW(S) not required.
P CAS(S)	abcd	Centralized Attendant signal (send) pulse. Pulse time not variable. ***Note:*** Prompted for 2.0 Mb DTI only.
	N	If CAS(S) not required.
CLRF(R)	abcd	Clear forward (receive).
	N	If CLRF(R) not required.
SOSI	abcd	Special operator signal defined.
	(N)	Undefined. Prompted when OPRC = N.
Outgoing Calls:		
SEZA(S)	abcd	Seize acknowledgement
SEZD(S)	abcd	Seize acknowledgement and (send) data signal.
	N	If SEZD(S) not required.
SEZV(S)	abcd	Seize acknowledgement and (send) voice signal. Only recommended for Meridian to M-1 applications.

LD 73 — Defining the 2.0 Mb DTI ABCD signaling bit tables (Part 6 of 8)

Prompt	Response	Description
TIME	xxx yyy	Minimum and maximum time range for OPRS(R) in milliseconds. xxx = 8-(48)-2040 yyy = xxx-(128)-2040
	N	If SEZV(S) not required.
SEZA(R)	abcd	Seize acknowledgment (receive) signal.
	N	If SEZA(R) not required.
P WNKS(R)	abcd	Wink start pulsed seize acknowledgment (receive) signal.
	N	If P WNKS(R) not required.
TIME	20-(140)-500, 20-(290)-500	Minimum and maximum length of WNKS(R) pulse in milliseconds.
P EOS(R)	abcd	End of selection (receive) signal.
	N	If EOS(R) not required.
TIME	(64)-320 64-(256)-320	Length of EOS(R) pulse stored in multiples of 8 milliseconds.
CONN(S)	abcd	Connect send.
CONN(R)	abcd	Connect receive.
P OPRC(R)	abcd	Operator recall signal for special services. minimum three pulses of 160 milliseconds each.
	N	If OPRC(R) not required.
P BURS(S)	abcd	Bring up receiver (send) for L1 networking.
	N	If BURS(S) not required.
P BURS(R)	abcd	Bring up receiver (receive) for L1 networking.

LD 73 — Defining the 2.0 Mb DTI ABCD signaling bit tables (Part 7 of 8)

Prompt	Response	Description
	N	If BURS(R) not required.
TIME	64-(128)-192	Length of BURS(R) pulse in milliseconds.
	N	If SEZV(S) not required.
P CAS(R)	abcd	CAS Flash. Same timing as analogue trunks. Prompted for JDMI only. Operational only if CASR package equipped.
	N	If CAS(R) not required.
CLRB(R)	abcd	Clear back.
	N	If CLRB(R) not required, when IDLE is used.
P RCTL(R)	abcd	Release control. Prompted only when CLRB is unused or is defined the same as IDLE.
	N	If RCTL(R) not required.
TIME	96-(128)-320 96-(256)-320	Time value stored in multiples of 8 milliseconds.
P NXFR(R)	abcd	Network transfer.
	N	If not required.
P ESNW(R)	abcd	ESN wink signal.
	N	If ESNW(R) not required.
P CAS(R)	abcd	Centralized attendant service signal. 2.0 Mb DTI only [3].
	N	If CAS(R) not required.
CLRF(S)	abcd	Clear forward (send).
	N	If CLRF(S) not required.

LD 73 — Defining the 2.0 Mb DTI ABCD signaling bit tables (Part 8 of 8)

Prompt	Response	Description
TIME	(0)	800 milliseconds. ***Note:*** Prompted when the abcd bits entered in response to the CLFR(S) prompt are different from the abcd bits of the IDLE signal.
SOSO	abcd (N)	Special operator signal defined (undefined). ***Note:*** Prompted when OPRC = N.

LD 73 — Defining the 2.0 Mb DTI pad tables (Part 1 of 4)

Prompt	Response	Description
REQ	NEW CHG	Add or change Digital Trunk Interface data block.
TYPE	DTI2	2.0 Mb DTI.
FEAT	PAD	Request the digital pad feature.
PDCA	1-16	PAD Category table. If one channel is using the specified table, then the command is aborted. Cannot modify or delete Table 1.
TNLS	YES (NO)	TN List. This is for the print command only. A YES response means that a list of the trunk TNs using the requested PAD category tables are printed after the table.
DFLT	(1)-16	For NEW only. The table is used for default values.

LD 73 — Defining the 2.0 Mb DTI pad tables (Part 2 of 4)

Prompt	Response	Description
The following prompts define the pad levels. The receiving pad code is *r* and the transmission pad code is *t*. These entries have the range 0-15. The pad values (in decibels) relating to these codes are shown after this table.		
ONP	r t	On-premises extension.
OPX	r t	Off-premises extension.
DTT	r t	Digital TIE trunks.
SDTT	r t	Digital Satellite TIE trunks.
NTC	r t	Nontransmission compensated.
TRC	r t	Transmission compensated.
DCO	r t	Digital COT, FEX, WAT, and DID trunks.
VNL	r t	Via Net Loss.
DTO	r t	2.0 Mb DTI digital TOLL office trunks.
ACO	r t	AnalogCO or WATS trunks.
AFX	r t	Analog FEX trunks.
ADD	r t	Analog DID trunks.
SATT	r t	Analog satellite TIE trunks.
TNLS	YES (NO)	TN List. This is for the print command only. A YES response means that a list of the trunk TNs using the requested PAD category tables are printed after the table.
DFLT	(1)-16	For NEW only. The table is used for default values.

LD 73 — Defining the 2.0 Mb DTI pad tables (Part 3 of 4)

Prompt	Response	Description
The following prompts define the pad levels. The receiving pad code is *r* and the transmission pad code is *t*. These entries have the range 0-15. The pad values (in decibels) relating to these codes are shown after this table.		
ONP	r t	On-premises extension.
OPX	r t	Off-premises extension.
TNLS	YES (NO)	TN List. This is for the print command only. A YES response means that a list of the trunk TNs using the requested PAD category tables are printed after the table.
DFLT	(1)-16	For NEW only. The table is used for default values.
The following prompts define the pad levels. The receiving pad code is *r* and the transmission pad code is *t*. These entries have the range 0-15. The pad values (in decibels) relating to these codes are shown after this table.		
ONP	r t	On-premises extension.
OPX	r t	Off-premises extension.
DTT	r t	Digital TIE trunks.
SDTT	r t	Digital Satellite TIE trunks.
NTC	r t	Nontransmission compensated.
TRC	r t	Transmission compensated.
DCO	r t	digital COT, FEX, WAT, and DID trunks.
VNL	r t	Via Net Loss.
DTO	r t	2.0 Mb DTI digital TOLL office trunks.
ACO	r t	Analog CO or WATS trunks.

LD 73 — Defining the 2.0 Mb DTI pad tables (Part 4 of 4)

Prompt	Response	Description
AFX	r t	Analog FEX trunks.
ADD	r t	Analog DID trunks.
SATT	r t	Analog satellite TIE trunks.
ATO	r t	Analog TOLL office trunks.
DTI2	r t	2.0 Mb DTI trunk (Prompted only if the 1.5/2.0 Mb Gateway feature is equipped and TYPE=DTI2).
XUT	r t	Analog CO trunk (Prompted only if the 1.5/2.0 Mb Gateway feature is equipped and TYPE=DTI2).
XEM	r t	Analog TIE trunk (Prompted only if the 1.5/2.0 Mb Gateway feature is equipped and TYPE=DTI2).

The following pads are available for the 2.0 Mb DTI card. Their respective codes are also given. Positive dB represents loss and negative dB represents gain.

Table 90
2.0 Mb DTI pads

code	0	1	2	3	4	5	6	7
value (dB)	0.0	+1.0	+2.0	+3.0	+4.0	+5.0	+6.0	+7.0
code	8	9	10	11	12	13	14	15
value (dB)	+8.0	+9.0	+10.0	+11.0	+12.0	+13.0	+14.0	-1
code	16	17	18	19	20	21	22	23
value (dB)	-2	-3	-4	-5	-6	-7	-8	-9
code	24	25	26					
value (dB)	-10	idle	+0.6					

LD 73 — Defining the 2.0 Mb DTI timers (Part 1 of 2)

Prompt	Response	Description
REQ	NEW CHG	Add or Change Digital Trunk Interface data block
TYPE	DTI2	2.0 Mb DTI
FEAT	LPTI	Set the timers used for a 2.0 Mb DTI
LOOP	xx	2.0 Mb DTI card slot number. xx = 1-9 in Main Cabinet. xx = 11-19, 21-29, 31-39, 41-49 in IP expansion cabinets 1-4, respectively. xx = 11-14, 21-24, 31-34, 41-44 of the first, second, third and fourth Succession Media Gateways, respectively.
P DIGT (S)	abcd	Digit pulse timing from TDS (Bits P, X or U are selectable)

LD 73 — Defining the 2.0 Mb DTI timers (Part 2 of 2)

Prompt	Response	Description
	N	If DIGT(S) signal not required
P METR(R)	abcd	Metering (receive). Bits P, X or U. Only two P bits allowed. COT and DID trunks only. ***Note:*** PPM package must be enabled.
	N	If METR(R) signal not required
EDGE	0	PPM bit counted when changed from 1 to 0.
	1	PPM bit counted when changed from 0 to 1.
TIME	40-(240)-480	Maximum time METR signal is in milliseconds.
SASU	0-(1920)-8064	Seize acknowledge supervision period in milliseconds. 2.0 Mb DTI default = 1920
MFAO	YES (NO) <CR>	DTI card will or will not set bit 3 of timeslot 0 if loss of Multiframe Alignment Signal (MFAS) occurs. 2.0 Mb DTI default = NO <cr> = no change is required
SZNI	YES (NO)	PSTN incoming seizure during lockout of MFAS and far-end fault states allowed (denied)
MFF	CRC	Multiframe format - Cyclic Redundancy Check (CRC 4)
	(AFF)	Alternative Frame Format ***Note:*** Prompted for Small Systems and Succession 1000 only.

The following prompts and associated responses define the grade of service timers for the DTI card. Group I problems are treated individually. They are bipolar violations, bit error rate (frame alignment) slips, and CRC-4 errors.

Group II problems are treated as a group. They are bit 3 of TS0 (far-end out of service), bit 6 of TS16 (far-end lost multiframe alignment), AIS (alarm indication signal), loss of frame alignment, and loss of multiframe alignment.

Responses are interpreted as follows:

- mt = Maintenance threshold time.
- ct = New call suppression (hardware service removal) threshold time.
- ot = Out of service threshold time.
- dt = No new data calls suppression threshold time.

Each of the response times are expressed as follows:

- nnnY = time in milliseconds where nnnn = 20-5000 (input to nearest 20 milliseconds.)
- nnnS = time in seconds where nnn = 1-240

- nnnM = time in minutes where nnn = 1-240
- nnH = time in hours where nn = 1-24

LD 73 — Defining the grade of service timers for the DTI card (Part 1 of 2)

Prompt	Response	Description
CRC	NC mt dt ct ot	Cyclic redundancy check error counts. NC = Error count values are in the range 1-255. mt = Maintenance threshold time (MNT). dt = No new data calls threshold time (NNDC). ct = No new calls threshold time (NNC). ot = Out of service threshold time (OOS). ***Note:*** The following requirements must be met for input. mt = Maintenance threshold is equal to or greater than dt. dt = Data calls threshold is equal to or greater than ct. ct = Calls threshold is equal to or greater than ot.
BPV	NB mt dt ct ot	Bipolar violation error counts. NB = Error count values are in the range 1-255. mt = Maintenance threshold time (MNT). dt = No new data calls threshold time (NNDC). ct = No new calls threshold time (NNC). ot = Out of service threshold time (OOS). ***Note:*** The following requirements must be met for this input: mt = >dt = >ct = >ot.
FAP	NF mt dt ct ot	Frame alignment problem thresholds. NF = Error count values are in the range 1-255. mt = Maintenance threshold time (MNT). dt = No new data calls threshold time (NNDC). ct = No new calls threshold time (NNC). ot = Out of service threshold time ***Note:*** The following requirements must be met for this input: mt = >dt = >ct = >ot.

LD 73 — Defining the grade of service timers for the DTI card (Part 2 of 2)

Prompt	Response	Description
SLP	NS mt dt ct ot	Maintenance threshold slip count. NS = Error count values are in the range 1-255. mt = Maintenance threshold time (MNT). dt = No new data calls threshold time (NNDC). ct = No new calls threshold time (NNC). ot = Out of service threshold time (OOS).
GP2	T2 mt dt ct ot	Group 2 error thresholds. This is the maximum amount of time that can occur before software checks the associated thresholds of 120 to 32640 msec and rounds it to the closest multiple of 128 msec. T2 error count values are in the range 1-(20)-255. NC = Error count values are in the range 1-255. mt = Maintenance threshold time (MNT). dt = No new data calls threshold time (NNDC). ct = No new calls threshold time (NNC). ot = Out of service threshold time (OOS). ***Note:*** The following requirements must be met for this input: mt = >dt = >ct = >ot.
FRFW	YES (NO)	This 2.0 Mb DTI card is (is not) equipped with special Firmware for France.

LD 73 — Defining the 2.0 Mb DTI system timers (Part 1 of 3)

Prompt	Response	Description
REQ	NEW CHG	Add or Change Digital Trunk Interface data block.
TYPE	DTI2	2.0 Mb DTI.
FEAT	SYTI	Change the switch timers and counters for 2.0 Mb DTI. There is only one such block per switch.

LD 73 — Defining the 2.0 Mb DTI system timers (Part 2 of 3)

Prompt	Response	Description
MAND	0-(15)-1440	Maintenance guard time in minutes.
NCSD	0-(15)-1440 1S-59S	New call suppression guard time in minutes and seconds.
OSGD	0-(15)-1440	Out-of-service guard time in minutes.
OOSC	0-(5)-127	Out-of-service occurrences since midnight (DTI disabled).
PERS	0-(100)-254	Persistence timer in milliseconds for far-end problems.
DBNC	(10)-32	Debounce timer in milliseconds.
CCO	xx	Card slot number for Clock Controller 0.
	<CR>	No change for defaults.
	X	To remove clock controller data.
PREF CCO	xx	Card number of PRI/DTI/SILC containing the primary clock reference for the main cabinet
SREF CCO	xx	Card number of PRI/DTI/SILC containing the primary clock reference for the main cabinet
CC1	xx	Card number for Clock Controller 1.
PREF CC1	xx	Primary Reference DTI/PRI loop for Clock controller one.
SREF CC1	xx	Primary Reference DTI/PRI loop for Clock controller one.
CC2	xx	Card number for Clock Controller 2.
PREF CC2	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
SREF CC2	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
CC3	xx	Card number for Clock Controller 3.

LD 73 — Defining the 2.0 Mb DTI system timers (Part 3 of 3)

Prompt	Response	Description
PREF CC3	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
SREF CC3	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
CC4	xx	Card number for Clock Controller 4.
PREF CC4	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
CCGD	0-(15)-1440	Clock controller free run guard time in minutes.
CCAR	0-(15)	Clock controller audit rate. The time, in minutes, between normal CC audits. Only programmable on units equipped with 2-Mb DTI. ***Note 1:*** The clock controller prompts only appear for clocks which are valid for the machine type being configured. The prompts only appear if the system is in a valid state for the definition of the 2.0 Mb DTI clock controller data that is, the DTI clock references must be unused or in a free-run mode. ***Note 2:*** Before programming clock controller references, the QPC775 clock controller card(s) must be plugged in, and the switches on the system's QPC441 3 Port Extender must be appropriately set. Otherwise, the PREF and SREF prompts are not given.

LD 16 — Configuring the service routes (Part 1 of 3)

Prompt	Response	Description
REQ	NEW CHG	Add or Change Route data block.
TYPE	RDB	Route data block.
CUST	xx	Customer number, as defined in LD 15
ROUT	 0-511 0-127	Route number For Large Systems For Small Systems and Succession 1000 systems
TKTP		Service routes allowed with ISDN.
	TIE COT DID	TIE trunk route. Central office trunk. Direct Inward Dial trunk.
RCLS	(EXT) INT	Class marked route as Internal or External.
DTRK	 (NO) YES	Digital trunk route. Analog. Digital.
DGTP	DTI2	Select a digital trunk type of 2.0 Mb DTI.
...		
NCNA	YES (NO)	Network Call Name is (is not) allowed.
NCRD	YES (NO)	Network Call Redirection. Allows network call redirection messages to be sent (or blocks messages if NCRD=no).

LD 16 — Configuring the service routes (Part 2 of 3)

Prompt	Response	Description
PTYP		Port type at far-end:
		Analog TIE trunk routes:
	(ATT)	Analog TIE trunk.
	AST	Analogue satellite system TIE trunk or ESN satellite Meridian SL-1 TIE trunk.
	AOT	Analogue TIE trunk, used instead of ATT whenever the system has one or more digital satellite trunk routes (DST) to any digital satellite system which includes OPX sets.
		Digital TIE trunk routes:
	(DTT)	Digital TIE trunk.
	DCT	Combination digital TIE trunk.
	DST	Digital satellite system TIE trunk.
AUTO	YES (NO)	Auto-terminate must be NO if response to DSEL is VOD.
ICOG	IAO	Incoming and outgoing trunk.
	ICT	Incoming trunk.
	OGT	Outgoing trunk.
SRCH	(LIN) RRB	Linear search, or round-robin search, used for outgoing trunks.
ACOD	xxxx	Trunk route access code.
TARG	1-15	Trunk access restriction group for routes.
OABS	0-9	Outgoing digit(s) to be absorbed.
INST	(0)-999	Digits to be inserted.
CNTL	(NO) YES	Changes to controls or timers.
NEDC		Near-end disconnect control.
	ETH	Either end control.

LD 16 — Configuring the service routes (Part 3 of 3)

Prompt	Response	Description
	ORG	Originating end control. Default for TIE, ATVN, DID, and CCSA trunk types.
FEDC		Far-end disconnect control.
	ETH	Either end.
	FEC	Far-end.
	JNT	Joint.
	(ORG)	Originating end.
DLTN	YES (NO)	Dial tone on originating calls.
TIMER	(30)-240	Network Ring Again duration timer time is in minutes. ***Note:*** Package 148, Advanced ISDN Features, is required.

LD 14 — Defining the associated list of service trunks (Part 1 of 3)

Prompt	Response	Description
REQ	NEW CHG	Add or Change Trunk data block.
TYPE	TIE COT DID	TIE trunk route. Central Office trunk data block. Direct Inward Dial trunk data block.
CHID	1-382	Channel ID for this trunk.
TN	l ch	Loop and channel for digital trunks

LD 14 — Defining the associated list of service trunks (Part 2 of 3)

Prompt	Response	Description
TOTN	s c	New card slot and channel, where: • s = 1-9 DTI2 card slot number (Option 11C main cabinet) s = 11-19 DTI2 card slot number (IP expansion cabinet 1) s = 21-29 DTI2 card slot number (IP expansion cabinet 2) s = 31-39 DTI2 card slot number (IP expansion cabinet 3) s = 41-49 DTI2 card slot number (IP expansion cabinet 4) • For Succession 1000: s = 11-14 DTI2 card slot number (Succession Media Gateway 1) s = 21-24 DTI2 card slot number (Succession Media Gateway 2) s = 31-34 DTI2 card slot number (Succession Media Gateway 3) s = 41-44 DTI2 card slot number (Succession Media Gateway 4) • c = 1-30, 2.0 Mb DTI channel
PDCA	(1) - 16	Pad Category Number. This prompt is given if the card is a 2.0 Mb DTI card, or if the card is a 2.0 Mb DTI card and the 1.5/2.0 Mb Gateway feature is equipped. For 2 to 16, the pad category used must already be defined in LD 73.
PCML	(MU) A	System PCM law. Prompted if the card is 2.0 Mb DTI, or if the card is a 2.0 Mb DTI card and the 2.0 Mb Gateway feature is equipped. MU, the default, was entered in the PCML prompt in LD 17.
CUST	xx	Customer number, as defined LD 15
NCOS		Network class-of-service group number:
	0-3	CDP
	0-7	BARS/NFCR
	0-15	NARS

LD 14 — Defining the associated list of service trunks (Part 3 of 3)

Prompt	Response	Description
RTMB		Route number and Member number
	0-511 1-510	For Large Systems
	0-127 1-510	For Small Systems and Succession 1000 systems
NITE	xxxx	Night-service directory number.
TGAR	(0)-15	Trunk group access restriction.
CLS		Class-of-service restrictions. Note: If DIP option is selected, a new SLCA table must be defined in LD 73.

2.0 Mb PRI implementation

Contents

This section contains information on the following topics:

Overview

This chapter provides the information required to install 2.0 Mb PRI on a system. It includes information about hardware installation and software implementation.

Hardware requirements

Circuit cards

To implement 2.0 Mb PRI, an NTAK79 or an NTBK50 PRI card plus associated daughterboards is required.

Table 91
2.0 Mb PRI hardware requirement (Part 1 of 2)

Circuit card	Description
NTBK50	2.0 Mb PRI circuit card. Supports the NTAK20 clock controller daughterboard and a D-channel handler interface daughterboard (NTAK93 DCHI or NTBK51 DDCH).
NTAK79	2.0 Mb PRI circuit card. Supports an on-board clock controller and an on-board D-channel handler interface.
NTAK20	Clock-controller daughterboard. The system supports only one active clock controller per system or IP expansion cabinet. ***Note:*** Every cabinet or Succession Media Gateway that contains a digital trunk must contain a clock controller. Connects to the NTBK50 PRI card.

Table 91
2.0 Mb PRI hardware requirement (Part 2 of 2)

Circuit card	Description
NTAK93	D-channel-handler interface (DCHI) daughterboard. Connects to the NTBK50 PRI card.
NTBK51	Downloadable D-channel daughterboard (DDCH). Connects to the NTBK50 PRI card.

Cables

One of the following cables is required for a PRI connection:

- CEPT Cable - NTBK05DA (120 ¾ twisted pair—6.15 m length), or
- CEPT Cable - NTBK05CA (75 ¾ coaxial—6.15 m length)

Hardware description

2.0 Mb PRI cards

Two PRI cards are available on the system:

- NTAK79 2.0 Mb PRI card
- NTBK50 2.0 Mb PRI card

The difference between the two PRI cards is that the NTBK50, when equipped with the NTBK51 D-channel daughterboard, can download software onto the card. This feature is based on the MSDL platform and essentially replaces the D-channel circuit on the NTAK79 PRI card. (The NTAK79 PRI card does not support the NTBK51 Downloadable D-channel handler daughterboard.)

A second difference between the NTAK79 and NTBK50 2.0 Mb PRI cards is that the NTAK79 has an on-board clock controller while the NTBK50 supports the NTAK20 clock controller daughterboard.

> ***Note:*** If the NTAK93 D-channel daughterboard is attached to the NTBK50 PRI card instead of the NTBK51 Downloadable D-channel daughterboard, the NTBK50 PRI card functions in the same manner as the NTAK79 PRI card.

NTAK79 2.0 Mb PRI circuit card

The 2.0 Mb Primary Rate Interface card provides the physical interface for the digital E-1 carrier on the system. The card includes an on-board clock controller and on-board D-channel handler. It is installed in slots 1-9 in the main cabinet. On IP Expansion cabinets, it is installed in slots 11-19, 21-29, 31-39, 41-49 of the first, second, third, and fourth expansion cabinets, respectively.

For Succession 1000, it is installed in slots 11-14, 21-24, 31-34, 41-44 of the first, second, third and fourth Succession Media Gateways, respectively.

For information on the NTAK79 faceplate LEDs, refer to *ISDN Primary Rate Interface: Maintenance* (553-3001-517).

NTBK50 2.0 Mb PRI circuit card

The 2.0 Mb Primary Rate Interface card provides the physical interface for the digital E-1 carrier on the system. The card is installed in slots 1-9 in the main cabinet or Succession Media Gateway. On IP Expansion cabinets, it is installed in slots 11-19, 21-29, 31-39, 41-49 of the first, second, third, and fourth expansion cabinets, respectively.

For Succession 1000, it is installed in slots 11-14, 21-24, 31-34, 41-44 of the first, second, third and fourth Succession Media Gateways, respectively.

Note: For Succession 1000, the NTAK79 card and NTBK50 cards are installed only in the Succession Media Gateway. They are not supported in the Succession Media Gateway Expansion.

IMPORTANT!
Each Succession Media Gateway that has a digital trunk must have a clock controller set to an external reference clock.

Note: Clocking slips can occur between Succession Media Gateways that are clocked from different COs, if the COs are not synchronized. The slips can degrade voice quality.

The NTBK50 supports the following clock controller and D-channel handler daughterboards:

- NTAK20 clock controller daughterboard
- NTAK93 D-channel handler daughterboard, or NTBK51 Downloadable D-channel daughterboard.

If the NTAK93 D-channel daughterboard is attached, the NTBK50 PRI card functions in the same manner as the NTAK79 PRI card. If the NTBK51 D-channel daughterboard is attached, software is downloaded to the card instead of residing in a D-channel circuit.

For information on the NTBK50 faceplate LEDs, refer to *ISDN Primary Rate Interface: Maintenance* (553-3001-517).

NTAK20 Clock Controller (CC) daughterboard

The NTAK20 Clock Controller daughterboard is used with the NTBK50 2.0 Mb PRI card. The NTAK79 PRI card has an *on-board* clock controller.

Digital Trunking requires synchronized clocking so that a shift in one clock source results in an equivalent shift of the same size and direction in all parts of the network. On systems, synchronization is accomplished with the NTAK20 clock controller circuit card.

IMPORTANT!

Every Small System cabinet or Succession Media Gateway that contains a digital trunk must contain a clock controller. If a Small System is equipped with digital trunks, Nortel Networks recommends that at least one digital trunk is placed in the Small System main cabinet.

The Clock Controller circuitry synchronizes the system to an external reference clock, and generates and distributes the clock to the system. The system can function either as a slave to an external clock or as a clocking master. The NTAK20AB version of the clock controller meets AT&T Stratum 3 and Bell Canada Node Category D specifications. The NTAK20BB version meets CCITT stratum 4 specifications.

Shelf slot assignment

On non-CISPR B system cabinets, the NTAK20 is placed in slots 1-9. On cabinets NTAK11Dx and NTAK11Fx, the active NTAK20 is placed in slots 1-3 (slots 4-10 cannot be used.) On IP Expansion cabinets, the NTAK20 is placed in slots 11-19, 21-29, 31-39, 41-49 of the first, second, third, and fourth expansion cabinets, respectively.

For Succession 1000, it is installed in slots 11-14, 21-24, 31-34, 41-44 of the first, second, third and fourth Succession Media Gateways, respectively.

> ***Note:*** For Succession 1000, physical card slots are numbered 1-4 on the first, second, third and fourth Succession Media Gateway.

NTAK93 D-Channel Handler Interface (DCHI) daughterboard

The NTAK93 DCHI daughterboard interfaces with the system Central Processing Unit (CPU) and mounts on the NTBK50 PRI card for PRI (but not ISL) applications. The equivalent circuit resides on-board the NTAK79 2.0 Mb PRI card. The DTI/PRI digital trunk card is installed in the Succession 1000 Media Gateway. Digital trunk cards are not supported in Media Gateway Expansions.

The DCHI is responsible for performing the Q.921 layer 2 protocol information. It transfers layer 3 signaling information between two adjacent network switches.

The NTAK93 DCH daughterboard, when installed on the NTBK50 circuit card, is addressed in the same slot as the NTBK50.

A minimum of one NTAK93 is required for each PRI link. If more than one PRI link connects to the same end location, a single DCHI circuit card can support up to a maximum of sixteen PRI connections for the system. This allows for the support of 495 B-Channels or PRI trunks.

NTBK51 Downloadable D-Channel (DDCH) daughterboard

The NTBK51 DDCH daughterboard interfaces with the system Central Processing Unit (CPU) and mounts on the NTBK50 2.0 Mb PRI circuit card for PRI D-Channel applications.

For Succession 1000, it is installed in slots 11-14, 21-24, 31-34, 41-44 of the first, second, third and fourth Succession Media Gateways, respectively.

Digital trunk cards are not supported in Succession Media Gateway Expansions.

The DDCH is equivalent to the MSDL card on larger systems, but it only supports D-channel applications (no SDI or ESDI).

The NTBK51 DDCH daughterboard, when installed on the NTBK50 circuit card, is addressed in the same slot as the NTBK50.

A minimum of one NTBK51 is required for each PRI link. If more than one PRI link connects to the same end location, a single DDCH circuit card can support up to a maximum of 16 PRI connections for the system. This enables support for 495 B-channels or PRI trunks.

Install the NTAK79 PRI card

The steps required to install PRI are as follows:

1 Inspect the PRI card.

2 Set the switches on the PRI card.

3 Insert the PRI card in slots 1-9 of the Small System main cabinet, or in slots 11-19, 21-29, 31-39, 41-49 of the first, second, third, and fourth Expansion cabinets, respectively.

4 For Succession 1000, it is installed in slots 11-14, 21-24, 31-34, 41-44 of the first, second, third and fourth Succession Media Gateway, respectively.

5 Connect the cables.

Each step is described in the pages that follow. The PRI hardware installation procedure is the same regardless of the type of system at the far-end that is, another system such as the AXE-10, or SYS-12.

Inspect the NTAK79 circuit card

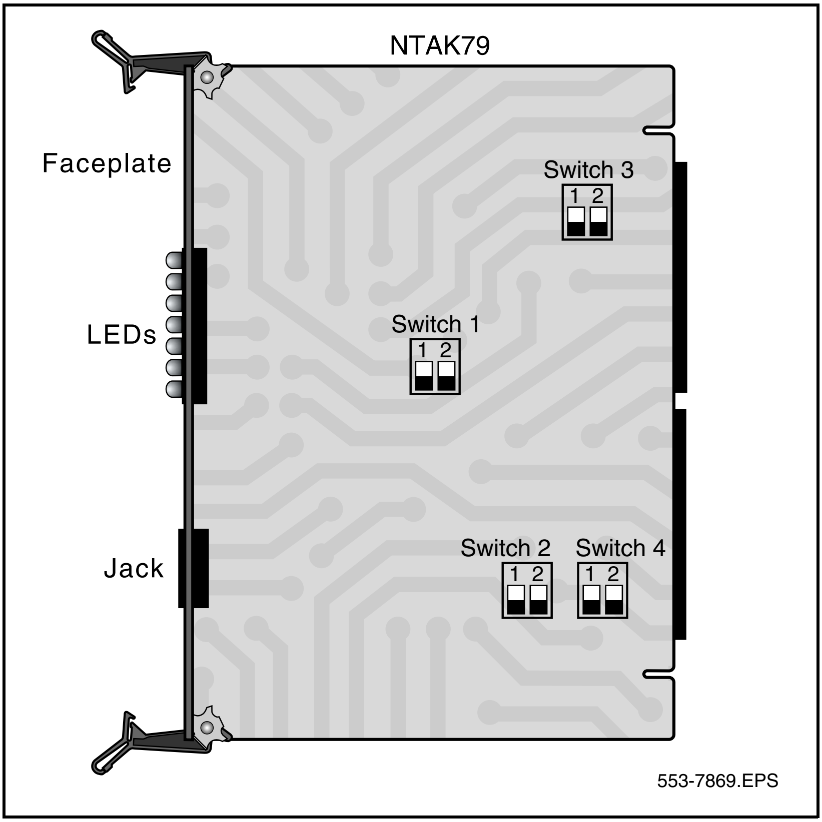
- Locate the NTAK79 2.0 Mb circuit card and carefully remove it from its packaging.
- Inspect the circuit card for any visible damage that occurred during shipping.

Set the switches on the NTAK79

The NTAK79 incorporates four on-board dip switches. The tables that follow provide information on the various settings and related functions of these switches.

Note: The ON position for all the switches is positioned toward the bottom of the card. This is indicated by a white dot printed on the board adjacent to the bottom left corner of each individual switch.

Figure 83
NTAK79 with switch locations



Set the switches on the circuit card according to the requirements of your specific installation:

Switch SW1 — DCHI configuration

This switch enables and disables the on-board DCHI and sets the operating mode of the DCHI.

For the U.K., use DPNSS1 mode. For all other countries, use Q.931 mode.

Table 92
Switch SW1

Switch	Down (On)	Up (Off)
SW 1-1	enable DCHI	disable DCHI
SW 1-2	DPNSS1/DASS2	Q.931

Switch SW2 — Carrier impedance configuration

This switch sets the carrier impedance to either 120¾ or 75¾. Twisted pair cable is usually associated with 120¾. Coaxial cable is usually associated with the 75¾ setting.

Table 93
Switch SW2

Cable Type	SW 2-1	SW 2-2
75¾	Up (Off)	Down (On)
120¾	Down (On)	Up (Off)

Switch SW3 — Clock controller configuration

This switch enables and hardware disables the on-board Clock Controller. SW 3-2 should be disabled if the on-board clock controller is not in use.

Table 94
Switch SW3

Switch	Down (On)	Up (Off)	Note
SW 3-1	—	—	Spare
SW 3-2	Disabled	Enabled	

Switch SW4 — Carrier shield grounding

This switch allows for the selective grounding of the Tx/Rx pairs of the carrier cable. Closing the switch (down position) applies Frame Ground (FGND) to the coaxial carrier cable shield, creating a 75¾ unbalanced configuration. This applies only to the NTBK05CA cable.

Table 95
Switch SW4

Switch	Down (On)	Up (Off)
SW 4-1	Rx—FGND	Rx—OPEN
SW 4-2	Tx—FGND	Tx—OPEN

Note: The usual method is to ground the outer conductor of the receive coax signal.

Insert the NTAK79

Slide the circuit card into card slot 1-9 in the Small System main cabinet, or in slots 11-19, 21-29, 31-39, 41-49 of the first, second, third, and fourth IP Expansion cabinets, respectively.

For Succession 1000, it is installed in slots 11-14, 21-24, 31-34, 41-44 of the first, second, third and fourth Succession Media Gateway, respectively.

Secure the circuit card in the cabinet by locking the lock latch assemblies. The card number associated with a 2.0 Mb PRI card is based on the slot in which the card is installed.

Procedure 40
Connecting the cables

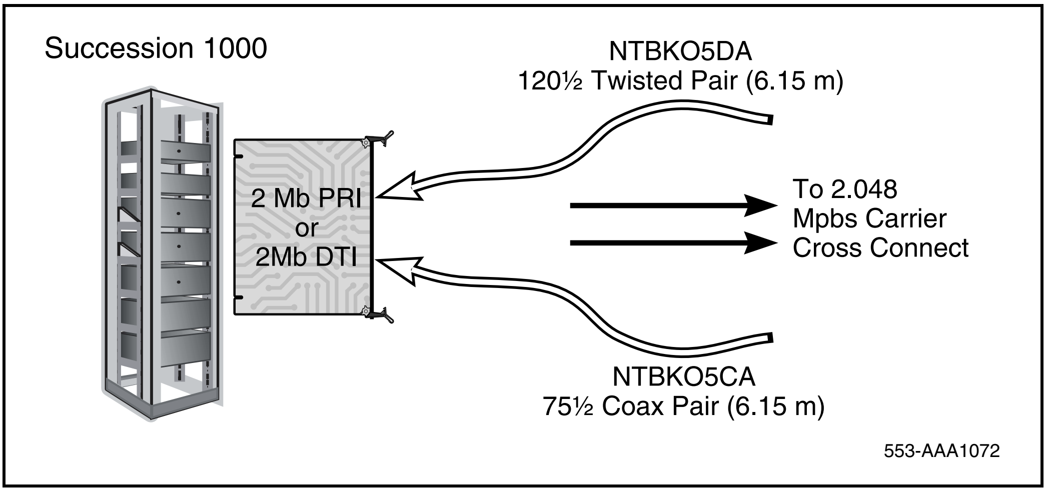
Follow the instructions below to connect cables to the NTAK79 PRI card. Also refer to Figure 84.

1 In the cabling area, located directly below the card cage, remove the retaining bar that secures the MDF cables. Connect the NTBK05DA/CA interface cable to the 50-pin Amphenol connector below the slot in which the NTAK79 is installed. Re-install the retaining bar to secure the cable(s) in place.

2 Terminate the NTBK05DA/CA carrier cable as required.

End of Procedure

Figure 84
NTAK79 cabling



NTBK05DA pinouts

The pinouts for the NTBK05DA cable are as follows:

Table 96
NTBK05DA pinouts

From: 50-pin MDF connector	To: 9-pin connector	Colour	Signal
pin 23	pin 6	Black	R0
pin 48	pin 7	White	T0
pin 50	pin 9	Bare	R0/T0 FGND
pin 24	pin 2	Black	R1
pin 49	pin 3	Red	T1
pin 25	pin 5	Bare	R1/T1 FGND

NTBK05CA pinouts

The pinouts for the NTBK05CA cable are as follows:

Table 97
NTBK05CA pinouts

From: 50-pin MDF connector	To: Transmit coax connector	To: Receive coax connector	To: 50-pin MDF connector
pin 23	Inner conductor	—	—
pin 48	outer conductor	—	—
pin 24	—	Inner conductor	—
pin 49	—	outer conductor	—
pin 21	—	—	pin 49
pin 46	—	—	pin 48

Install the NTBK50 PRI card

The NTBK50 serves as a motherboard to the NTAK20 clock controller, and either the NTBK51 Downloadable D-channel handler or the NTAK93 D-channel handler.

The steps required to install PRI are as follows:

1. Inspect the PRI card and daughterboards.
2. Set the switches on the PRI card.
3. Mount the daughterboard(s) on the PRI card.
4. Insert the PRI card in the Small System main cabinet or Succession Media Gateway and any IP expansion cabinets.
5. Connect the cables.

Each step is described in the pages that follow. The PRI hardware installation procedure is the same regardless of the type of system at the far-end.

Procedure 41
Inspecting the NTBK50 circuit card

1 Locate the NTBK50 2.0 Mb circuit card plus associated daughterboard(s) and carefully remove them from their packaging.

2 Inspect the circuit cards for any visible damage that occurred during shipping.

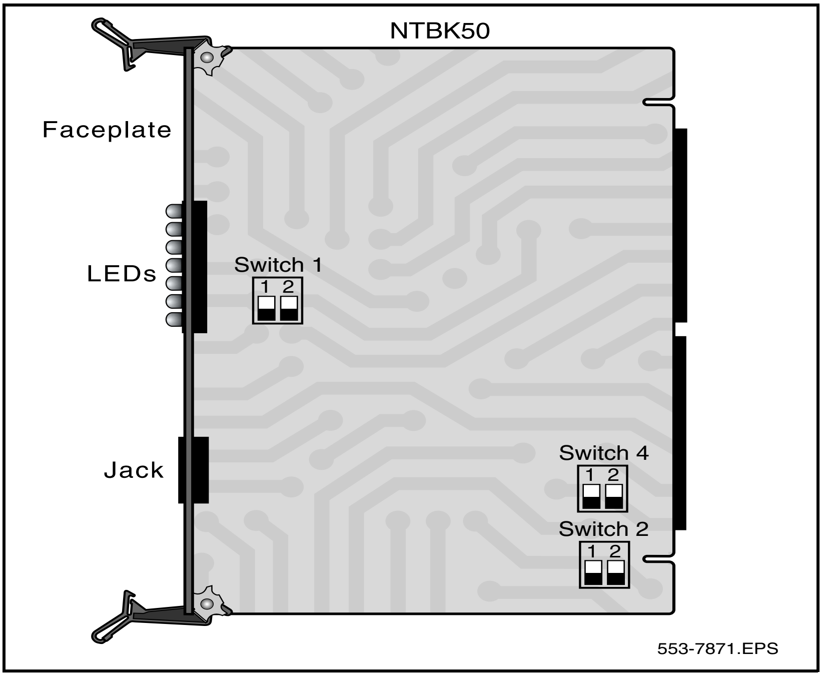
End of Procedure

Set the switches on the NTBK50

The NTBK50 incorporates three on-board dip switches. The following tables provide information on the various settings and related functions of these switches.

> ***Note:*** The ON position for all the switches is positioned toward the bottom of the card. This is indicated by a white dot printed on the board adjacent to the bottom left corner of each switch.

Figure 85
NTBK50 with switch locations



Set the switches on the circuit card according to the requirements of your installation.

Switch SW1 — DCHI configuration (NTAK93 only)

This switch enables and disables the DCHI and sets the operating mode of the DCHI. It is only used if an NTAK93 D-channel handler daughterboard is being used. It has no effect when using the NTBK51 DDCH daughterboard.

For the U.K., use DPNSS1 mode. For all other countries, use Q.931 mode.

Table 98
Switch SW1

Switch	Down (On)	Up (Off)
SW 1-1	—	—
SW 1-2	DPNSS1/DASS2	Q.931

Switch SW2 — Carrier impedance configuration

This switch sets the carrier impedance to either 120¾ or 75¾. Twisted pair cable is usually associated with 120¾. Coaxial cable is usually associated with the 75¾ setting.

Table 99
Switch SW2

Cable type	SW 2-1
75¾	Down (On)
120¾	Up (Off)

Switch SW4 — Carrier shield grounding

This switch supports the selective grounding of Tx and Rx pairs of carrier cable. Closing the switch (down position) applies Frame Ground (FGND) to the coaxial carrier cable shield, creating a 75¾ unbalanced configuration. This applies only to the NTBK05CA cable.

Table 100
Switch SW3

Switch	Down (On)	Up (Off)
SW 4-1	Rx—FGND	Rx—OPEN
SW 4-2	Tx—FGND	Tx—OPEN

Note: The usual method is to ground the outer conductor of the receive coax signal.

Mount the daughterboards on the NTBK50

Use the following procedure to mount and remove the NTAK20 CC and the NTBK51 DDCH or NTAK93 DCHI daughterboards onto the NTBK50 PRI.

Install the NTAK93 or NTBK51 daughterboard before the NTAK20 daughterboard. Work on a flat surface when mounting or removing daughterboards.

1 Visually inspect the connector pins on the underside of the daughterboard. Realign any bent pins prior to mounting.

2 Place the NTBK50 down flat on an anti-static pad.

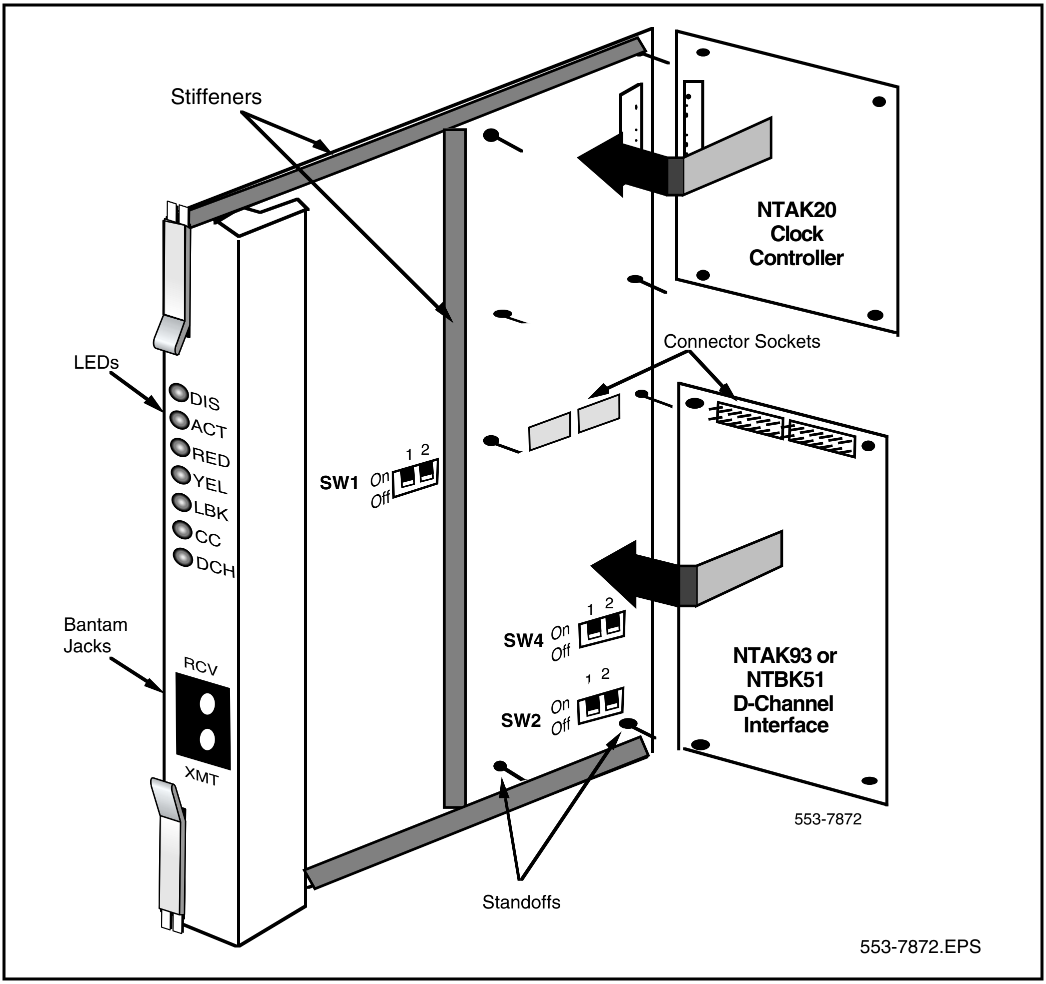
3 From an overhead view, with the daughterboard parallel above the NTBK50 and the connector pins aligned over the connector sockets, align the mounting holes on the daughterboard with the tops of the standoffs on the NTBK50 (see Figure 86 on page 352).

4 Slowly lower the daughterboard toward the NTBK50, keeping the standoffs in line with all four holes, until the holes rest atop the four standoffs.

If more than slight pressure is required at this point, the connector pins might not be aligned with the connector socket. If so, lift the daughterboard off the NTBK50 and return to step 2.

5 Gently apply pressure along the edge of the board where the connector is located until the standoffs at the two corners adjacent to the connector snap into a locked position. Then press down on the two corners on the opposite side until they lock into place.

Figure 86
Daughterboard installation



Remove the daughterboards from the NTBK50

Use these guidelines to remove the NTAK20 and NTBK51 or NTAK93 from the NTBK50 PRI card. Because of the physical layout of the mother and daughterboards, the NTAK20 should be removed before the NTAK93 or NTBK51.

1 Starting at the two corners opposite the connector, gently lift each corner out of the locking groove of the standoff.

2 At the two corners adjacent to the connector, gently lift the entire side until the mounting holes are clear of the locking groove of the standoff.

3 To remove the connector pins, grasp the edge of the board adjacent to the connector and lift gently.

If more than one NTBK50 card is installed, the additional cards may not carry daughterboards, depending on system configuration. At least one NTAK20 (per system) is always required.

Insert the NTBK50

Slide the circuit card into card slot 1-9 in the Small System main cabinet, or in slots 11-19, 21-29, 31-39, 41-49 of the first, second, third, and fourth IP expansion cabinets, respectively.

For Succession 1000, it is installed in slots 11-14, 21-24, 31-34, 41-44 of the first, second, third and fourth Succession Media Gateway, respectively.

> ***Note:*** For Succession 1000, physical card slots are numbered 1-4 on the first, second, third and fourth Succession Media Gateways.

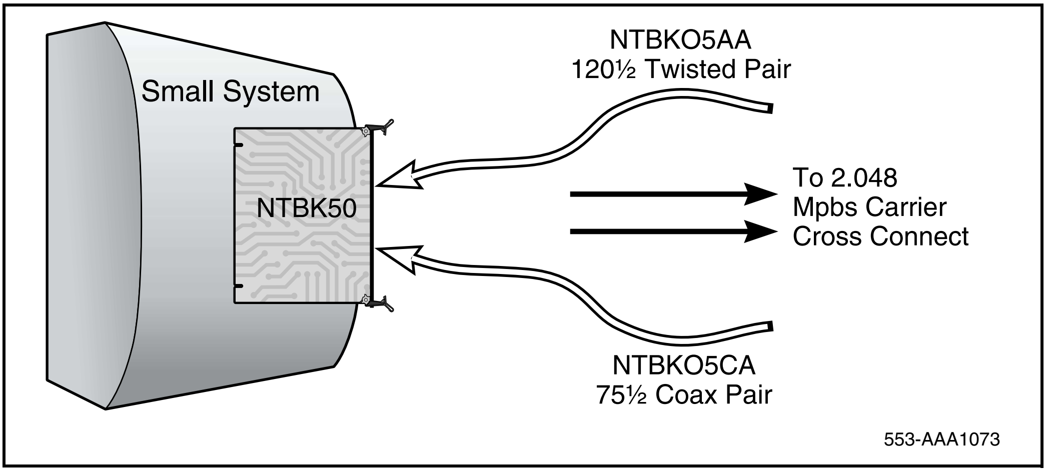
Secure the circuit card in the cabinet by locking the lock latch assemblies. The card number associated with a 2.0 Mb PRI card is based on the slot in which the card is installed.

Connect the cables

Follow the instructions below to connect cables to the NTBK50 PRI card. Also refer to Figure 87.

- In the cabling area, located directly below the card cage, remove the retaining bar that secures the MDF cables. Connect the NTBK05DA/CA interface cable to the 50-pin Amphenol connector below the slot in which the NTBK50 is installed. Re-install the retaining bar to secure the cable(s) in place.
- Terminate the NTBK05DA/CA carrier cable as required.

Figure 87
NTBK50 cabling



NTBK05DA pinouts

The pinouts for the NTBK05DA cable are as follows:

Table 101
NTBK05DA pinouts

From: 50-pin MDF connector	To: 9-pin connector	Colour	Signal
pin 23	pin 6	Black	R0
pin 48	pin 7	White	T0
pin 50	pin 9	Bare	R0/T0 FGND
pin 24	pin 2	Black	R1
pin 49	pin 3	Red	T1
pin 25	pin 5	Bare	R1/T1 FGND

NTBK05CA pinouts

The pinouts for the NTBK05CA cable are as follows:

Table 102
NTBK05CA pinouts

From: 50-pin MDF connector	To: Transmit coax connector	To: Receive coax connector	To: 50-pin MDF connector
pin 23	Inner conductor	—	—
pin 48	outer conductor	—	—
pin 24	—	Inner conductor	—
pin 49	—	outer conductor	—
pin 21	—	—	pin 49
pin 46	—	—	pin 48

PRI software implementation

The following information describes the process required to program basic 2.0 Mb PRI on the system.

PRI cards must be configured before defining the DCH links or PRI applications.

Prompts which do not show a response are left as default. For more information on any of these prompts, refer to *Software Input/Output: Administration* (553-3001-311).

Task summary

> ***Note:*** Before installing PRI cards in IP expansion cabinets or Succession Media Gateways, configure them for IP connectivity. Refer to LD 117 in the *Software Input/Output: Maintenance* (553-3001-511) for further information.

The following is a summary of the tasks in this section:

1 LD 17 — Adding a PRI card

2 LD 17 — Adding a DCHI or DDCH

3 LD 15 — Defining a PRI customer

4 LD 16 — Defining a PRI service route

5 LD 14 — Defining service channels and PRI trunks

6 LD 73 — Defining system timers and clock controller parameters

7 LD 73 — Defining PRI parameters and thresholds

8 LD 73 — Changing trunk pad category values

LD 17 — Adding a PRI card (Part 1 of 2)

Prompt	Response	Description
REQ	CHG	Change data.
TYPE	CFN	Configuration data block.

LD 17 — Adding a PRI card (Part 2 of 2)

Prompt	Response	Description
CEQU	YES	Changes to common equipment.
PRI2	xx	The PRI2 digital card number, where: xx = 1-9 (Option 11C main cabinet), 11-19 (IP expansion cabinet 1), 21-29 (IP expansion cabinet 2), 31-39 (IP expansion cabinet 3), 41-49 (IP expansion cabinet 4.) xx = 11-14, 21-24, 31-34, 41-44 of the first, second, third and fourth Succession Media Gateways, respectively.

LD 17 — Adding a DCHI or DDCH (Part 1 of 3)

Prompt	Response	Description
REQ	CHG	Change data.
TYPE	CFN	Configuration data block.
ADAN	NEW DCH xx CHG DCH xx OUT DCH xx	Add a primary D-channel (any unused SDI port.) Change a primary D-channel. Out the primary D-channel, where: xx = 1-9 for Option 11C main cabinet, 11-19 for IP expansion cabinet 1, 21-29 for IP expansion cabinet 2, 31-39 for IP expansion cabinet 3, and 41-49 for IP expansion cabinet 4. xx = 11-14, 21-24, 31-34, 41-44 of the first, second, third and fourth Succession Media Gateways, respectively.
CTYP	MSDL TMDI	Card type where: MSDL = The NTBK51BA Downloadable D-Channel Daughterboard. TMDI = TMDI (NTRB21) card.

LD 17 — Adding a DCHI or DDCH (Part 2 of 3)

Prompt	Response	Description
CDNO	1-50	Card slot number used as the primary DDCH/DCHI. Card slots 10, 20, 30, 40, and 50 are only applicable for D-channel configuration of ISL or VNS.
PORT	1	PORT set to "1".
USR	PRI	D-channel is for ISDN PRI only. ***Note:*** 2.0 Mb only supports PRI or SHA user mode.
IFC	xx	Interface type.
DCHL	xx	PRI card number carries the D-channel. Must match entry made for the "CDNO" associated with the "DCHI" prompt above. Where: xx = 1-9 for Option 11C main cabinet, 11-19 for IP expansion cabinet 1, 21-29 for IP expansion cabinet 2, 31-39 for IP expansion cabinet 3, and 41-49 for IP expansion cabinet 4. xx = 11-14, 21-24, 31-34, 41-44 of the first, second, third and fourth Succession Media Gateways, respectively.
PRI2	<CR>	Additional PRI Loops controlled by this DCHI. Remember one DCHI can control up to 16 PRI loops going to the same destination. For the system, the maximum limit is eight loops.
OTBF	1-(16)-127	Number of output request buffers. Note: for a single PRI link, leave this prompt at default (16). Add 5 output request buffers per additional link.
SIDE	NET (USR)	Prompted only if IFC is set to SL1. NET = network, the controlling switch USR = slave to the controller

LD 17 — Adding a DCHI or DDCH (Part 3 of 3)

Prompt	Response	Description
RLS	XX	Software release of far-end. This is the current software release of the far-end. If the far-end has an incompatible release of software, it prevents the sending of application messages, for example, ‘Network Ring Again.
RCAP	MSL	MSDL RCAP capability.
OVLR	<CR>	Allow or disallow overlap receiving on a D-channel. Default is NO.
LAPD	YES (NO)	Change LAPD parameters. Enter carriage return if timers are left at default. The following timers are prompted only if LAPD is set to YES. They are all left at default during initial set-up.
- T23	1-(20)-31	Interface guard timer checks how long the interface takes to respond. In units of 0.5 seconds (default 20 = 10 seconds).
T200	2-(3)-40	Retransmission timer in units of 0.5 seconds (default 3 = 1.5 seconds).
- N200	1-(3)-8	Maximum number of retransmissions.
- N201	4(260)	Maximum number of octets in information field.
- K	1-(7)-32	Maximum number of outstanding unacknowledged frames (NAKS).

LD 15 — Defining a PRI customer (Part 1 of 3)

Prompt	Response	Description
REQ:	NEW CHG	Add new data. Change existing data.
TYPE:	NET	Networking data.

LD 15 — Defining a PRI customer (Part 2 of 3)

Prompt	Response	Description
CUST		Customer number
	0-99	For Large Systems
	0-31	For Small Systems and Succession 1000 systems
LDN	XXXX	Enter the customer's Listed Directory Number.
AC2		Access Code 2. Enter call types (type of number) that use access code 2. Multiple responses are permitted. This prompt only appears on NARS equipped systems. If a call type is not entered here, it automatically defaults to access code 1.
	NPA	E.164 National.
	NXX	E.164 Subscriber.
	INTL	International.
	SPN	Special Number.
	LOC	Location Code.
ISDN	YES	Customer is equipped with ISDN.
PNI	1-32700	Customer private network identifier. This number is unique to this customer in the private network. For example, it is used as part of the setup message for feature operation such as Network Ring Again and Network ACD. Note that if PNI is set to zero (0), NRAG and NACD does not work.
HNPA	NPA	Telephone area code for this system. Sent in the setup message as calling line identification.
HNXX	NXX	Telephone local exchange code for this system. Sent in the setup message as calling line identification.

LD 15 — Defining a PRI customer (Part 3 of 3)

Prompt	Response	Description
HLOC	XXX	Home location code (NARS)
LSC	1-9999	One to four digit Local Steering Code established in the Coordinated Dialing Plan (CDP). The LSC prompt is required for Calling Line ID and Network ACD.

LD 16 — Defining a PRI service route (Part 1 of 2)

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	RDB	Route data block.
TKTP	xxx	Trunk type.
DTRK	YES	Digital trunk route.
DGPT	PRI2	2.0 Mb PRI. Prompted only if PRA = YES in LD15.
ISDN	YES	ISDN option.
MODE	PRI	Route used for PRI only.
PNI	1-32700	Customer private network identifier. Is the same as the CDB PNI at far-end.
IFC	xx	Interface type.
CHTY	BCH	Signaling type. Prompted if DTRK is YES. D-channel signaling for B-channels.

LD 16 — Defining a PRI service route (Part 2 of 2)

Prompt	Response	Description
CTYP	aaa <CR>	Call Type. Enter the call type to associate with the outgoing route for direct dialing using the trunk access code (instead of NARS access code).
INAC	YES	Insert Access Code. Permits the NARS AC1 or AC2 access code to be re-inserted automatically on an incoming ESN call. This prompt only appears on a TIE route and is set to "YES" for features such as Network ACD to function. On an existing ESN network, setting this prompt to "YES" may also require modifying the Digit Manipulation Index (DMI) associated with this route at the far-end (so the Access Code is not re-inserted twice). The INSERT prompt (INST) is bypassed if INAC = YES.

LD 14 — Defining service channels and PRI trunks

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data. ***Note:*** When assigning several members at once use the multiple create command NEW XX.
TYPE	TIE	TIE trunk only, allowed between MSL-1.
TN	l ch	Loop and channel for digital trunks
RTMB	 0-511 1-510 0-127 1-510	Route number and Member number For Large Systems For Small Systems and Succession 1000 systems
...		

LD 73 — Defining system timers and clock controller parameters (Part 1 of 2)

Prompt	Response	Description
REQ	CHG	Change data.
TYPE	PRI2	2.0 Mb PRI.
FEAT	SYTI	System timers.
CCO	xx	Card slot number for Clock Controller 0.
PREF CCO	xx	Card number of PRI/DTI/SILC containing the primary clock reference for the main cabinet
SREF CCO	xx	Card number of PRI/DTI/SILC containing the primary clock reference for the main cabinet
CC1	xx	Card number for Clock Controller 1.
PREF CC1	xx	Primary Reference DTI/PRI loop for Clock controller one.
SREF CC1	xx	Primary Reference DTI/PRI loop for Clock controller one.
CC2	xx	Card number for Clock Controller 2.
PREF CC2	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
SREF CC2	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
CC3	xx	Card number for Clock Controller 3.
PREF CC3	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
SREF CC3	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
CC4	xx	Card number for Clock Controller 4.

LD 73 — Defining system timers and clock controller parameters (Part 2 of 2)

Prompt	Response	Description
PREF CC4	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
SREF CC4	xx	Card number of PRI/DTI/SILC or DTI2/PRI2/SILC containing the primary clock reference.
CCAR	0-(15)	Clock Controller Audit Rate. Enter the time (in minutes) between normal CC audits.

LD 73 — Defining PRI parameters and thresholds (Part 1 of 3)

Prompt	Response	Description
REQ	CHG	Change data.
TYPE	PRI2	2.0 Mb PRI.
FEAT	LPTI	Loop timers.
LOOP	X	X is the slot number of the 2.0 Mb PRI card.
MFF	AFF (CRC)	Alternate mode or CRC multi-frame mode.
ALRM	(REG) ALT	Default or alternate alarms selected.
G10S		
SLP	mc mt oc ot	Slip error count. Where: mc = Maintenance threshold slip count, 1- (5)-255. mt = Maintenance threshold time, default 24 hours. oc = Out-of-service threshold slip count, 1-(30)-255. ot = Out-of-service threshold time, default 1 hour.

LD 73 — Defining PRI parameters and thresholds (Part 2 of 3)

Prompt	Response	Description
BPV	n1 n2	Bipolar violation error count. Range is 1-(128)-255 for n1, 1-(122)-255 for n2. Where: n1 is multiplied by 16 to obtain the actual count, giving an actual count range of 16-4080.
CRC	n1 n2	Cyclic redundancy check error count. Range is 1-(201)-255 for n1, 1-(97)-255 for n2. Where: n1 is multiplied by 4 to obtain the actual count, giving an actual count range of 4-1020.
FAP	n1 n2	Frame alignment problem error count. Range is 1-(28)-255 for n1, (1)-255 for n2.
RATS	1-(10)-15	Number of seconds firmware has to check BPV/CRC/FAP for excessive error rate.
GP2	T2 mt dt ct ot	Group 2 error thresholds. This is the maximum amount of time that can elapse before software checks the associated thresholds of 120 to 32,640 msec and rounds it to the closest multiple of 128 msec. Where: T2 = Error count values are in the range 1-(20)-255. mt = Maintenance threshold time (MNT)(default =100S). dt = No new data calls threshold time (NNDC)(default =12S). ct = No new calls threshold time (NNC)(default =12S). ot = Out of service threshold time (OOS)(default =4S).

LD 73 — Defining PRI parameters and thresholds (Part 3 of 3)

Prompt	Response	Description
		Note 1: The following requirements must be met for input mt = >dt = >ct = >ot. ***Note 2:*** Threshold times are one of the following: nnnnT, nnnS, nnnM, or nnH, where nnnn is and integer and T,S,M, or H show the increments of use. The values are as follows: -nnnnT is the time in 20 millisecond increments (nnnn = 20-5000) - nnnS is the time in 1 second increments (nnn= 1-240) - nnnM is the time in 1 minute increments (nnn= 1-240) - nnH is the time in 1 hour increments (nn= 1-24)
MNG1	nnnM	Maintenance Guard time Group 1, default = 15M.
NCG1	nnnM	No New Calls Guard time Group 1, default = 15M.
OSG1	nnnM	Out Of Service Guard time Group 1, default = 15M.
MNG2	nnnS	Maintenance Guard time Group 2, default = 15S.
NCG2	nnnS	No New Calls Guard time Group 2, default = 15S.
OSG2	nnnS	Out Of Service Guard time Group 2, default = 15S.
PERS	ttt	Persistence Timer for Group II problems. Enter 0-256 msec in increments of 2 msec. Default is 50 (=100ms).
CLRS	ttt	Clearance Timer for Group II problems. Enter 0 - 256 msec in increments of 2 msec. Default is 50 (=100ms).
OOSC	nnn	Out-of-Service Counter. Range for nnn of 0-255 with a default of 5.

LD 73 — Changing trunk pad category values (Part 1 of 2)

Prompt	Response	Description
REQ	CHG	Change data.
TYPE	PRI2	2.0 Mb PRI.
FEAT	PADS	
PDCA	#	PAD table-0 is default and is hard coded.
The following prompts define the pad levels. The receiving pad code is *r* and the transmission pad code is *t*. These entries have the range 0-15. The pad values (in decibels) relating to these codes are shown after this table.		
ONP	r t	On-premises extension.
DSET	r t	Meridian Digital set. Prompted only if the 2.0 Mb Gateway feature is equipped.
OPX	r t	Off-premises extension.
DTT	r t	Digital TIE trunks.
SDTT	r t	Digital Satellite TIE trunks.
NTC	r t	Nontransmission compensated.
TRC	r t	Transmission compensated.
DCO	r t	Digital COT, FEX, WAT, and DID trunks.
VNL	r t	Via Net Loss.
DTO	r t	2.0 Mb PRI2 digital TOLL office trunks.
ACO	r t	Analog CO or WATS trunks.
AFX	r t	Analog FEX trunks.
ADD	r t	Analog DID trunks.

LD 73 — Changing trunk pad category values (Part 2 of 2)

Prompt	Response	Description
SATT	r t	Analog satellite TIE trunks.
ATO	r t	Analog TOLL office trunks.
PRI2	r t	2.0 Mb PRI trunk. Prompted only if the 1.5/2.0 Mb Gateway feature is equipped and TYPE=2.0 Mb PRI.
XUT	r t	Analog CO trunk. Prompted only if the 1.5/2.0 Mb Gateway feature is equipped and TYPE=PRI2.
XEM	r t	Analog TIE trunk. Prompted only if the 1.5/2.0 Mb Gateway feature is equipped and TYPE=PRI2.

Table 103 shows the pads available to 2.0 Mb PRI. Positive dB represents loss and negative dB represents gain.

Table 103
Pad values

code	0	1	2	3	4	5	6	7
value (dB)	0.0	+1.0	+2.0	+3.0	+4.0	+5.0	+6.0	+7.0
code	8	9	10	11	12	13	14	15
value (dB)	+8.0	+9.0	+10.0	+11.0	+12.0	+13.0	+14.0	-1
code	16	17	18	19	20	21	22	23
value (dB)	-2	-3	-4	-5	-6	-7	-8	-9
code	24	25	26					
value (dB)	-10	idle	+0.6					

Configure DPNSS1 with IP expansion cabinets/Succession Media Gateways

For Small Systems, when configuring a PRI2 card slot number for DPNSS1, the response to the DDCS prompt in LD 17 is: 1-9 (Option 11C Cabinet), 11-19 (IP expansion cabinet 1), 21-29 (IP expansion cabinet 2), 31-39 (IP expansion cabinet 3), 41-49 (IP expansion cabinet 4).

For Succession 1000, the response is: 11-14, 21-24, 31-34, 41-44 for the first, second, third and fourth Succession Media Gateways, respectively.

Configure ISDN BRI trunking with IP expansion cabinets/ Succession Media Gateways

For Small Systems, when configuring the MISP card slot number for ISDN BRI trunking in LD 27, the response to the LOOP prompt is: 1-9 (Option 11C Cabinet), 11-19 (IP expansion cabinet 1), 21-29 (IP expansion cabinet 2), 31-39 (IP expansion cabinet 3), 41-49 (IP expansion cabinet 4).

For Succession 1000, the response is: 11-14, 21-24, 31-34, 41-44 for the first, second, third and fourth Succession Media Gateways, respectively.

For Small Systems, when configuring the DSL for ISDN BRI trunking in LD 27, the response to the MISP prompt is: 1-9 (Option 11C Cabinet), 11-19 (IP expansion cabinet 1), 21-29 (IP expansion cabinet 2), 31-39 (IP expansion cabinet 3), 41-49 (IP expansion cabinet 4).

For Succession 1000, the response is: 11-14, 21-24, 31-34, 41-44 for the first, second, third and fourth Succession Media Gateways, respectively.

2.0 Mb ISL implementation

Contents

This section contains information on the following topics:

Overview

This chapter provides the information required to implement ISL on the system including:

- hardware and software installation
- implementation of components needed to provide basic call service

ISDN features are treated separately in the chapter devoted to ISDN feature implementation.

This chapter assumes that ESN implementation is already in place. It also assumes that the reader has a basic understanding of NARS and CDP.

Two modes of ISL are available: shared and dedicated. This chapter covers ISL installation in dedicated mode using dedicated and leased lines. Shared mode installations are done according to the instructions supplied for PRI, with the noted exceptions.

ISL hardware requirements

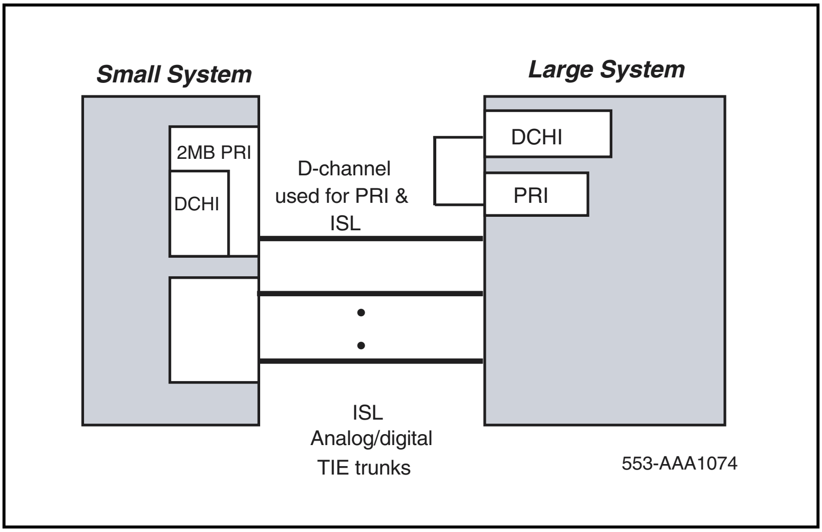
ISL, regardless of the operation mode, uses analog or digital TIE lines as B-channels.

ISL in shared mode

In shared mode, PRI hardware is required in addition to the existing TIE lines interface cards.

- NT8D15 Analog trunk card(s)
- NTAK02 SDI/DCH, NTAK10 2.0 Mb DTI, NTAK79 2.0 Mb PRI, or NTBK50 2.0 Mb PRI card(s)

Figure 88
ISL in shared mode



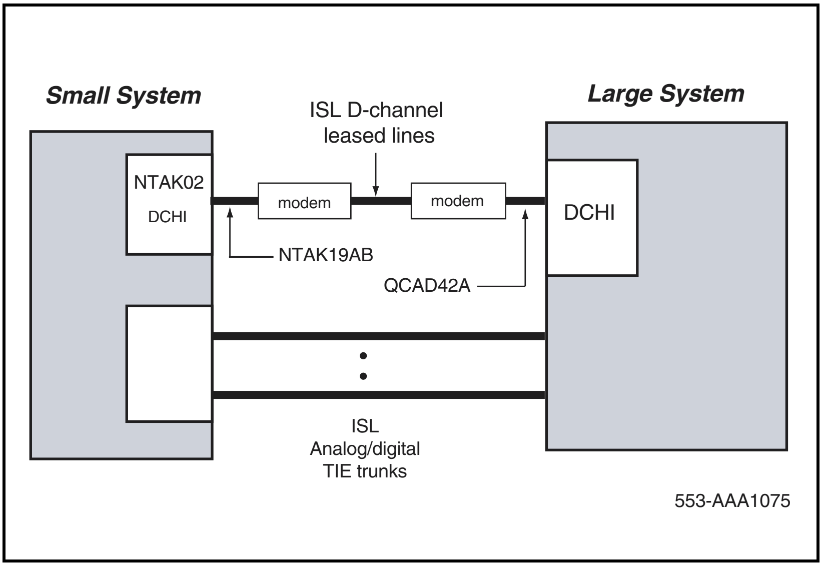
ISL in dedicated mode using leased line

The following hardware is required:

- NTAK02 SDI/DCH D-channel handler interface

- A modem capable of the following: (such as Ventel 2400-33 or 2400 Plus II)
  - minimum of 2400 baud
  - synchronous operation
  - must support leased line (also known as private line or point-to-point) operation
- NTAK19BA 4-Port SDI Cable

Figure 89
ISL in dedicated mode using leased line



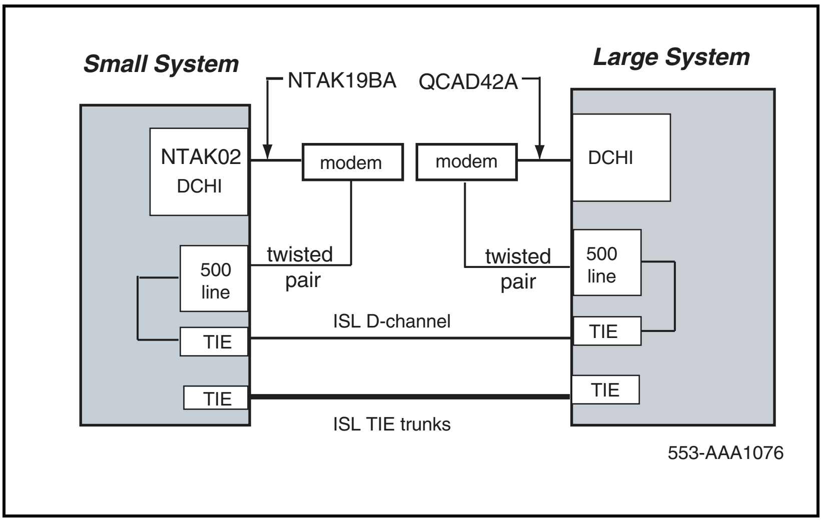
ISL in dedicated mode using dial-up modem

The requirements are as follows:

- NTAK02 SDI/DCH D-channel handler interface.

- Modems such as the Ventel 2400, Hayes 2400 (the Hayes Smartmodem 2400 cannot be used on leased lines) or Gandalf 2400 that can support 2 or 4-wire leased line operation. 4-wire operation must be specified when ordering. Otherwise, modems are factory shipped for 2-wire operation. Modems capable of the following:
  - — autodial capability
  - — minimum of 2400 baud
  - — synchronous operation
  - — programmable so that one modem originates the call while the other auto-answers
- NTAK19BA 4-port SDI cable.
- NT8D09 500 set line card.

Figure 90
ISL in dedicated mode using dial-up modem



ISL hardware installation

Shared mode

The hardware installation is identical to the PRI installation, with the addition of analogue or digital TIE trunks (or both).

Dedicated mode

Procedure 42
Installing the NTAK02

The NTAK02 connects to the modem through the NTAK19BA 4-port cable. Only ports 1 and 3 are available for use as DCHIs.

1 Set option switches/jumpers on the DCHI card, as shown in Table 104 and Table 105, for mode of operation that is, RS232 or RS422 and DTE or DCE.

2 Install the NTAK02 in any spare slot 1-9 of the Main Cabinet or slots 11-14 of the Succession Media Gateway.

3 Install the NTAK19BA four port cable on the 50-pin Amphenol connector associated with the slot holding the NTAK02.

Table 104
NTAK02 switch settings

Port 0	Port 1	SW1-1	SW1-2
SDI	DCH	OFF	OFF
SDI	DPNSS1	OFF	ON
—	ESDI	ON	ON

Port 2	Port 3	SW1-3	SW1-4
SDI	DCH	OFF	OFF
SDI	DPNSS1	OFF	ON
—	ESDI	ON	ON

Table 105
NTAK02 jumper settings

Unit	Jumper location	Strap for DTE	Strap for DCE	Jumper location	RS422	RS232
Unit 0	J10	C - B	B - A			
Unit 1	J7 J6	C - B C - B	B - A B - A	J9 J8	C - B C - B	B - A B - A
Unit 2	J5	C - B	B - A			
Unit 3	J4 J3	C - B C - B	B - A B - A	J2 J1	C - B C - B	B - A B - A

Procedure 43
Setting up the D-channel

If this is a dedicated mode installation using leased line modems, the D-channel connects the DCHI with the far-end modem over a dedicated leased line. Synchronous modems with a minimum 2400 baud data rate must be configured. Modems must support leased line capability and synchronous mode. The Hayes Smartmodem 2400 cannot be used on leased lines.

If this a dedicated mode using dial-up modems, modems such as Hayes 2400, Ventel 2400 or Gandalf 2400 can be used. In this configuration, the DCHI connects to a modem which is connected to a 500 set line card. The call connects to the far-end through the 500 set-to-TIE trunk path.

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 auto-dial number must be coordinated with the far-end switch. The originating modem has this auto-dial number stored internally as part of the modem configuration routine.

The far-end modem need only be set-up for auto-answer.

End of Procedure

ISL software implementation

There are two modes of ISDN Signaling Link (ISL) operation, shared mode and dedicated mode.

Shared mode

The NTAK79 on-board DCHI supports ISDN PRI signaling and ISL trunks. The configuration is basically the same as the PRI D-channel, with the D-channel also supporting ISL trunks.

The DTI/PRI software implementation sequence can be used (refer to the appropriate chapters for more information) with the following exceptions.

LD 17 — Shared mode

Prompt	Response	Description
USR	SHA	D-channel for ISL in “shared” mode, used for both ISDN PRI and ISL.
ISLM	1-240	Number of ISL B-channel (trunks) controlled by the D-channel (no default value).

LD 16 — Interface type

Prompt	Response	Description
IFC	SL1	Interface type must be SL1 (this is the only type supported for ISL).
MODE	ISLD	TIE route used for ISL members.

LD 14 — Channel identifier

Prompt	Response	Description
CHID	1-240	Channel identifier for ISL channels. Must be coordinated with the far-end.

Dedicated mode

The DCHI uses the NTAK02 circuit card and does not support ISDN PRI signaling. The DCHI is reserved for ISL use only. The D-channel can communicate with the far-end by means of a dedicated leased line modem or dial-up modem.

Note that the following implementation relates to analogue TIE trunks being used as B-channels. In the case where DTI/PRI trunks are also used, then LD 17 digital loop (2.0 Mb PRI) and LD73 (2.0 Mb PRI/SYTI) must also be configured with the appropriate clocking and threshold settings.

For ISL dedicated mode using a dial-up modem, a 500 set, TIE trunk route and member must be programmed (used for D-channel). Table 106 summarizes the required steps.

Table 106
Configuring basic ISL capability

Step	LD	Action
1	17	Configure the D-channel for ISL use.
2	15	Enable ISDN option.
3	16	Enable the ISL option on a per route basis, assign a D-channel for each route.
4	14	Assign a channel identification to each trunk with the ISL option.

LD 17 — Configure the D-channel for ISL (Part 1 of 3)

Prompt	Response	Description
REQ	CHG	Change existing data
TYPE	CFN	Configuration data block.
ADAN	NEW DCH 0-79	Add primary D-channel.

LD 17 — Configure the D-channel for ISL (Part 2 of 3)

Prompt	Response	Description
CTYP	DCHI	D-channel card type.
CDNO	0-15	Serial Data Interface (SDI) Card number Number the SDI cards logically with the system.
	1-9 11-19 21-29, 31-39 41-49	MSDL application small system Card number
	1-50	DCHI small system Card number
PORT	1	Must be set to 1.
USR	PRI	D-channel for ISDN PRI only.
IFC	SL1	Interface type.
DCHL	1-9	PRI2 card number. (Must match entry for CDNO).
SIDE	NET (USR)	Net: network, the controlling switch. User: slave to controller.
RLS	XX	Software release of far-end. This is the current software release of the far-end. If the far-end has an incompatible release of software, it prevents the sending of application messages. For example, for Network Ring Again.
CLOK		D-channel clock type for signaling.
	EXT	Source of D-channel clock is external to DCHI card (in this case the DTI/PRI circuit card). Normally, EXT is used for PRI/ ISL. ***Note:*** Do not confuse this clock with the E1 span Clock Controller found on the NTAK10/79. This clock is in reference to the DCHI synchronous mode of operation. ***Note:*** If directly connecting two DCHI ports with out the use of modems, set “CLOK” to “EXT” on one side and “INT” on the other.

LD 17 — Configure the D-channel for ISL (Part 3 of 3)

Prompt	Response	Description
LAPD	YES,(NO)	Change LAPD parameters. Simply carriage return if timers are to be left at default value. The following timers are prompted only if LAPD is set to YES. The following can all be left at default during initial set-up.
T23	1-(20)-31	Interface guard timer checks how long the interface takes to respond. In units of 0.5 seconds (default 20 = 10 seconds).
T200	2-(3)-40	Retransmission timer in units of 0.5 seconds (default 3 = 1.5 seconds).
N200	1-(3)-8	Maximum number of retransmissions.
N201	4(260)	Maximum number of octets in information field.
K	1-(7)-32	Maximum number of outstanding unacknowledged frames (NAKS).

LD 15 — Enable the ISDN option (Part 1 of 2)

Prompt	Response	Description
REQ:	NEW CHG	Add new data. Change existing data.
TYPE:	NET	Networking data.
CUST	 0-99 0-31	Customer number For Large Systems For Small Systems and Succession 1000 systems
ISDN	YES	Customer is equipped with ISDN.

LD 15 — Enable the ISDN option (Part 2 of 2)

Prompt	Response	Description
PNI	1-32700	Customer private network identifier. MUST be unique to this customer in the private network. Used as part of the setup message for feature operation such as Network Ring Again and Network ACD.
HNPA	NPA	Telephone area code for this system. Sent as part of setup message as CLID.
HNXX	NXX	Telephone local exchange code for this system. Sent as part of setup message for calling line identification.
HLOC	XXX	Home location code (NARS).
LSC	1-9999	One to four digit Local Steering Code established in the Coordinated Dialing Plan (CDP). The LSC prompt is required for Calling Line ID and Network ACD.
AC2		Access Code 2. Enter call types (type of number) that use access code 2. Multiple responses are permitted. This prompt only appears on NARS equipped systems. If a call type is not entered here, it is automatically defaulted to access code 1.
	NPA	E.164 National.
	NXX	E.164 Subscriber.
	INTL	International.
	SPN	Special Number.
	LOC	Location Code.

LD 16 — Enable the ISL option

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	RDB	Route data block.
CUST	xx	Customer number, as defined in LD 15
ROUT	 0-511 0-127	Route number For Large Systems For Small Systems and Succession 1000 systems
TKTP	TIE	TIE trunk route.
DTRK	YES NO	Enter YES if this is a Digital Trunk Interface (DTI or PRI).
ISDN	YES	ISDN option.
MODE	ISLD	Route for ISL application.
DCHI	XX	DCHI port number in CFN to carry the D-channel for this TIE trunk route.
PNI	1-32700	Customer private network identifier. Must be the same as the CDB PNI at the fa- end.
IFC		Interface type.
	SLI	System to system.
CTYP	aaa <CR>	Call Type. Enter the call type to be associated with the outgoing route for direct dialing using the trunk access code (instead of NARS access code).
INAC	YES	Insert Access Code. Permits the NARS AC1 or AC2 access code to be re-inserted automatically on an incoming ESN call.

LD 14 — Assign a channel identifier

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	TIE	TIE trunk type.
TN	 l s c u c u	Terminal Number For Large Systems For Small Systems and Succession 1000 systems
RTMB	 0-511 1-510 0-127 1-510	Route number and Member number For Large Systems For Large Systems and Succession 1000 systems
CHID	1-240	Channel identifier for ISL channels (remove with Xnn). Must be coordinated with far-end (no default value).

Non-standard cables

Contents

The section contains information on the following topics:

Introduction

This section provides information required to build systems cables of non-standard lengths for ISDN PRI applications.

NT5K40AA, NT5K41AA, NT5K86AA

These cables are used to transport the 2Mb digital signal from the faceplate connector on the PRI card to the Line Terminating Equipment interface.

- Standard lengths:
  - NT5K40AA - 4 m (13 ft.)
  - NT5K41AA - 8 m (26 ft.)
  - NT5K86AA - 12m (39 ft.)
- Construction - 75 ohm dual co-axial type with solid inner conductor and braided shield.
- J1 Connector - 15-pin, male, subminiature D with jack-screws
- J2 Connector - 75 ohm BNC crimp plug
- J3 Connector - 75 ohm BNC crimp plug

Table 107
NT5K40AA, NT5K41AA, NT5K86AA wire list

From (pack end)	To (I/O end)	Signal
J1-1	J2 Inner Conductor	XTIP (transmit)
J1-9	J2 Shield	XRING (transmit)
J1-3	J3 Inner Conductor	RTIP (receive)
J1-11	J3 Shield	RRING (receive)
J1-9	J3 Shield	FRAME GROUND

NT8D7206, NT8D7207

This cable is used to transport the 2Mb/s digital signal from the PRI pack to the I/O assembly located at the cabinet bulkhead.

- Standard length -
  3.05 m (10 ft.) for Half Group systems and Single group systems
- Construction - 24 AWG, stranded foil-shielded twisted pairs
- P1 Connector (Pack end) - 9-pin, male, subminiature D, with jack-screws
- P2 Connector (I/O Panel end) - 9-pin, male, subminiature D, with jack-screws

Table 108
NT8D7206, NT8D7207 wire list

Color	From (pack end)	To (I/O end)	Signal
White	P1-1	P2-6	XTIP (transmit)
Black	P1-9	P2-7	XRING (transmit)
Green Shield	nc	P2-CASE P2-9	GROUND
Red	P1-3	P2-2	RTIP (receive)
Black	P1-11	P2-3	RRING (receive)
Red Shield	nc	P2-CASE P2-5	GROUND

QCAD128

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

- 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

See Table 109.

Table 109
QCAD128 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

This cable is used to connect the RS-232-C interface between an echo canceller and the PRI pack.

- Standard length - 2.1 m (7 ft.)
- 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 110
QCAD129 wire list

PRI Signal	From	To	Echo Canceller Signal
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 (Test Port Enable Bar)	P1-15	nc	

QCAD133

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 111 on page 390.

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 111
QCAD133 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)

NT8D7205

This cable is used to transport the 2Mb digital signal from the I/O panel at the cabinet bulkhead to the Network Channel Terminating Equipment (NCTE) telephone company interface.

- Standard length - 15.3 m (50 ft.)
- Construction - Individually foil-shielded, twisted pairs, 24 AWG (0.511 mm), stranded
- P1 Connector - 9-pin, female, subminiature D with jack-screws
- P2 Connector - 9-pin, male, subminiature D, with jack screws

Table 112
NT8D7205 wire list

Color	From (pack end)	To (I/O end)	Signal
White	P1-6	P2-6	XTIP (transmit)
Black	P1-7	P2-7	XRING (transmit)
Green Shield	P1-9	nc	GROUND
Red	P1-2	P2-2	RTIP (receive)
Black	P1-3	P2-3	RRING (receive)
Red Shield	P1-5	nc	GROUND

QCAD328

This cable is used to connect the PRI pack to the D-channel interface card, either the QPC757 or NT6D11AB DCHI. There are two types of QCAD328 cables: QCAD328A and QCAD328B.

- QCAD328A - 1.8 m (6 ft)
- QCAD328B - 5.5 m (18 ft)
- QCAD328C - 10.67 m (35 ft)
- QCAD328D - 15.24 m (50 ft)
- Construction - 24 AWG (0.511 mm), stranded
- P1 Connector - 25-pin male, subminiature D
- P2 Connector - 15-pin male, subminiature D

Table 113
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 (QCAD110B) 3 m (10 ft)
- 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 (QCAD130) 3 m (10 ft)

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

Meridian 1, Succession 1000,
Succession 1000M

ISDN Primary Rate Interface

Installation and Configuration

Publication number: 553-3001-201
Document release: Standard 1.00
Date: October 2003
Produced in Canada

NORTEL NETWORKS™