Meridian 1

Option 11C

2.0 Mb DTI/PRI

Document Number: 553-3011-315
Document Release: Standard 11.00
Date: April 2000

Revision history

April 2000

Standard 11.00. This is a global document and is up-issued for X11 Release 25.0x. Document changes include removal of redundant content, including references to previous software releases, and references to equipment types except Option 11C.

March 1999

Release 10.00, Standard , for Generic X11 Release 24.0x

October 1997

Release 9.00, Standard, for Generic X11 Release 23.00

September 1996

Release 8.00, Standard, for Generic X11 Release 22.0x

November 1995

Release 7.00, Standard, for Generic X11 Release 21.1x

July 1995

Release 6.00, Standard, for Generic X11 Release 21.0x

December 1994

Release 5.00, Standard, for Generic X11 Release 20.0x

July 1994

Issue 4.00, Standard, published for Generic X11 Release 19.0x

February 1994

Issue 3.00, Standard, published for Generic X11 Release 18.0x

January 1993

Issue 2.00, Standard, published for Generic X11 Release 17.0x

April 1992

Issue 1.00, Standard, published for Generic X11 Release 16.0x

Contents

About this guide

This document contains specifc information on how to configure 2.0 Mb ISDN DTI/PRI on Meridian 1 Option 11C. For general information on ISDN, and for information on software features, refer to *X11 Networking Features and Services* (553-2901-301).

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.

ISDN features

For a detailed description and implementation information, see the *X11 Networking Features and Services* (553-2901-301).

For a detailed description and implementation information for DPNSS1, see the *DPNSS1: Features and Services Guide* (553-3921-300).

For a detailed description and implementation information for DASS2, see the *DASS: Features and Services Guide* (553-3911-300).

2.0 Mb DTI Implementation

Content list

The following are the topics in this section:

Overview

This chapter provides the information required to install 2.0 Mb DTI on Meridian 1 Option 11C systems, including:

- hardware installation
- software programming

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)

  or

  CEPT Cable - NTBK05CA (75 ¾ coaxial—6.15 m length)

Figure 1
2.0 Mb DTI Cabling
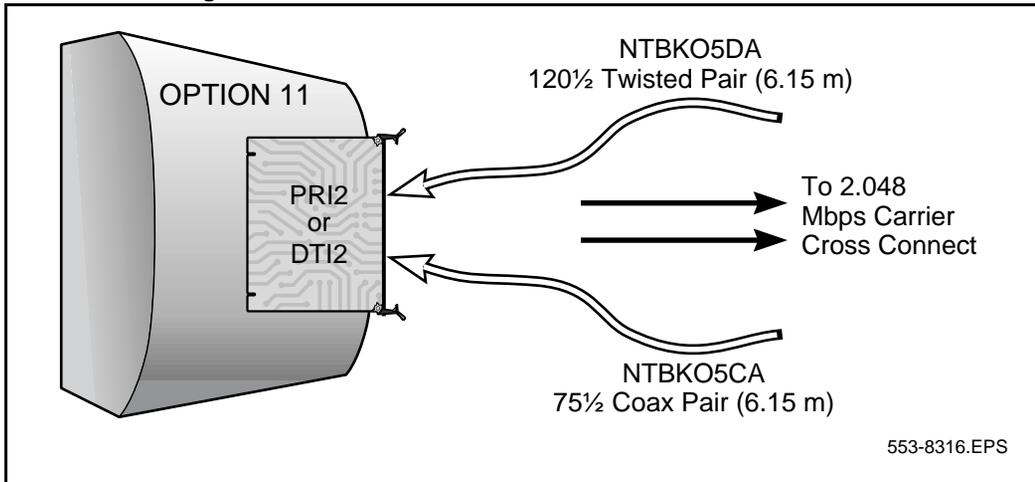
NTAK10 2.0 Mb DTI card

The 2.0 Mb Digital Trunk Interface card provides the physical interface for the digital E-1 carrier on the Option 11C system. The card includes an on-board clock controller and is installed in slots 1 through 9 in the main cabinet. The NTAK10 2.0 Mb DTI card is also used for ISL shared mode applications.

For information on the NTAK10 faceplate LEDs, refer to DTI Maintenance in this guide. For more information on the operation of the on-board clock controller, refer to Network Clocking in this guide.

Install DTI hardware

The NTAK10 circuit card can be installed in any available card slot 1-9 in the main cabinet.

Inspect the NTAK10 circuit card

Inspect the circuit card before installing it in the main cabinet:

- Locate the NTAK10 2.0 Mb circuit card and carefully remove it from its packaging.

- Inspect the circuit card for any visible damage which may have occurred during shipping.

Set the switches

The NTAK10 incorporates four surface mounted dip switches. The following tables provided information on the various settings and related functions of these switches.

Note: The ON position for all the switches is towards 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 found on the circuit card as per the requirements of your specific installation.

Switch S1—Clock Controller Configuration

This switch enables/disables the on-board Clock Controller.

Table 1
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 2
Switch S2

Switch	Off (Up)	On (Down)
S2-1	120¾	75¾
S2-2	75¾	120¾

Switch S3—Mode of Operation

This switch selects the mode in which the NTAK10 operates. The NTAK10 supports firmware that allows it to operate in the standard CEPT format mode, or the modified CEPT format used in France.

Table 3
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 allows for the 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 (i.e. Rx is carrier received from the far end device).

Table 4
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 into the main cabinet

Slide the circuit card into any unused slot (1 - 9) in the main cabinet. Secure the circuit card in the cabinet by locking the lock latch assemblies.

Connect the cables

- In the cabling area, located directly below the card cage, remove the retaining bar used to secure 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) in place.

- Terminate the NTBK05DA/CA carrier cable as required.

NTBK05DA pinouts

The pinouts for the NTBK05DA cable are as follows:

Table 5
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 6
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 programming

The following information describes the process required to program the 2.0 Mb DTI feature in the Meridian 1 Option 11C software.

The information is presented in the sequence in which it must be programmed. As an example, 2.0 Mb DTI loops must be configured before defining any error detection thresholds, loop timers, pad information or ABCD signaling bit information. Table 7 summarizes the procedures required to configure 2.0 Mb DTI on Option 11C.

Table 7
Procedure summary, configure 2.0 Mb DTI on Option 11C

Step	Overlay	Action
1	LD 17 Configuration Record	Select Pulse Code Modulation companding Law
2	LD 17 Configuration Record	Add a 2.0 Mb DTI loop.
3	LD 73 Digital Data Block	Define the 2.0 Mb DTI ABCD signaling bit tables
4	LD 73 Digital Data Block	Define the 2.0 Mb DTI pad tables
5	LD 73 Digital Data Block	Define the 2.0 Mb DTI loop timers
6	LD 73 Digital Data Block	Define the 2.0 Mb DTI system timers
7	LD 16 Route Data Block	Define service routes.
8	LD 14 Trunk Data Block	Define the associated list of service trunks.

The prompts and responses are explained in the text that follows. Responses in parentheses are default values throughout the procedure.

Step 1: Select the Pulse Code Modulation companding Law.

LD 17 – Select the Pulse Code Modulation companding Law.

Prompt	Response	Description
REQ:	CHG	
TYPE:	PARM	Change system parameters
...		
PCML		Pulse Code Modulation companding Law
	(MU)	µ-law (use µ-law for North America)
	A	A-Law

Step 2: Add a 2.0 Mb DTI loop.

The allowable range of base-cabinet slot numbers for the DTI circuit card is 1-9. The CPU/CONF circuit card is provisioned in slot 0, and the TDS card is provisioned in slot 1, effectively leaving slots 2-9 available to these interface card.

LD 17 – Add a 2.0 Mb DTI loop

Prompt	Response	Description
REQ:	CHG	
TYPE:	CEQU	Change common equipment
...		
DTI2	xxx	Enter a loop number for 2.0 Mb DTI.

Step 3: Define the 2.0 Mb DTI ABCD signaling bit tables. Use LD 73 to allow the implementation and administration of the 2.0 Mb DTI software and hardware.

The "abcd" response represents the following trunk supervisory signals:

- Steady signals: bits 0, 1 or U (do-not-care). If c or d are not input they default to 0 and 1 respectively.

- Pulsed signals: P (pulsing), X (not pulsed) or U[4] (do-not-care).

The following prompts are given when FEAT = ABCD:

LD 73 – Define the 2.0 Mb DTI ABCD signaling bit tables.

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 to be 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
	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.

Prompt	Response	Description
	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).
	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

Prompt	Response	Description
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.
	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
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.

Prompt	Response	Description
P CAS(S)	N	If ESNW(S) not required
	abcd	Centralized Attendant signal (send) pulse. Pulse time not variable.
		Note: Prompted for 2.0 Mb DTI only.
CLRF(R)	N	If CAS(S) not required
	abcd	Clear forward (receive)
	N	If CLRF(R) not required
SOSI	abcd	Special operator signal defined
	(N)	Undefined. Prompted when OPRC = N
Outgoing Calls:		
SEZ(S)	abcd	Seize voice or data from or to a non SL-1 switch
SEZD(S)	abcd	seize data (send) signal. Only for SL-1 to SL-1 applications
	N	If SEZD(S) not required
SEZV(S)	abcd	Seize voice (send) signal. Only recommended for SL-1 to SL-1 applications
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

Prompt	Response	Description
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
	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 would be 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
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

Prompt	Response	Description
SOSO	abcd,(N)	special operator signal defined (undefined).
		Note: Prompted when OPRC = N

Step 4: Define the 2.0 Mb DTI pad tables, using LD 73. The following prompts in LD 73 require a response.

LD 73 – Define the 2.0 Mb DTI pad tables.

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.
		Table 1 cannot be modified or deleted.
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 will be 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	Analogue CO or WATS trunks
AFX	r t	Analogue FEX trunks
ADD	r t	Analogue DID trunks
SATT	r t	analogue 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 will be 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
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 will be 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	Analogue CO or WATS trunks
AFX	r t	Analogue FEX trunks
ADD	r t	Analogue DID trunks
SATT	r t	analogue satellite TIE trunks

ATO	r t	analogue 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	analogue CO trunk (prompted only if the 1.5/2.0 Mb Gateway feature is equipped and TYPE=DTI2)
XEM	r t	analogue 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 8
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					

Step 5: Define the 2.0 Mb DTI loop timers, using LD 73. The following prompts in LD 73 require a response.

LD 73 – Define the 2.0 Mb DTI loop timers.

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	l	2.0 Mb DTI loop number.
P DIGT(S)	abcd	(send) digit pulse timing from TDS. Bits P, X or U.
	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 can be on 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 Option 11C only. For non Option 11C only AFF is supported.

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

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 must be equal to or greater than dt. dt = Data calls threshold must be equal to or greater than ct. ct = Calls threshold must be equal to or greater than ot.

Prompt	Response	Description
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.
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 32,640 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 loop is (is not) equipped with special Firmware for France.

Step 6: Define the 2.0 Mb DTI system timers, using LD 73. The following prompts in LD 73 require a response.

LD 73 – Define the 2.0 Mb DTI system timers.

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.
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
CLKN	1-9	Clock controller slot number
	<CR>	No change for defaults
	X	To remove clock controller data
PREF CK0	c	Primary reference for clock controller zero. The response is the loop from which the clock controller will be deriving its primary clock pulses. NOT PROMPTED FOR Option 11C
	<CR>	Primary reference remains at current setting.
	X	Primary reference reverts to the free-run mode.
SREF CK0	c	Secondary reference for clock controller zero. The response is the loop from which the clock controller will be deriving its secondary clock pulses.
	<CR>	Secondary reference remains at current setting.
	X	Secondary reference reverts to the free-run mode.
	C	Card number for the secondary reference clock for clock controller 0.
	<CR>	Primary reference remains at current setting.
	X	Primary reference reverts to the free-run mode.

Prompt	Response	Description
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 will only appear for clocks which are valid for the machine type being configured. The prompts will only appear if the system is in a valid state for the definition of the 2.0 Mb DTI clock controller data (i.e., 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 appropriately set. Unless this is done, the PREF and SREF prompts are not given.

Step 7: Define service routes. Use LD 16 to configure service routes and set the NRAG duration timer.

LD 16 – Configure the service routes.

Prompt	Response	Description
REQ	NEW CHG	Add or change Route data block
TYPE	RDB	Route data block
CUST	0-31	Customer number
ROUT	0-30	Route number
TKTP		Service routes allowed with ISDN
	TIE	Tie trunk route (the only service trunk type permitted for Meridian 1 to Meridian 1 connections)
	COT	Central office trunk
	DID	Direct Inward Dial trunk
RCLS	(EXT) INT	Class marked route as Internal or External
DTRK		Digital trunk route
	(NO) YES	Analog Digital
DGTP	DTI2	Select a digital trunk type of 2.0 Mb DTI
...		

Prompt	Response	Description
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).
PTYP		Port type at far end:
	(ATT) AST	**Analogue tie trunk routes:** Aanalogue Tie trunk Analogue satellite Meridian 1 Tie trunk or ESN satellite Meridian SL-1 Tie trunk
	AOT	Analogue Tie trunk, used instead of ATT whenever the Meridian 1 has one or more digital satellite trunk routes (DST) to any digital satellite Meridian 1 which includes OPX sets
	(DTT) DCT DST	**Digital tie trunk routes:** Digital Tie trunk Combination digital Tie trunk Digital satellite Meridian 1 Tie trunk
AUTO	YES (NO)	Auto-terminate must be NO if response to DSEL is VOD
ICOG	IAO ICT OGT	Incoming and outgoing trunk Incoming trunk 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
	ORG	Originating end control. Default for TIE, ATVN, DID, and CCSA trunk types
FEDC		Far end disconnect control
		Note: Loop start trunks may be assigned either ETH or ORG.
	ETH	Either end
	FEC	Far end
	JNT	Joint

Prompt	Response	Description
	(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.

Step 8: Define the associated list of service trunks. Use LD 14.

LD 14 – Define the associated list of service trunks

Prompt	Response	Description
REQ	NEW CHG	Add or change Trunk data block
TYPE	TIE	Tie trunk route (only type allowed with SL-1 to SL-1 ISDN ISL or 2.0 Mb DTI)
	COT	Central Office trunk data block
	DID	Direct Inward Dial trunk data block
CHID	1-382	Channel ID for this trunk
TN	l c	Terminal Number
		Use loop number created in LD 17, where:
		• l = 0-9, 2.0 Mb DTI loop number
		• c = 1-30, 2.0 Mb DTI channel
TOTN	l c	New loop and channel. Loop must be a 2.0 Mb DTI loop, where:
		• l = 0-9, 2.0 Mb DTI loop number
		• c = 1-30, 2.0 Mb DTI channel
PDCA	(1) - 16	Pad Category Number. This prompt is given if the loop is a 2.0 Mb DTI loop, or if the loop is a 2.0 Mb DTI loop 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 loop is 2.0 Mb DTI, or if the loop is a 2.0 Mb DTI loop and the 2.0 Mb Gateway feature is equipped. MU, the default, was entered in the PCML prompt in LD 17.
CUST	0-31	Customer number

NCOS	0-3 0-7 0-15	Network class-of-service group number: CDP BARS/NFCR NARS
RTMB	0-127 1-510	Route number and member number
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 Mb PRI Implementation

Content list

The following are the topics in this section:

Reference list

The following are the references in this section:

- *X11 Administration* (553-3001-311)

Overview

This chapter provides the information required to install 2 Mb PRI on a Meridian 1 Option 11C system:

- hardware installation

- software programming instructions

Hardware requirements

Circuit cards

To implement 2.0 Mb PRI on the Meridian 1 Option 11C, an NTAK79 or an NTBK50 PRI card plus associated daughterboards is required.

Table 9
2.0 Mb PRI hardware requirements

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. Option 11C supports only one active clock controller per system.
	Connects to the NTBK50 PRI card
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

The following cables are required for PRI connections:

- 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 Option 11C system:

- NTAK79 2.0 Mb PRI card
- NTBK50 2.0 Mb PRI card

The difference between the two PRI cards is the ability of the NTBK50, when equipped with the NTBK51 D-channel daughterboard, to 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 Mb PRI circuit card

The 2 Mb Primary Rate Interface card provides the physical interface for the digital E-1 carrier on the Option 11C system. The card includes an on-board clock controller and on-board D-channel handler. It is installed in slots 1 through 9 in the main cabinet.

For information on the NTAK79 faceplate LEDs, refer to PRI Maintenance in this guide.

NTBK50 2 Mb PRI circuit card

The 2 Mb Primary Rate Interface card provides the physical interface for the digital E-1 carrier on the Option 11C system. The card is installed in slots 1 through 9 in the main cabinet and supports 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 PRI Maintenance in this guide.

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 will result in an equivalent shift of the same size and direction in all parts of the network. On Option 11C systems, synchronization is accomplished with the NTAK20 clock controller circuit card.

The Clock Controller circuitry synchronizes the Option 11C to an external reference clock, and generates and distributes the clock to the system. Option 11C 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. See Network Clocking for details.

Shelf slot assignment

On non-ECM system cabinets, the NTAK20 may be placed in slots 1-9. On cabinets NTAK11Dx and NTAK11Fx, the active NTAK20 must be placed in slots 1-3 (slots 4-10 may not be used.)

NTAK93 D-Channel Handler Interface (DCHI) daughterboard

The NTAK93 DCHI daughterboard interfaces with the Meridian 1 Option 11C Central Processing Unit (CPU) and mounts on the NTBK50 PRI card for PRI (but not ISL) applications. The equivalent circuit is contained on-board the NTAK79 2.0 Mb PRI card.

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. The NTAK93 can use SDI I/O addresses 1 to 15 and port 1.

A minimum of one NTAK93 is required for each PRI link. If more than one PRI link is connected to the same end location, a single DCHI circuit card can support up to a maximum of 8 PRI connections for the Option 11C system. This allows for the support of 240 B-Channels or PRI trunks.

NTBK51 Downloadable D-Channel daughterboard

The NTBK51 DDCH daughterboard interfaces with the Meridian 1 Option 11C Central Processing Unit (CPU) and mounts on the NTBK50 2.0 Mb PRI circuit card for PRI D-Channel applications. The DDCH is equivalent to the MSDL card used on the larger Meridian 1 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 is connected to the same end location, a single DDCH circuit card can support up to a maximum of 8 PRI connections for the Option 11C system. This allows for the support of 240 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 the main cabinet (slots 1-9 only)

4 Connect the cables

Each of these steps 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 (i.e. another Meridian 1, AXE-10, SYS-12, etc.).

Inspect the NTAK79 circuit card

• Locate the NTAK79 2 Mb circuit card and carefully remove it from its packaging.

• Inspect the circuit card for any visible damage which may have 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 towards 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 2
NTAK79 with Switch locations
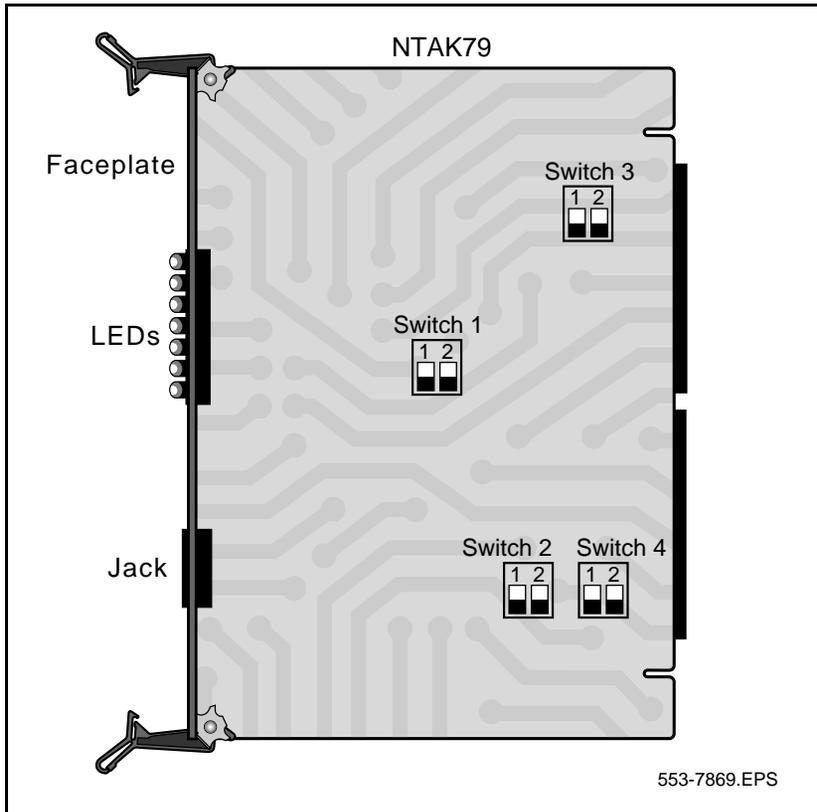
Set the switches found on the circuit card as per the requirements of your specific installation:

Switch SW1—DCHI Configuration

This switch enables/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 10
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 11
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/disables (H/W) the on-board Clock Controller. SW 3-2 should be disabled if the on-board clock controller is not in use.

Table 12
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 13
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 into the main cabinet

Slide the circuit card into any unused card slot 1 through 9 in the main cabinet. 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 NTAK79 PRI card. Also, refer to Figure 3.

- In the cabling area, located directly below the card cage, remove the retaining bar used to secure 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.

- Terminate the NTBK05DA/CA carrier cable as required.

Figure 3
NTAK79 Cabling

OPTION 11

2 Mb PRI
or
2Mb DTI

NTBKO5DA
120Ω Twisted Pair (6.15 m)

To 2.048
Mpbs Carrier
Cross Connect

NTBKO5CA
75Ω Coax Pair (6.15 m)

553-8320.EPS
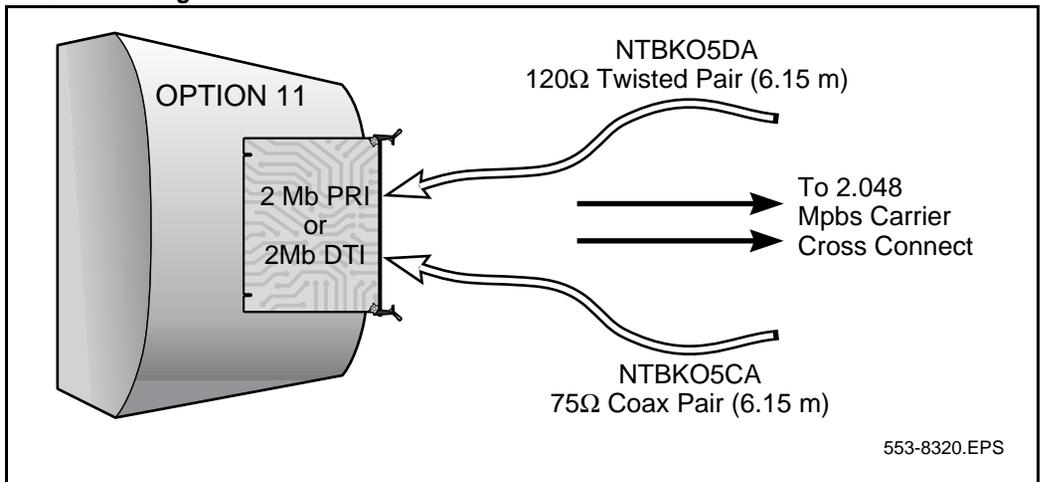
NTBK05DA pinouts

The pinouts for the NTBK05DA cable are as follows:

Table 14
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 15
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	—

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 main cabinet

5   Connect the cables

Each of these steps 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 (i.e. another Meridian 1, AXE-10, SYS-12, etc.).

Inspect the NTBK50 circuit card

- Locate the NTBK50 2.0 Mb circuit card plus associated daughterboard(s) and carefully remove them from their packaging.

- Inspect the circuit cards for any visible damage which may have occurred during shipping.

Set the switches on the NTBK50

The NTBK50 incorporates three on-board dip switches. The following tables provided information on the various settings and related functions of these switches.

Note: The ON position for all the switches is towards 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 4
NTBK50 with switch locations
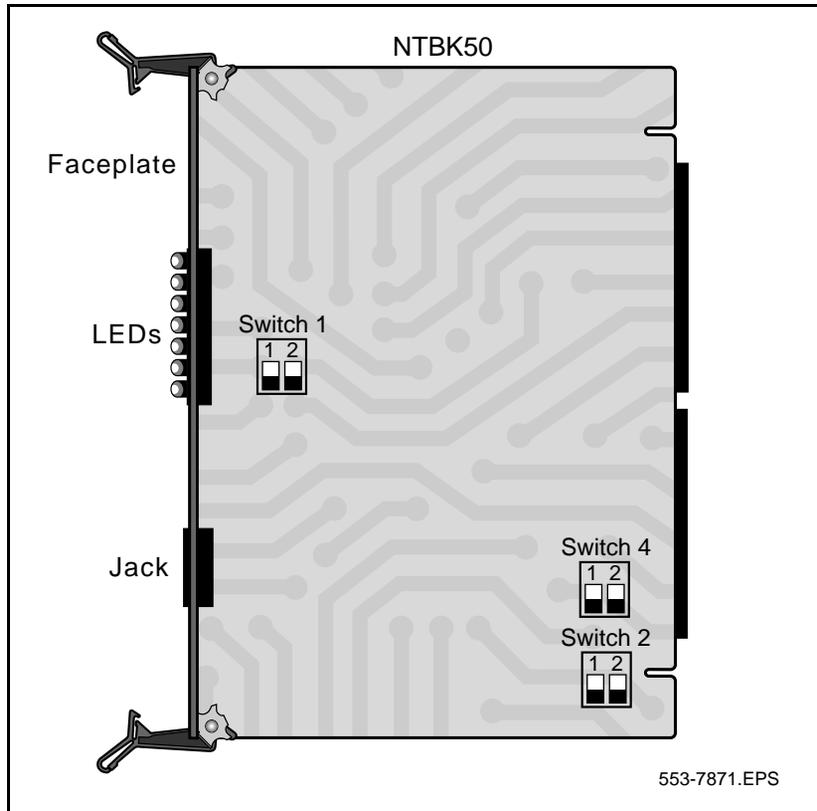
Set the switches found on the circuit card as per the requirements of your
specific installation.

Switch SW1—DCHI Configuration (NTAK93 only)

This switch enables/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 16
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 17
Switch SW2

Cable Type	SW 2-1
75¾	Down (On)
120¾	Up (Off)

Switch SW4—Carrier Shield Grounding

This switch allows for the selective 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. This applies only to the NTBK05CA cable.

Table 18
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. Any pins that are bent should be re-aligned prior to
    mounting.

2   Place the NTBK50 down flat on an anti-static pad.

3   From an overhead viewpoint, with the daughterboard parallel above the
    NTBK50 and the connector pins aligned over the connector sockets, line
    up the mounting holes on the daughterboard (see the figure below) with
    the tops of the standoffs on the NTBK50.

4   Slowly lower the daughterboard towards the NTBK50, 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 may 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 also are locked into place.

Figure 5
Daughterboard installation

553-7872

553-7872.EPS
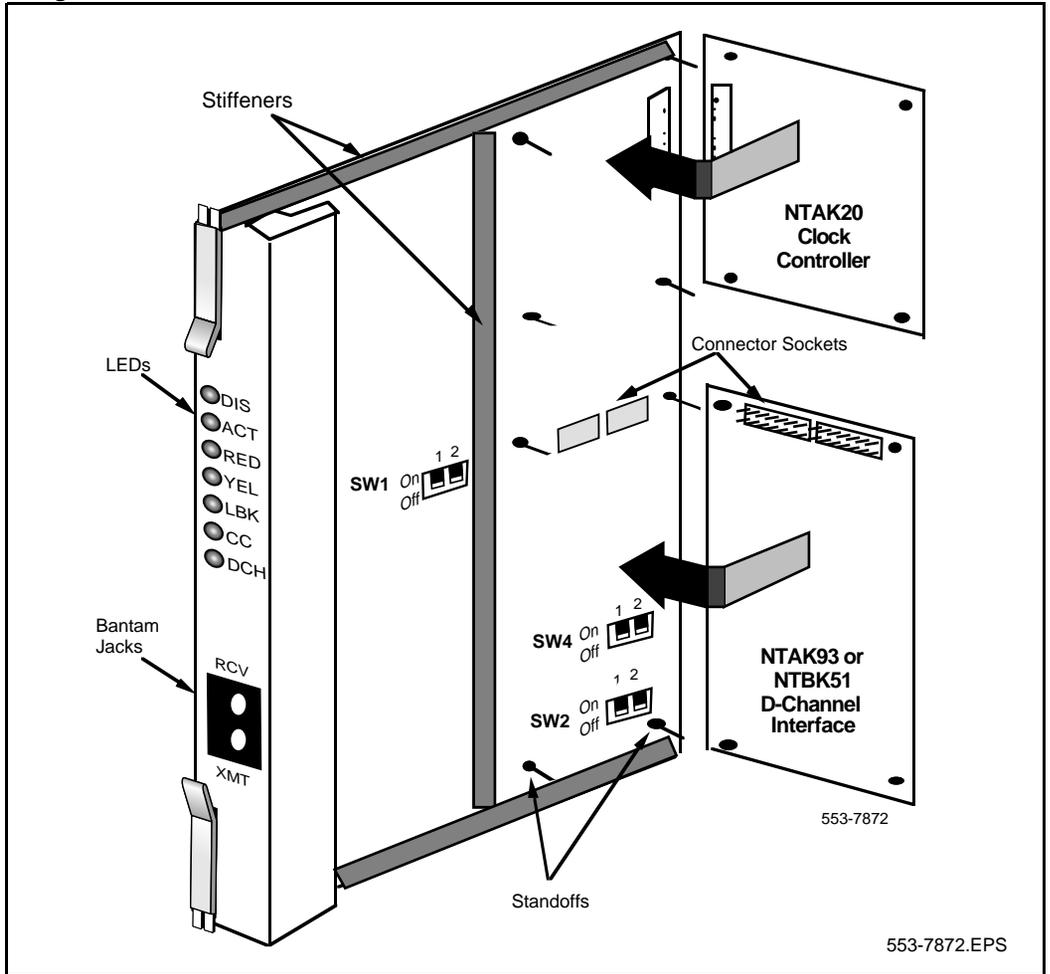
Remove the daughterboards from the NTBK50

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 the system configuration. At least one NTAK20 (per system) is always required.

Insert the NTBK50 into the main cabinet

Slide the circuit card into any unused card slot 1 through 9 in the main cabinet. Secure the circuit card in the cabinet by locking the lock latch assemblies. The card number associated with a 2 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 6.

- In the cabling area, located directly below the card cage, remove the retaining bar used to secure 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 6
NTBK50 Cabling
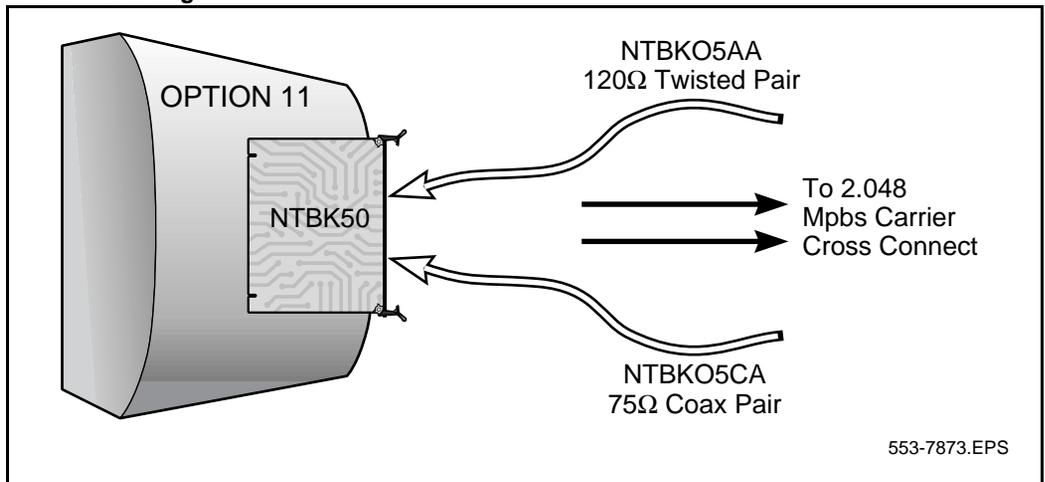
NTBK05DA pinouts

The pinouts for the NTBK05DA cable are as follows:

Table 19
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 20
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	—

PRI software programming

Use the following procedure to configure PRI loops, the DCHI/DDCH interface, the DCH link and ISDN trunk route and trunks (B-channels). No feature applications other than Basic Call Service are programmed.

Prompts which do not show a response can be left at default. For more information on any of these prompts, refer to *X11 Administration* (553-3001-311).

LD 17 is used to create, change or remove a logical D-channel which is associated with:

- a D-channel handler interface (DCHI):

    — NTAK79 PRI card

    — NTAK02 SDI/DCH card

    — NTBK50 PRI card with the NTAK93 daughterboard

- a downloadable D-channel handler (DDCH) on an NTBK50 PRI card with the NTBK51 daughterboard.

Limitations

PRI loops must be configured before defining DCH links or PRI applications. The following restrictions apply when configuring a D-channel:

- The card slot number used for the DCHI/DDCH must be between 1-9.

- The port number must be set to 1.

- A primary D-channel cannot act as the backup D-channel of another primary D-channel.

- A primary D-channel with a backup D-channel cannot be taken out. The craftperson must first take out the backup D-channel.

- The D-channel must be disabled if any DCH parameters are changed.

- Card type of the backup D-channel must be the same as the card type of the primary D-channel. (Example: an NTAK02 DCH can not act as a backup to an NTAK79 DCH. The backup must be another NTAK02).

- The MOV DCH command is not supported.

Procedure summary

Table 21lists the procedures for programming basic 2.0 Mb on Option 11C.

Table 21
Summary of procedures for programming basic 2.0 Mb PRI

Step	Overlay	Action
1	LD 17 (CFN)	Add a PRI loop.
2	LD 17 (CFN)	Add a DDCH/DCHI card.
3	LD 15 (CDB)	Define a PRI customer.
4	LD 16 (RDB)	Define a PRI service route.
5	LD 14 (TDB)	Define service channels (B-channels) and PRI trunks.
6	LD 73 (PRI2)	Define clock controller parameters.
7	LD 73 (PRI2)	Define PRI parameters and thresholds.
		Note: In most cases, the settings should be left at their default values. However, if changes to these values are necessary, use this step to make them.
8	LD 73 (PRI2)	Change trunk pad category values.

LD 17 – Add a PRI loop.

Prompt	Response	Description
REQ	CHG	Change data
TYPE	CFN	Configuration data block
CEQU	YES	Changes to common equipment
PRI2	XXX	Where XXX is the PRI2 digital card number (1-9)

LD 17– Add a DCHI or DDCH.

Prompt	Response	Description
REQ	CHG	Change data.
TYPE	CFN	Configuration data block.
ADAN	NEW DCH 1-15	Add a primary D-Channel port number. Any unused SDI port number.
CTYP	DCHI MSDL	DCHI for D-Channel configuration on the NTAK79, NTAK02, NTAK93 D-channel.
		MSDL for Downloadable D-Channel configuration (NTBK51 D-channel). The MSDL base and D-Channel application software are downloadable into the DDCH card.
CDNO	1-9	Card slot number to be used as the primary DDCH/DCHI
PORT	1	PORT must be set to "1"
DES	<CR>	Back-up DCHI port number, if required
DPNS	<CR>	Default is no
USR	PRI	D-channel is for ISDN PRI only.
		Note: 2.0 Mb only supports PRI or SHA user mode.
IFC	SL1	Interface type is Meridian 1 - Meridian 1
DCHL	(1-9)	PRI card number which will be carrying the D-channel. Must match entry made for the "CDNO" associated with the "DCHI" prompt above
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 Option 11C 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.

Prompt	Response	Description
SIDE	NET (USR)	Prompted only if IFC is set to SL1. Default is set to slave. NET = network, the controlling switch USR= slave to the controller
RLS	XX	X11 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, i.e. for 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 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.)
- 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 – Define a PRI customer.

Prompt	Response	Description
REQ:	NEW CHG	Add new data Change existing data
TYPE	NET	Networking data

Prompt	Response	Description
CUST	0-31	Customer number
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 is automatically defaulted 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 must be unique to this customer in the private network. e.g. it is used as part of the setup message for feature operation such as Network Ring Again, Network ACD....Note that if set to zero (0), NRAG and NACD will not work.
HNPA	NPA	Telephone area code for this Meridian 1. Sent as part of setup message as calling line identification.
HNXX	NXX	Telephone local exchange code for this Meridian 1. 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.

LD 16 – Define a PRI service route.

Prompt	Response	Description
REQ	NEW CHG	Add new data Change existing data
TYPE	RDB	Route data block
TKTP	TIE	TIE trunk only, allowed between Meridian 1 to Meridian 1.
DTRK	YES	Digital trunk route
DGPT	PRI2	
ISDN	YES	ISDN option
MODE	PRI	Route used for PRI only
PNI	1-32700	Customer private network identifier-must be the same as the CDB PNI at far end.
IFC	SL1	Interface type: Meridian 1 to Meridian 1
CHTY	BCH	Signaling type- prompted if DTRK is YES. D-channel signaling for B-channels.
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. This prompt only appears on a TIE route and must be set to "YES" in order 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 that the Access Code does not get re-inserted twice). The INSERT prompt (INST) is bypassed if INAC is set to YES.

LD 14 – Define 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	c ch	Enter the PRI trunk card (c) and channel number (ch). c = 1-9, ch = 1-30
RTMB ...	0-127 1-510	Route number and member number

LD 73 – Define clock controller parameters. Free-run is used when this Meridian PBX serves as the clock source master for the private network. This is only prompted if the CC has been physically connected to the system.

Prompt	Response	Description
REQ	CHG	Change data
TYPE	PRI2	2 Mb PRI
FEAT	SYTI	System timers
CLKN	1-9	Card slot number of the PRI circuit card which will have the active clock controller.
PREF	1-9	Primary reference source for clock controller. Enter the PRI card number of the PRI card which will have an active clock controller. This is the PRI which the clock controller will use as it's primary source to synchronize (to track) the system network clock. A carriage return <CR> here signifies the system will operate in free-run (non-tracking).
SREF	1-9	Secondary reference source for clock controller—prompted only if primary source is not free-run. Enter the card number of the PRI card that is to be used as the secondary clock reference. This is the PRI link that the clock controller will use as it's secondary source to synchronize (to track) the network clock. It is only used when unable to track on the primary source (i.e. too many slips).
CCAR	0-(15)	Clock Controller Audit Rate. Enter the time (in minutes) between normal CC audits.

LD 73 – Define PRI parameters and thresholds.

Prompt	Response	Description
REQ	CHG	Change data
TYPE	PRI2	2 Mb PRI
FEAT	LPTI	
LOOP	X	X is the slot number of the 2 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,
		mc = Maintenance threshold slip count, 1- (5)-255
		mt = Maintenance threshold time, default 24 hours, see Note after Step 3
		oc = Out-of-service threshold slip count, 1-(30)-255
		ot = Out of service threshold time, default 1 hour, see Note after Step 3
BPV	n1 n2	Bipolar violation error count, 1-(128)-255 for n1, 1-(122)-255 for n2.
		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 1-(201)-255 for n1, 1-(97)-255 for n2.
		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 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.

Prompt	Response	Description
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 32,640 msec and rounds it to the closest multiple of 128 msec. 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). **Note :** The following requirements must be met for input mt = >dt = >ct = >ot. **Note :** Threshold times must be 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. 10/09/91 -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)
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).

Prompt	Response	Description
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 – Change trunk pad category values.

Prompt	Response	Description
REQ	CHG	Change data
TYPE	PRI2	2 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 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

Prompt	Response	Description
VNL	r t	VIA NET LOSS
DTO	r t	2 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
SATT	r t	Analog satellite TIE trunks
ATO	r t	Analog TOLL office trunks
PRI2	r t	2 Mb 2 Mb PRI trunk (prompted only if the 1.5/2 Mb Gateway feature is equipped and TYPE=2 Mb PRI)
XUT	r t	Analog CO trunk (prompted only if the 1.5/2 Mb Gateway feature is equipped and TYPE=PRI2)
XEM	r t	Analog TIE trunk (prompted only if the 1.5/2 Mb Gateway feature is equipped and TYPE=PRI2)

Table 22 shows the pads available to 2 Mb PRI. Positive dB represents loss and negative dB represents gain.

Table 22
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					

DTI Maintenance

Content list

The following are the topics in this section:

Overview

From a maintenance perspective, Option 11C DTI operation consists of the following major aspects:

- hardware and software states

- near-end and far-end status

- link and/or span integrity

- clocking status

- frame alignment

Option 11C DTI operation is monitored and reported on through maintenance messages, out-of-service alarms, and circuit card faceplate LEDs.

Option 11C maintenance provides several tools, either manual or automatic, for maintaining effective DTI operation. These tools are service change and maintenance commands that are accessible through the software overlays and resident diagnostic routines.

Replace the NTAK10 2 Mb DTI card

To replace a DTI circuit pack, follow the procedure below:

1 Software disable the NTAK10 2 Mb DTI card(s) using LD 60 (command DISL N, where N is the 2 Mb DTI card number).

2 Software disable the clock controller using LD 60 (DIS CC 0).

3 Hold the NTAK10 by the lock latches, unlock the latches and slide the card out of the cabinet. Once out of the slot you may remove any of the daughterboards.

To avoid damage to the circuit cards from electrostatic discharge, wear the wrist strap connected to the inside of your Option 11C cabinet whenever handling the circuit cards. Figure 7 shows the location of the wrist strap in relation to the cabinet.

Figure 7
Wrist strap connection to the Option 11C cabinet

553-8289.EPS
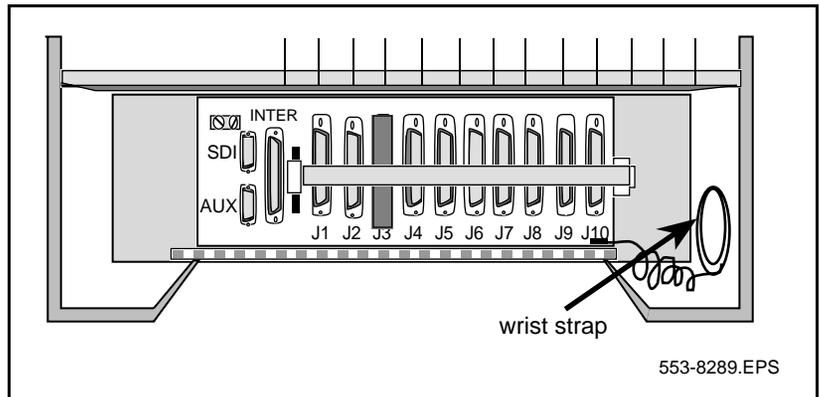
4 Slide the new card into the cabinet and lock the latches.

5 Software enable all NTAK10 2 Mb DTI cards using LD 60 (command ENLL N, where N is the 2 Mb DTI card number).

6 Software enable the clock controller using LD 60 (ENL CC 0).

7 Enable clock tracking on primary digital loop by issuing the following command TRCK PCK.

Monitor Option 11C DTI operation

Maintenance messages

The 2 Mb DTI status and error conditions are reported in the following types of messages, as shown in Table 23. Additional information on DTI messages can be found in the *X11 Maintenance* (553-3001-511).

Table 23
Maintenance messages

Message	Meaning
DTA	Digital Trunk Alarms (Resident Monitor)
DTI	Digital Trunk Interface

2 Mb DTI Error messages

The Digital Trunk Interface diagnostic program (LD 60) is used to maintain the NTAK10 2 Mb DTI Interface Card.

Comprehensive lists of the self-test failure codes for the NTAK10 2 Mb DTI follow the self-test description, later in this chapter.

Grade-of-Service messages

Grade-of-Service messages (DTA XXX) provide near and far end switch status. A summary of these status messages is given in Table 24:

Table 24
Grade-of-Service messages

Status	2 Mb DTI Capability
Acceptable	Both incoming and outgoing calls allowed
Maintenance	Both incoming and outgoing calls allowed
No new data calls	No new outgoing data calls
No new calls	No new outgoing data or voice calls
Out of Service	2 Mb DTI is disabled

2 Mb DTI Alarms

There are two groups of alarm indicators monitored by the 2 Mb DTI. Within these two alarm groups there are several individual alarm types.

Group 1 alarms are event driven and include indicators that decrement a counter whenever an error is detected. Grade-of-service is changed based on how quickly the threshold of the counter is exceeded. The threshold count is determined in LD 73 and downloaded to the 2.0 Mb DTI. Group 1 alarms are:

1 Bipolar Violations (BPV)—Near End Alarm

2 Slips (SLP)—Near End Alarm

3 Frame Alignment Problems (FAP)—Near End Alarm

4 Cyclic Redundancy Check (CRC-4)—Near End Alarm

Group II alarm indicators may be either continuous or spurious. Grade-of-service is changed based on the duration of the alarm within a defined period of time. A minimum persistence time is defined in LD 73 and downloaded to the 2 Mb DTI.

Group II alarm types are listed from high to low priority. A Group II alarm type may not be reported when a greater type is detected.

1 Alarm Indication Signal (AIS)—Far End Alarm

2 Loss of Frame Alignment Signal (LFAS)—Near End Alarm

3 Loss of Multiframe Alignment Signal (LMAS)—Near End Alarm

4 Loss of CRC-4 Multiframe Alignment Signal (CFAS)—Near End Alarm

5 Remote Alarm Indication (RAI, B3)—Far End Alarm

6 Remote Yellow Alarm (B6)—Far End Alarm

7 Alarm Indication Signal, 64 Kilobit (AIS 64)—Far End Alarm

Group 1

Bipolar violation (BPV)   In a bipolar pulse stream, pulses alternate in polarity. A bipolar violation has occurred if, after transmission, two pulses of the same polarity are received in succession (this could be caused by an electrical disturbance such as noise).

Figure 8
Bipolar violations

Normal

Error

553-8300.EPS
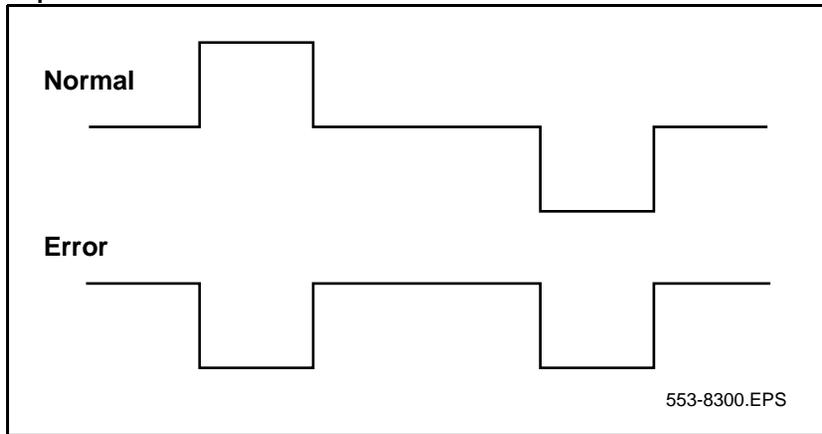
Cyclic Redundancy Check (CRC-4)   When the 2 Mb DTI card is running
in CRC-4 mode, the CRC-4 word contains a checksum of all data in the
multiframe. The receiving side uses the checksum to verify the data.

The primary difference between BPV and CRC is that bipolar violation
tracking indicates errors in the local span, while CRC indicates errors on an
end-to-end span. For example, on a satellite link, BPV only detects errors in
the span between the Meridian 1 and the satellite connection. Since CRC
traverses the entire span, it indicates an end-to-end bit error rate.

Slip (SLP) 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 as the
repetition of, or deletion of 256 bits (one frame) due to a discrepancy in the
read and write rates at the buffer (clocks aren't 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.

All of the degradations shown in Table 25 can be controlled or avoided by proper clock (network) synchronization.

Table 25
Performance Impact of one Slip.

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 4-8 scan lines. Drop Call.
Voice Band Data	Transmission Errors for 0.01 to 2 s. Drop Call.
Voice	Possible Click

Clock synchronization can be either tracking, on the primary or secondary reference clock, or free run (non-tracking). In LD 73 (prompts PREF and SREF), the 2 Mb DTI which supports the active clock controller is defined as the primary clock reference. Another 2 Mb DTI may be defined as the secondary clock reference. The clock controller synchronizes from the primary or secondary's incoming pulse stream. The clock controller in turn supplies clocking to all the other 2 Mb DTI cards.

2 Mb DTI hardware detects frame slips in tracking and free run modes. For tracking mode, running the midnight routines prints the number of overflows and clears the counter. For free run mode, running the midnight routines prints the number of slips and clears the counters.

Frame Alignment Problem (FAP)   A Frame Alignment Problem is counted when a bit error occurs within the framing pattern.

Group 2

Loss of Frame Alignment Signal (LFAS)   A Loss of Frame Alignment condition can be defined as: frame alignment is lost on three consecutive frame alignment errors. This condition may occur as a result of the far end of the E1 span going completely out of service.(due to a power interruption, for example) or any other reason resulting in losing the incoming pulse stream. The B3 alarm is sent to the far end after the persistence time expires.

Loss of frame alignment thresholds 2.0 Mb DTI hardware detects out of frame conditions. Running the midnight routines prints the number of occurrences when frame alignment was lost and clears the counters.

Alarm Indication Signal (AIS) AIS is defined as receiving all ones without framing. The detection algorithm for AIS is two or less zeros per two frames. This allows detection of AIS in the presence of a 10E-3 error rate, without mistaking framed all 1s for AIS.

When the AIS is detected, the prompt maintenance alarm indication associated with LFAS and excessive bit error rates should be inhibited. B3 alarm is sent to the far end after persistence time expires

Alarm Indication Signal 64 Kilobit (AIS64)   There are also specific AIS requirements for CNET (France). The first requirement relates to the transmission of AIS in TS16. In that case, all 1 should be transmitted in the event abcd signaling cannot be supported.

With respect to the reception of AIS in TS16, AIS 64 Kbits must be detected when multiframe alignment has been lost and the binary content of TS16 is 95 percent 1, counting on 256 or 512 bits.

When AIS in TS16 is detected, then bit 6 of outgoing TS16 frame 0 should be set. When the fault disappears, it should then be cleared. Setting and clearing bit 6 of TRS 16 frame 0 must follow changes in status of the fault by less than 100 msec.

Other requirements when AIS 64 Kbit is detected include setting an LED, printing a TTY message and the updating of present status and history files. When a fault is detected, further changes in other error types should continue to be reported.

Loss of Multiframe Alignment Signal (LMAS)   This condition is sometimes called a multiframe yellow alarm. An LMAS occurs when two consecutive multiframes contain errors in their Multiframe Alignment Signal, or when all TS16 bits are zero for at least one multiframe.

B6 alarm is sent to the far end after persistence time expires. If the option is enables, B3 alarm is also sent.

Loss of CRC-4 Multiframe Alignment Signal   This condition is declared when the CRC-4 multiframe search fails to recognize two valid multiframe alignment words within 8 msec. This category is only relevant however, when CRC-4 option is selected.

B6 alarm is sent to the far end after persistence time expires. If the option is enabled, B3 alarm is also sent.

Remote Alarm Indication (RAI)   Bit 3 of TS0 in non-FAS frames is set to "1". This alarm is sometimes called a yellow alarm. The far end is receiving AIS.

Remote Yellow Alarm (B6)   Bit 6 of TS16 in Frame 0 is "1". This alarm occurs when the far end has detected a loss of MFA.

NTAK10 Faceplate LEDS

The NTAK10 2 Mb DTI circuit card has a total of six LEDs on its face. Five of the LEDs are directly associated with the operation of the NTAK10 2 Mb DTI circuit card. The remaining LED is associated with the on-board clock controller. Table 26 shows the LEDs found on the NTAK10 2 Mb DTI circuit card and the meaning of each:

Table 26
NTAK10 Faceplate LEDS

LED	State	Definition
DIS	On (Red)	The NTAK10 2 Mb DTI circuit card is disabled
	Off	The NTAK10 2 Mb DTI is not in a disabled state
OOS	On (Yellow)	The NTAK10 2 Mb DTI circuit card is in an out of service state.
	Off	The NTAK10 is not in an out of service state.
NEA	On (Yellow)	A near end alarm state has been detected
	Off	No near end alarm
FEA	On (Yellow)	A far end alarm state has been detected
	Off	No far end alarm
LBK	On (Yellow)	NTAK10 2 Mb DTI is in loop-back mode
	Off	NTAK10 2 Mb DTI is not in loop-back mode
CC	On (Red)	The clock controller is switched on and disabled
	On (Green)	The clock controller is switched on and is either locked to a reference or is in free run mode
	Flashing (Green)	The clock controller is switched on and locking onto the primary reference
	Off	The clock controller is switched off

Option 11C DTI maintenance tools

The tables below provide DTI and clock controller maintenance commands.

WARNING

You must disable the clock controller before unseating circuit cards, otherwise the system will initialize and momentarily interrupt call processing.

DTI commands

Below is a quick reference list of important 2.0 Mb DTI commands in LD 60.

LD 60 – DTI commands.

Command	Action
DLBK L	Disable "loopback mode" for 2.0 Mb DTI
RLBK L	Enable "loopback mode" for 2.0 Mb DTI
DISI L	Disable 2.0 Mb DTI when idle
DISL L	Force disable 2.0 Mb DTI
ENLL L	Enable 2.0 Mb DTI
LCNT (L)	List alarm counters
RCNT (L)	Reset alarm counters
SLFT (L)	Do 2.0 Mb DTI self-test
STAT (L)	List 2.0 Mb DTI status

Clock Controller commands

Below is a quick reference list of clock controller commands in LD 60.

Command	Action
DIS CC 0	Disable clock controller N
ENL CC 0	Enable clock controller N
SSCK 0	Status of clock controller N
TRCK XXX	Set clock controller tracking. XXX can be:
PCK	Track primary clock reference source
SCLK	Track secondary clock reference source
FRUN	Free run mode

2.0 Mb DTI tests

Self test/Local loopback

The NTAK10 self-tests when requested in LD 60. This procedure checks the sanity of the on board processors, operation of memory and peripheral hardware as well as per-channel and per-loop loopback.

Before this test is run, the loop must be disabled as follows:

1   Disable the NTAK10 using LD 60:

   LD 60

   DISL L CH

2   Run the self-test using LD 60:

   LD 60

   SLFT L (for the entire loop)

   SLFT L CH (for a specific channel)

Local loopback may also be performed on a per-channel basis without having to disable the entire loop. In this case, only the tested channel must be disabled. The procedure for this test is as follows:

1   Disable the 2 Mb DTI channel using LD 60:

   LD 60

   DISL L CH

2   Run the self-test using LD 60:

   LD 60

   SLFT L CH (for a specific channel

For self testing individual channels, follow the same procedure as above, but use the following commands:

   DSCH C CH

   SLFT C CH (specific channel)

Table 27
Self-test failure codes for NTAK10 2 Mb DTI

DTI009 loop ch	DTI/PRI loop or channel failed hardware self test. For DTI009 L M E, the output data is
	    L = loop
	    M = N for NI microprocessor
	    M = C for CI microprocessor
	    E = error code for debug purposes.

DTI009C ch	DTI Card C or channel ch of Card C failed hardware self-test.
	Error codes for NI microprocessor (M=N):
	00 = NI self test has finished.
	01 = Undefined messout received
	02 = Problem with group 2 error handling (invalid level)
	03 = NI to CI FIFO full (128 messages lost)
	04 = CI-1 Micro failed to initialize on power-up
	05 = NI group 1 error handling - undefined condition found
	06 = Bad MESSOUT number 6 encountered.
	07 = NI Messout queue is full.
	08 = NI Messin queue full.
	09 = NI priority Messin queue is full.
	10 = Bad MESSOUT number 10 encountered.
	11 = TN = 0 read from regular queue.
	12 = TN = 0 read from priority queue.
	14 = Bad TN associated with MESSOUT number 14
	15 = Bad TN associated with MESSOUT number 15
	50 = External RAM in range 880h-8EFH failed (MESSIN queue)
	51 = Internal RAM test failed.
	52 = Pad RAM test failed.
	53 = External RAM test failed.
DTI009C ch	**Error codes for NI microprocessor (M=N) continued:**
	54 = 8253 or DALLAS timer/counter test failed.
	55 = Slip counter test failed.

	56 = Loopback of TS16 frame 0 failed.
	57 = Loopback of non fas TSO failed.
	58 = Echo test to CI-1 micro failed.
	60 = A07 device failed
	61 = Motorola DUART failed
	62 = Multiframe loopback test failed
	255 = Loss of NI FIFO synchronization (Stop byte = 0 not found).
	DTI009 error codes for CI microprocessor (M=C):
	03 = A complete message was not received from NI micro
	128 = Message received by CI-1 through FIFO requested an undefined task.
	129 = Request for a timed two-state pulse was received, with the TN of TS 0 or 16
	130 = An attempt was made to set the flag to invoke the pulse timer for TS 0.
	131 = A request for a task defined under Messout 30 has been received with the TN of TS 0.
	132 = Attempt was made to enable outpulsing TS 0 or TS16.
	133 = A Messout 31 has been received for TS 0 or TS 16 with the pulse hold time not = 0.
	134 = An attempt has been made to set the bit to invoke the pulse timer for TS 0 or TS 16.
	135 = A request for outpulsing was received, but outpulsing data was not downloaded.
	137 = A request for PPM counting was received, but the was not downloaded.
	138 = A Messout 30 was received requesting a task to be performed for DTI TS 16 which is not allowed.
DTI009C ch	**DTI009 error codes for CI microprocessor (M=C):**
	139 = The 8031 on CHIP RAM failed self test.
	140 = The TS 16 signaling RAM and/or the TS 16 pick up buffer failed self test.
	141 = The CI-1 micro external RAM failed self test.

	142 = Attempt was made to set/clear the flag used to invoke PPM pulse timing for DTI timeslot 0 or 16.
	143 = CI-2 micro responded to echo request message but response was in error.
	144 = CI-2 micro failed to respond to request echo message.
	145 = The request for self test received did not have the TN of TS 0
	146 = The TN of MESSOUT 26 received was not that or TS 0.
	147 = The TN of MESSOUT 28 received was not that of TS 0.
	148 = The TN of MESSOUT 29 received was not that of TS 0.
	149 = Upon enabling the DTI card, the CI-1 was unable to write Frame 0, TS 16 with '0B'.
	150 = MESSOUT 26 was received with the PPM counting bit (abcd) all equal to zero.
	151 = MESSOUT 28 was received with the outpulsing bit (abcd) equal to zero.
	152 = CI-2 failed to respond to the CI-1 watch dog message.
	153 = The CI-2 failed to respond to five consecutive watchdog messages and is assumed to be out of service.
	154 = Messout received requesting the lower nibble of MFAS pattern to be written with something other than '0000'.
	155 = MESSOUT received requesting '0000' to be written into an 'abcd' state.
	156 = MESSOUT received with a TN outside the range shelf 0, card 8-1 unit 3-0.
DTI009C ch	**DTI009 error codes for CI microprocessor (M=C):**
	157 = CI-1, NI FIFO overflowed, and has been cleared. 128 message were lost.

	255 = TS16-DS30X FIFO overflowed, and has been cleared. 128 messages were lost.
	147 = The TN of MESSOUT 28 received was not that of TS 0.
	148 = The TN of MESSOUT 29 received was not that of TS 0.
	149 = Upon enabling the DTI card, the CI-1 was unable to write Frame 0, TS 16 with '0B'.
	150 = MESSOUT 26 was received with the PPM counting bit (abcd) all equal to zero.
	151 = MESSOUT 28 was received with the outpulsing bit (abcd) equal to zero.
	152 = CI-2 failed to respond to the CI-1 watch dog message.
	153 = The CI-2 failed to respond to five consecutive watchdog messages and is assumed to be out of service.
	154 = Messout received requesting the lower nibble of MFAS pattern to be written with something other than '0000'.
	155 = MESSOUT received requesting '0000' to be written into an 'abcd' state.
	156 = MESSOUT received with a TN outside the range shelf 0, card 8-1 unit 3-0.
DTI009C ch	**DTI009 error codes for CI microprocessor (M=C):**
	157 = CI-1, NI FIFO overflowed, and has been cleared. 128 message were lost.
	255 = TS16-DS30X FIFO overflowed, and has been cleared. 128 messages were lost.

Near End Trunk loopback test

The near end trunk loopback test checks the integrity of the 2 Mb link from the Option 11C to the far end. Either a per-loop or per channel test may be run, with the far end device placed in the respective mode of remote loopback. Refer to Figure 9.

The procedure for a near-end per-loop loopback test is as follows:

Procedure	Overlay	Command
Disable the 2 Mb DTI card	LD 60	DISL L
Run the loopback test	LD 60	RMST L

The procedure for a near-end per-channel loopback test is as follows:

Procedure	Overlay	Command
Disable the 2 Mb DTI channel	LD 60	DSCH L CH
Run the loopback test	LD 60	RMST L CH

Figure 9
Near End Trunk Loopback
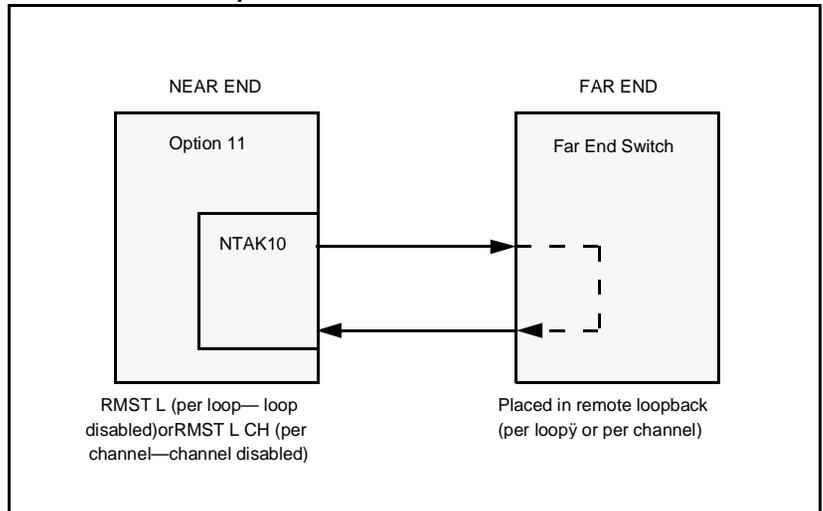
Far End Trunk loopback test

The far end trunk loopback test checks the integrity of the 2.0 Mb link from the far end to the carrier interface of the 2.0 Mb DTI (it does not test the 2 Mb DTI card). Either a per-loop or per-channel test may be run, with the near end device placed in the respective mode of remote loopback. Refer to Figure 10.

The procedures for **per-loop loopback tests** follow:

Procedure: near-end	Overlay	Command
Disable the 2 Mb DTI card	LD 60	DISL L
Place the 2 Mb DTI card in remote per-loop loopback	LD 60	RLBK L

Procedure: far-end	Overlay	Command
Disable the 2 Mb DTI channel	LD 60	DSCH L CH
Place the 2 Mb DTI channel in remote loopback	LD 60	RLBK L CH

Figure 10
Far End Trunk Loopback

NEAR END   FAR END

Option 11   Far End Switch

NTAK10

RLBK L (per loop— loop disabled) or   Per loop or per
RLBK L CH (per channel—channel   channeltest run
disabled)

PRI Maintenance

Content list

The following are the topics in this section:

Reference list

The following are the references in this section:

- *X11 Maintenance* (553-3001-511)

Overview

This chapter provides an overview of the maintenance tools available for 2.0 Mb PRI or ISL features:

- commands used to maintain PRI, DDCH, DCHI and clock controller hardware

- tests for 2.0 Mb PRI operation

- error detection for 2.0 Mb PRI, including the various thresholds found in the 2.0 Mb PRI loop timers in LD 73.

Enable the 2.0 Mb PRI after installation

To enable an NTAK79 or NTBK50 PRI circuit pack, follow one of the appropriate procedures which follow.

Enable the NTAK79 PRI

1   Software enable all 2.0 Mb PRI cards using LD 60 (command ENLL N). The DCHI will enable automatically from the enable PRI command.

2   Software enable the clock controller using LD 60 (command ENL CC 0).

3   Enable clock tracking on primary digital loop by issuing the following command: TRCK PCK.

   Within about 30 seconds the D-channel layer 3 should be established.

4   You can request the current status of the D-channel by issuing the command STAT DCH. The system should respond DCH N EST in LD 96 (meaning that the D-channel is established and operational).

Enable the NTBK50 PRI

1 If using the NTBK51 DDCH daughterboard, enable the DDCH in LD 96 by issuing the command ENL MSDL X.

2 Software enable all 2.0 Mb PRI cards using LD 60 (command ENLL N). The DCHI will enable automatically from the enable PRI command.

3 Software enable the clock controller using LD 60 (command ENL CC 0).

4 Enable clock tracking on primary digital loop by issuing the following command: TRCK PCK.

Within about 30 seconds the D-channel layer 3 should be established.

5 You can request the current status of the D-channel by issuing the command STAT DCH. The system should respond DCH N EST in LD 96 (meaning that the D-channel is established and operational).

Disable the 2.0 Mb PRI before removal

To disable a PRI circuit pack, follow the appropriate procedure below.

Disable the NTAK79 PRI

1 Software disable the DCHI using LD 96, command DIS DCH N, where N is the D-channel device number.

2 Software disable the clock controller using LD 60 (DIS CC 0).

3 Software disable the PRI card using LD 60 (command DISL N, where N is the PRI card number).

Disable the NTBK50 PRI

1 Software disable the DCHI using LD 96, command DIS DCH N, where N is the D-channel device number.

2 If using the NTBK51 DDCH daughterboard, enter the DIS MSDL N command in LD 96.

3 Software disable the clock controller using LD 60 (DIS CC 0).

4 Software disable the PRI card using LD 60 (command DISL N, where N is the PRI card number).

Monitor Option 11C PRI operation

Maintenance messages

Service messages report on near and far end switch status. Both service and service acknowledge messages are supported on PRI B-channels and ISL channels. These messages are used for backup D-channel and D-channel sanity polling. The status may be in-service and out-of-service.

Service and service acknowledge messages for B-channels and ISL channels are supported between:

- Meridian 1 to Meridian 1: ISL and PRI

- Meridian 1 to CO: PRI only

The status of these messages is reported by the service and service acknowledge messages for B-channels and ISL channels:

- in-service

- maintenance

- out-of-service

Near end and far end subcategories are defined for each maintenance status. See Table 28 for possible combinations of near end and far end status, and the channel capability for each status. When the status of the near end and far end does not match, the more severe maintenance status takes effect over the less severe maintenance status.

Table 28
Maintenance message status

Near end status	Far end status	B channel capability
In-service	In-service	both incoming and outgoing calls allowed
In-service	Maintenance	only incoming calls allowed
In-service	Out-of-service	not allowed to use
Maintenance	N/A	not allowed to use
Out-of-service	N/A	not allowed to use

Service message function

Service messages are used to monitor the following:

- D-channel establishment
- D-channel sanity polling
- B-channel or ISL status change
- Channel status audit.

D-channel establishment

When the D-channel establishes, the B-channel status is supported by sending service messages for each B-channel controlled by a D-channel. This allows the far end to synchronize its channel states. These services messages are sent when the D-channel is brought up automatically by the system or manually by using LD 96.

D-channel sanity polling

If a D-channel has been idle for 30 seconds, a service message is sent to poll the sanity of the link. The service message is sent regardless of whether the near end is configured as master or slave.

B-channel status change

Whenever there is a status change for a B-channel or an ISL channel, the new status is reported to the far end in a service message. Status change can occur through service change or maintenance operations, such as the addition or deletion of a channel in LD 14, or disabling of the associated loop, shelf, card or unit in LD 30, LD 32, LD 36, LD 41 or LD 60.

Channel status audit

LD 30 is enhanced to allow channel status audit to be initiated. The channels associated with each D-channel are examined and their status is reported to the far end by service messages.

Service message commands

You activate the service messages in LD 96 on a per D-channel basis. The commands are:

- ENL SERV N: turns on the support of service and service acknowledge messages for DCH link N. The command should only be executed when the specified D-channel is in the disabled state.

- DIS SERV N: turns off the support of service and service acknowledge messages for DCH link N.

- STAT SERV (N): displays the current service and service acknowledge message SERV setting for individual DDCH N or for DCHIs.

Two new statuses are added for maintenance messages, FE MbSY = Far end maintenance and FE DSBL = Far end disabled.

2.0 Mb PRI error detection

The Primary Rate Interface categorizes errors and alarm conditions into two main groups, Group I and Group 2 errors.

Group I Errors

These are real-time calculated error-rate thresholds. Group I errors can include:

- Bipolar Violations (BPV)

- Frame Bit Errors (FBER)

- CRC-4 Word Errors (CRC)

- Controlled Frame Slips

Bipolar Violations

In a alternate mark inversion (AMI) bipolar pulse stream, pulses alternate in polarity. A bipolar violation has occurred when two pulses of the same polarity are received in succession, as shown in Figure 11. This might be caused by an electrical disturbance such as noise, a low signal level or a faulty repeater Bipolar violations give a good indication of the integrity of the local span from the Meridian 1 to the first repeater.

The PRI card, following the CEPT PCM-30, uses a zero code suppression technique known as HDB3 which introduces intentional bipolar violations onto the carrier. This is accounted for by the receiver and disregarded as bipolar violation errors.

Figure 11
Bipolar violations
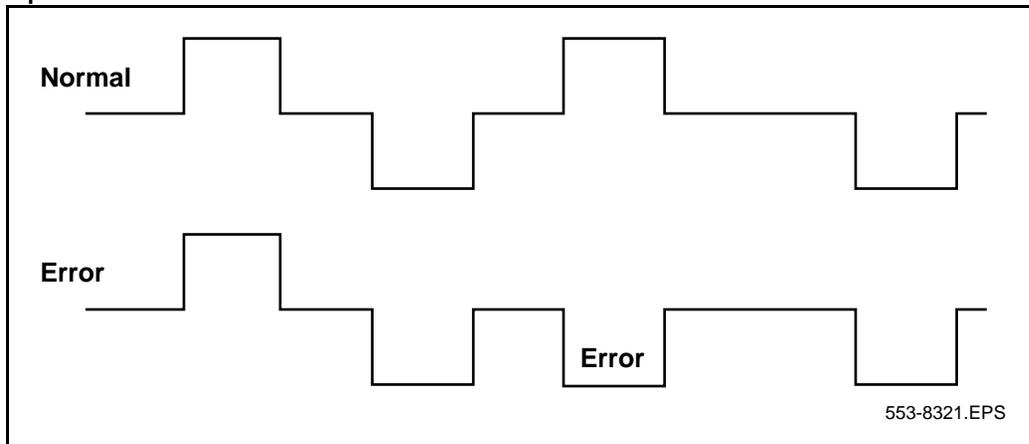
Frame Bit Errors

The NTAK79/NTBK50 PRI CEPT PCM-30 stream is structured into a frame
of 32 8-bit timeslots. To maintain alignment of this frame structure, alternate
timeslot zeros have a specific frame alignment pattern (X0011011).

A frame bit error is acknowledged when any of the bits in the received pattern
are in error. This error rate provides an indication of the integrity of the
complete end-to-end span.

CRC-4 Word Errors

When operating in the CRC-4 multiframe format (CRC), frames are bundled
into groups of 16. This format includes a specific multiframe alignment
pattern in bit 0 of every even frame's timeslot 0 (001011XX).

Each odd frame timeslot 0 includes a CRC-4 cyclic redundancy checksum of
the previous 8 frames (sub-multiframe). This transmitted checksum is
compared against a calculated checksum at the receiver. If the two checksums
do not match, a CRC-4 Word error is indicated.

Group I error rates are processed on the PRI card based on software
downloadable parameters N1 and N2 (for each BPV, CRC and FBER). The
values for N1 are scaled on the card as follows:

- $BPV = N1 \cdot 16$

- CRC = N1• 4

- FBER = N1• 1

N2 values are not scaled. These parameters may be established in LD 73 on a per card basis, or they can be left at their default values.

Parameters N1 and N2 provide for the following error rate thresholds reported to the system:

Severely Errored Second: when the number of occurrences of the error exceeds the value of N1 in the previous second. This error is reported and counted (LCNT), but no action is taken by the system.

Unavailable Condition: this is reported when 10 severely errored seconds are received in 10 consecutive seconds. This is equivalent to an error rate worse than 10^{-3} with the default value. When this condition is reached, the 2.0 Mb PRI is put into an out-of-service condition until the Group I OOS guard timer expires and the error condition has ceased or improved.

No New Call Condition: when the number of occurrences of the error exceeds the value of (10 x N2) in the previous minute. This corresponds to an error rate of 10^{-3} to 10^{-5} using the default N2 value. When this condition is reported, the system will record the error (LCNT) and place the PRI card into a no new call condition, with all idle channels set to MbSY. The card automatically returns to normal state when the condition improves after the Group I NNC guard timer expires.

Maintenance Condition: this condition implements when the number of occurrences of the error exceeds the value of N2 in the previous minute. This corresponds to an error rate between 10^{-5} and 10^{-6} based on the N2 default values. When this condition is reported, the system will record the error (LCNT) and place the 2.0 Mb PRI card into a maintenance alarm state. This state has no effect on call processing but simply alerts you of the line degradation. The card automatically returns to normal state when the condition improves after the Group I MAINT guard timer expires.

There is no error report for the error rates below 10^{-6} (10xN2), as such rates are considered satisfactory.

Program Group I Thresholds

To set your LD 73 Group I thresholds, use the following commands.

LD 73 – Program Group I Thresholds.

Prompt	Response	Description
REQ	CHG	
TYPE	PRI2	
FEAT	LPTI	
•		
BPV	N1 N2	Default: 128 122
CRC	N1 N2	Default: 201 97
FBER	N1 N2	Default: 28 1
•		
OOS1	1 - 60 M	Default: 15
NNC1	1 - 60 M	Default: 15
MNT1	1 - 60 M	Default: 15

Frame Slips

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 2.0 Mb 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 2.0 Mb PRI contains a buffer large enough to contain 2 full frames (256 x 2 = 512 bits), and is normally kept half full (1 frame). See Table 29 for the impact of one slip on various types of data.

All of the degradations shown in Table 29 can be controlled or avoided by proper clock (network) synchronization.

Table 29
Performance Impact of one Slip.

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 4-8 scan lines. Drop Call.
Voice Band Data	Transmission Errors for 0.01 to 2 s. Drop Call.
Voice	Possible Click

Clock synchronization can be either tracking, on the primary or secondary reference clock, or free run (non-tracking). In LD 73 (prompts PREF and SREF), the 2.0 Mb PRI which supports the clock controller is defined as the primary clock reference. Another 2.0 Mb PRI (or DTI) may be defined as the secondary clock reference. The clock controller synchronizes from the primary's or secondary's references incoming bit stream. The clock controller in turn supplies a synchronized reference for the rest of the system, including all 2.0 Mb PRIs and DTIs.

The 2.0 Mb PRI card detects and reports frame slips (repetitions and deletions) to the Meridian 1. The count of slips is recorded (LCNT), printed out, and cleared at each midnight routine.

Frame slips have two alarm thresholds as defined in LD 73. They are as follows:

Slip - Out of Service Threshold

When this threshold (variable count versus variable time) is reached, the PRI card is placed in an out-of-service state. The card automatically returns to a normal state if the slip rate improves after the Group I OOS guard timer expires.

Slip - Maintenance Threshold

When this threshold is reached, the PRI card is placed in a maintenance state that has no impact on call processing. The maintenance state is simply an indication that a degraded condition exists. The card automatically returns to a normal state if the slip rate improves after the Group I MAINT guard timer expires.

Define Slip Thresholds

To define your slip thresholds, use the following commands in LD 73. Times range from 1M to 24H (one 1 minute to 24 hours). Counts are 1 to 255.

LD 73 – Define Slip Thresholds.

Prompt	Response	Description
REQ	CHG	
TYPE	PRI2	
FEAT	LPTI	
	5 24H	This entry establishes a maintenance threshold of 5 slips in 24 hours
SLIP	20 1H	This entry establishes an OOS threshold of 20H [32] slips in 1 hour

Group 2 Errors

Group 2 errors are event-based alarms that can be separated into Red (local) and Yellow (far end) alarms.

Yellow (Far End) Alarms

A Yellow alarm on the 2.0 Mb PRI card indicates that the card is receiving an alarm indication from the far end.

This type of alarm may be received in two ways:

*   **Remote Alarm Indication** (RAI)—Bit 3 of non-FAS frame set

    or,

*   **Alarm Indication Signal** (AIS)—All 1s on the carrier.

Since the 2.0 Mb PRI is receiving a Yellow alarm signal, that indicates that there is a carrier connection, but the far end is not ready. It is possible, however, that the carrier connection is one way only (2.0 Mb PRI receiving).

When the 2.0 Mb PRI receives a Yellow alarm signal, all channels are placed in a maintenance busy mode (MBSY). Group 2 Yellow alarms are recorded (LCNT) on each occurrence, but the card is not placed into an out-of-service state.

Red (Local) Alarms

A Red alarm on the PRI card indicates that the card is having problems synchronizing with the incoming bit stream.

This type of alarm may be caused by the following:

*   **Loss of Signal** (LOS)

*   **Loss of Frame Alignment** (LFAS)

*   **Loss of CRC-4 Multiframe Alignment** (LMAS)

When the 2.0 Mb PRI is in a Red alarm state, RAI is transmitted to the far end.

For both Group 2 Red and Yellow alarm states, action is taken after the condition has persisted for a downloaded persistence (PERS) threshold. The parameter is set in LD 73 in multiples of 2 msec, with 2 x 50 = 100 msec as the default.

For Group 2 Red alarm conditions, there are four definable time thresholds that can be set in LD 73 on a per-loop basis. The first parameter sets an aggregate time in multiples of 128 msec (default 20=2.5 sec). The next four parameters provide time thresholds for MAINT, NNDC, NNC, and OOS.

For example, if the total cumulative time that an error has been present reaches the aggregate time (2.5 sec default) in less than the time set in OOS, the card is put into an out-of-service state. If it took more than the preset time for the error condition to register, the card could be put into NNDC, NNC or MAINT states. The card remains in the alarm condition until the error has improved and after the Group 2 guard timers expire.

Define Group 2 Error Thresholds

You are able to define Group 2 error thresholds in LD 73. Only the highest priority Group 2 alarm condition is active at a time. The order of priority (from highest to lowest) is: LOS, AIS, LFAS, LMAS, RAI.

LD 73 – Define Group 2 Error Thresholds.

Prompt	Response	Description			
TYPE	2.0 Mb PRI				
FEAT	LPTI				
•					
GP2	20 (Aggregate count default [20x128ms =2.5sec])	100s (Maintenance threshold)	12s (NNDC threshold)	12s (NNC threshold)	4s (OOS threshold)
•					
OOS2	1-(15)-255s	(Group 2 guard timer)			
NNC2	1-(15)-255s	(Group 2 guard timer)			
MNT2	1-(15)-255s	(Group 2 guard timer)			
PERS	50	(in multiples of 2ms)			
CLRS	50	(in multiples of 2ms)			
OOSC	1-(5)-255	(Out of service count limit) After this number is reached, the card does not auto-enable.			

NTAK79 Faceplate LEDs

The NTAK79 circuit card has a total of seven faceplate LEDs. Five of the LEDs are directly associated with the operation of the Primary Rate interface (PRI). The remaining two LEDs are associated with the on-board Clock Controller and the on-board D-channel interface (DCHI). Refer to Table 30.

Table 30
NTAK79 faceplate LEDs

LED	State	Definition
OOS	On (Red)	The NTAK79 2.0 Mb PRI circuit card is either disabled or out-of-service.
	Off	The NTAK79 2.0 Mb PRI is not in a disabled state.
ACT	On (Green)	The NTAK79 2.0 Mb PRI circuit card is in an active state.
	Off	The NTAK79 2.0 Mb PRI is in a disabled state. The OOS LED is red.
RED	On (Red)	A red alarm state has been detected. This represents a local alarm state of Loss of Carrier (LOS), Loss of Frame (LFAS) or Loss of CRC Multiframe (LMAS).
	Off	No red (local) alarm.
YEL	On (Yellow)	A yellow alarm state has been detected. This represents a remote alarm indication from the far end. The alarm may be either Alarm Indication (AIS) or Remote Alarm (RAI).
	Off	No yellow (remote) alarm.
LBK	On (Green)	NTAK79 2.0 Mb PRI is in loop-back mode.
	Off	NTAK79 2.0 Mb PRI is not in loop-back mode
LED	**State**	**Definition**
CC	On (Red)	The clock controller is switched on and software disabled
	On (Green)	The clock controller is enabled and is either locked to a reference or is in free run mode

	Flashing (Green)	The clock controller is enabled and is locking onto a reference.
	Off	The clock controller is switched off (by switch SW3).
DCH	On (Red)	DCHI is switched on and disabled
	On (Green)	DCHI is switched on and enabled, but not necessarily established.
	Off	DCHI is switched off (by switch SW1).

NTBK50 Faceplate LEDs

The NTBK50 circuit card has a total of seven faceplate LEDs. Five of the LEDs are directly associated with the operation of the Downloadable D-channel handler and D-channel interface. The remaining two LEDs are associated with the Clock Controller. Refer to Table 31.

Table 31
NTBK50 faceplate LEDs

LED	State	Definition
OOS	On (Red)	The NTBK50 2.0 Mb PRI circuit card is either disabled or out-of-service. Also, the state of the card after power-up, completion of self test, and exiting remote loopback.
	Off	NTBK50 is not in a disabled state.
ACT	On (Green)	NTBK50 PRI circuit card is in an active state.
	Off	NTBK50 2.0 Mb PRI is in a disabled state. The OOS LED is red.
RED	On (Red)	A red alarm state has been detected. This represents a local alarm state of Loss of Carrier (LOS), Loss of Frame (LFAS) or Loss of CRC Multiframe (LMAS).
	Off	No red (local) alarm.
YEL	On (Yellow)	A yellow alarm state has been detected. This represents a remote alarm indication from the far end. The alarm may be either Alarm Indication (AIS) or Remote Alarm (RAI).

	Off	No yellow (remote) alarm.
LBK	On (Green)	NTBK50 2.0 Mb PRI is in loop-back mode.
	Off	NTBK50 2.0 Mb PRI is not in loop-back mode
LED	**State**	**Definition**
CC	On (Red)	The clock controller is software disabled
	On (Green)	The clock controller is enabled and is either locked to a reference or is in free run mode
	Flashing (Green)	NTAK20 is equipped and is 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 may 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	The clock controller is not equipped.
DCH	On (Red)	DCH is disabled.
	On (Green)	DCH is enabled, but not necessarily established.
	Off	DCH is not equipped.

Option 11C PRI maintenance tools

Table 32
2.0 Mb PRI commands (LD 60)

Command	Action
DISI L	disable 2.0 Mb PRI when idle
DISL L	force disable PRI
ENLL L	enable PRI
LCNT (L)	list alarm counters
RCNT (L)	reset alarm counters and clear alarms
SLFT (L)	do 2.0 Mb PRI self-test (2.0 Mb PRI must be disabled first)
STAT (L)	list 2.0 Mb PRI status
RLBK L (C)	enable remote loopback
DLBK L (C)	disable remote loopback
RMST L (C)	Perform remote loopback

PRI status and error conditions are reported in the following types of messages.

DCHI commands

D-channel commands are found in LD 96. The following is a quick reference list of D-channel commands:

Table 33
DCHI commands

Command	Action
DIS DCHI N	disable DCHI port N
ENL DCHI N	enable DCHI port N
EST DCH N	establish D-channel N
PLOG DCHI N	print D-channel statistics log N
RLS DCH N	release D-channel N
SDCH DCH N	release a D-channel and switch D-channels
RST DCH N	reset D-channel N
STAT DCH (N)	print D-channel status (link status)

TEST 100/101	DCH tests
STAT SERV	Print the current service and service acknowledge message for DCHI N
ENL SERV N	Enable service messages for DCHI N
DIS SERV N	Disable service messages for DCHI N

D-channel status and error conditions are reported as DCH messages. These messages can be found in the *X11 Maintenance* (553-3001-511).

DDCH commands

Downloadable D-channel commands are found in LD 96. The following is a quick reference list of D-channel commands with minor modification:

Table 34
DDCH commands

Command	Action
DIS MSDL X (ALL)	Disable DCHI card X
ENL MSDL X (FDL, ALL)	Enable DCHI card X, with or without Force Download
RST MSDL X	Reset MSDL card X
STAT MSDL X (X (full))	Get MSDL status X, or a "FULL STATUS"
SLFT MSDL X	Execute a self test on MSDL card X
DIS LLB X	Disable local loop back on MSDL DCH X
DIS RLB X	Disable remote loop back on MSDL DCH X
DIS TEST X	Disable Test mode on MSDL DCH X
ENL LLB X	Enable local loop on MSDL DCH X
ENL RLB X	Enable remote loop on MSDL DCH X
ENL TEST X	Enable Test mode on MSDL DCH X
PCON DCH X	Print configuration parameters on MSDL DCH X
PMES DCH X	Print incoming layer 3 messages on MSDL DCH X
PTRF DCH X	Print traffic report on MSDL DCHX
TEST LLB X	Start local loop back test on MSDL DCH X
TEST RLB X	Start remote loop back test on MSDL DCH X

Note: "X" represents the D-channel device number

D-channel status and error conditions are reported as DCH messages. These messages can be found in the *X11 Maintenance* (553-3001-511).

Clock Controller commands

Clock Controller commands are accessed using LD 60. The following is a quick reference list of clock controller commands:

Table 35
Clock Controller commands

Command	Action
DIS CC 0	Disable clock controller
ENL CC 0	Enable clock controller
SSCK 0	Status of clock controller
TRCK XXX	Set clock controller tracking where XXX can be: PCK—track primary clock reference source SCLK—track secondary clock reference source FRUN—free run mode

NTAK79/NTBK50 Power on self test

When power is applied to the NTAK79/NTBK50 2.0 Mb PRI circuit card, the card performs a power-on self-test. The self-tests verify the operation of most of the on-board hardware.

If all the self-tests pass, the upper 5 LEDs blink simultaneously three times. If any of the self-tests fail, the LEDs do not blink. Only the OOS LED illuminates. The corresponding error code is then printed on the TTY.

Self-test error codes
The following table lists the self test failure codes for the NTAK79/NTBK50 2.0 Mb PRI. These codes could be returned on card power-up in the form "DTA105 L X" (where X is the failure code), or during a self test procedure in LD 60 as "DTI009 L X" (where X is the error code).

Failure codes 1-14 are hardware failures on the NTAK79/NTBK50 card. Codes 15-16 may be due to carrier span problems or lack of loopback activation at the far end.

Table 36
Self-Test error codes

Failure Code	Associated Error
0	Self test passed
1	Self test general failure
2	LCAs failed to program correctly
3	8031 code checksum failure
4	8031 internal RAM failure
5	8031 external RAM failure
6	PAD RAM failure
7	AO7 signaling interface failure
8	UART (card LAN) failure
9	CEPT transceiver failure
10	Line interface failure
11	Receiver framing failure
12	Transmit/receive (inter)national bit failure
13	Yellow (remote) alarm failure
14	PCM path integrity failure
15	Loop remote loopback failure
16	Channel remote loopback failure

2.0 Mb PRI self test

This self test can be run manually on a per-loop or per-channel basis using overlay 60. The DCHI/DDCH and 2.0 Mb PRI must be disabled before performing the self-test.

Self-test (entire loop)

1   Disable the DCHI/DDCH using:

    LD 96

    DIS DCH N

2   Disable the 2.0 Mb PRI card and run the self-test using:

    LD 60

    DISL L

    SLFT L (entire loop)

Self-test (specific channel)

DSCH L CH (disable an idle channel)

SLFT L CH (specific channel)

2.0 Mb PRI automatic loop test

This procedure is not recommended since it causes yellow at the far-end and there is a possibility of some of the B-channels not being re-enabled once the test is completed. Therefore leave the ATLP command set to 0.

The automatic loop test checks the same functions as the self test. Unlike the self test, it can be run automatically as part of the midnight routines.

Procedure (2.0 Mb PRI automatic loop test):

1   With ATLP command set to one.

2   If all 30 channels are idle at midnight, the Meridian 1 software disables the card and performs a self test on all channels. This causes a yellow alarm to be generated to the far end.

3   If any of the 30 channels are busy at midnight, the software disables one idle channel, chosen at random, and checks it while the card is enabled.

With the ATLP command set to zero, only one channel is tested. The channel tested is randomly selected by software; it cannot be specified.

To perform the automatic loop test as part of midnight routines, use

LD 60

ATLP 1 or 0

Link diagnostic and remote loop back tests

The remote loop-back and the link diagnostic test are performed manually on a per channel or per-loop (or card) basis.

Link diagnostic test

The link diagnostic test, also called the far end loop-back test, does not test the Meridian 1 2.0 Mb PRI. It puts the 2.0 Mb PRI in loop-back mode so a remote loop-back test can be performed on equipment at the far end. Refer to Figure 12.

The 2.0 Mb PRI channel or loop (card) tested must be disabled.

Figure 12
2.0 Mb PRI Link Diagnostic (Far End Loopback) Test
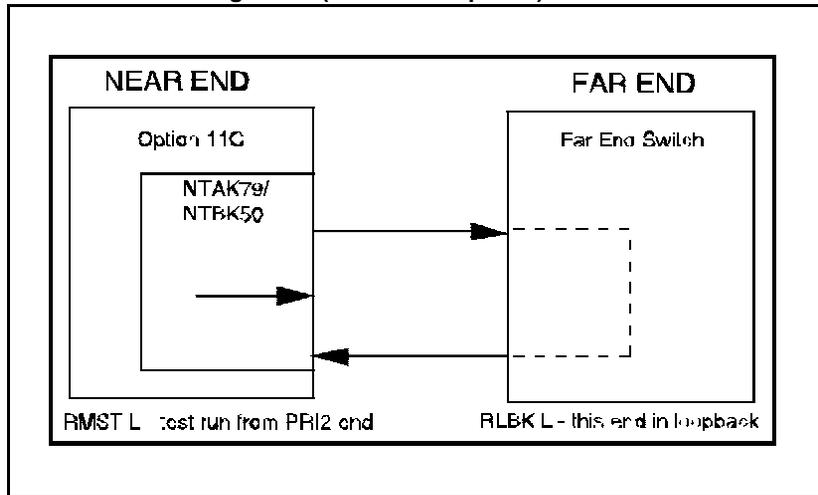
Running the link diagnostic test

To run the link diagnostic test on the Meridian 1, use the following procedure:

1   Call a technician at the far end. Ask for loopback mode at that facility.

2   When loop-back mode at the far end is confirmed:

•   Disable the DCHI/DDCH using:

LD 96

DIS DCH N

•   Disable the 2.0 Mb PRI card and run loop-back test using:

LD 60

DISL L

RMST L or RMST L C

Remote loop-back test

The remote loop-back test also called the near end loop-back test, checks the integrity of the 2.0 Mb PRI from the Meridian 1 system to the far end. The far end must be in loop-back mode before this test can be performed. Refer to Figure 13.

The 2.0 Mb PRI channel or loop (card) tested must be disabled.

Figure 13
2.0 Mb PRI Remote Loopback Test
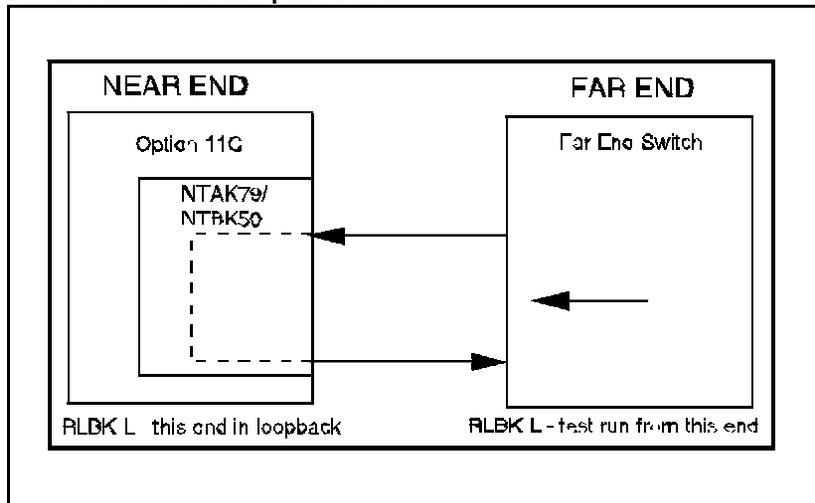
Coordinating the remote loopback tests

When a technician at the far end asks for loop-back mode on the Meridian 1, disable the DCHI/DDCH using:

LD 96
DIS DCH N

Disable the 2.0 Mb PRI card and activate loopback mode using:

LD 60
DISL L
RLBK L or **RLBK L C**

ISL Implementation and Maintenance

Content list

The following are the topics in this section:

Reference list

The following are the references in this section:

- *X11 Administration* (553-3001-311)

- *X11 System Messages Guide* (553-3001-411)

Overview

This chapter provides the information needed to implement ISL on the Meridian 1 Option 11C system. It provides:

- hardware and software installation

- programming all components needed to provide basic call service

ISDN features are treated separately in the chapter devoted to ISDN feature implementation.

This chapter builds on the ESN programming that is assumed to be already in place. It is also built on the assumption that you have 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 mode of operation, uses analogue 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 Analogue 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 14
ISL in shared Mode
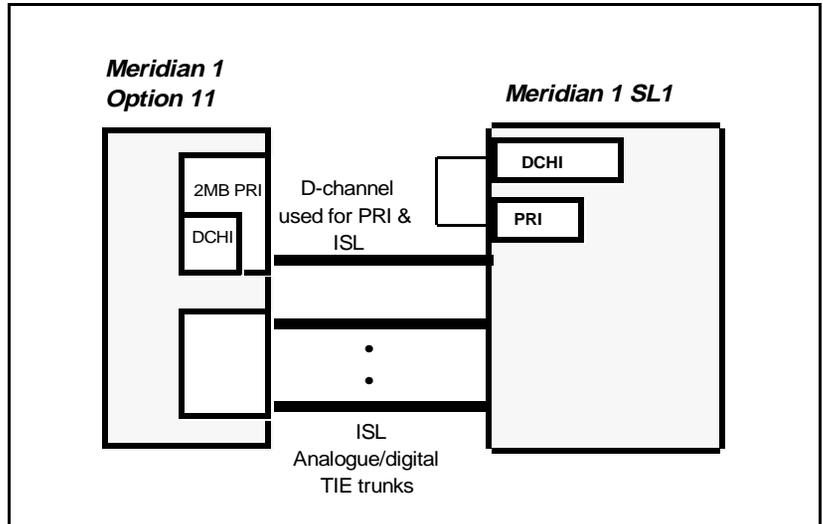
ISL in dedicated mode using leased line

The following hardware is required:

- NTAK02 SDI/DCH D-channel handler interface

- 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 15
**ISL in dedicated mode using leased line**
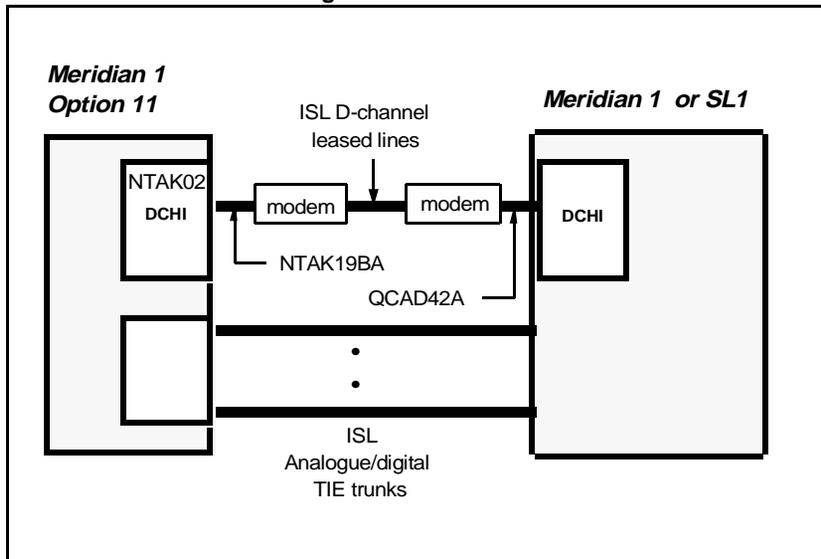
ISL in dedicated mode using dial-up modem

The requirements are as follows:

- NTAK02 SDI/DCH D-channel handler interface

- Modems such as 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).:

  — 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 16
ISL in dedicated mode using dial-up modem
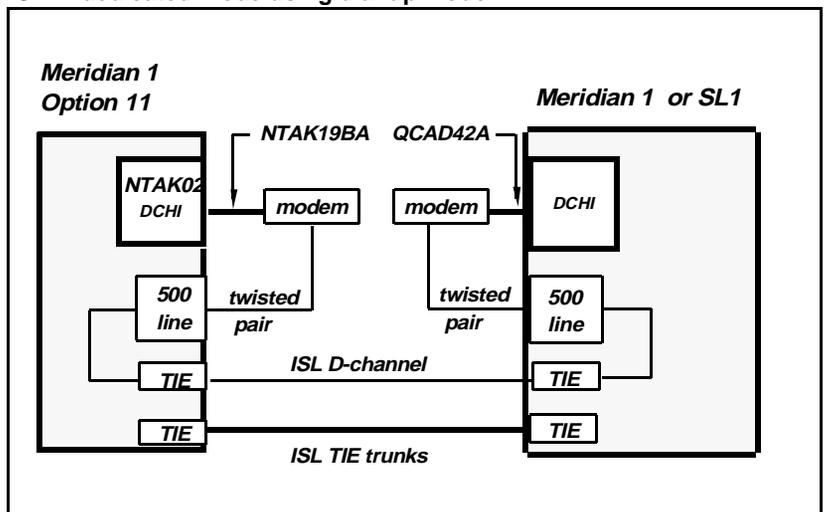
ISL hardware installation

Shared mode

The hardware installation is identical to the PRI installation, with the addition of analogue or digital TIE trunks (or both).

Dedicated mode

Step 1: Install 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.

a   Set option switches/jumpers on the DCHI card as shown below. for mode of operation (i.e. RS232 or RS422 and DTE or DCE)

b   Install the NTAK02 in any spare slot 1-9 of the main cabinet

c   Install the NTAK19BA four port cable on the 50 pin Amphenol connector associated with the slot holding the NTAK02.

Table 37
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 38
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

Step 2: set up the D-channel

a 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

b 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 is connected to a modem which is connected to a 500 set line card. The call is connected to the far-end through the 500 set-to-TIE trunk path.

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

ISL software programming

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 programming 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 programming 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 Mb PRI) and LD73 (2 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 39 summarizes the required steps.

Table 39
Configuring Basic ISL Capability

Step	Overlay	Action
1	LD 17	Configure the D-channel for ISL use.
2	LD 15	Enable ISDN option
3	LD 16	Enable the ISL option on a per route basis, assign a D-channel for each route
4	LD 14	Assign a channel identification to each trunk with the ISL option.

LD 17 – Configure the D-channel for ISL.

Prompt	Response	Description
REQ	CHG	Change data
TYPE	CFN	Configuration data block
ADAN	NEW DCH 1-15	Add primary D-channel
CTYP	DCHI	D-channel card type
CDNO	1-9	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	PRI2 card number. (Must match entry for CDNO.)
SIDE	NET (USR)	Net: network, the controlling switch User: slave to controller
RLS	XX	X11 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, i.e. 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).

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.

Prompt	Response	Description
REQ:	NEW CHG	Add new data Change existing data
TYPE	NET	Networking data
CUST	0-31	Customer number
ISDN	YES	Customer is equipped with ISDN
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 Meridian 1. Sent as part of setup message as CLID
HNXX	NXX	Telephone local exchange code for this Meridian 1. 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
	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	0-31	Customer number
ROUT	0-127	Route number
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 no. in CFN which will 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 far end**.
IFC		interface type
	SLI	Meridian 1 to Meridian 1
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	c u	Card and unit to be associated with this trunk
RTMB	0-127 1-510	Route number and member number
CHID	1-240	Channel identifier for ISL channels (remove with Xnn)—must be coordinated with far end (no default value)

ISL maintenance

DCHI quick reference

Below is a quick reference list of D-channel commands (LD 96).

Command	Action
DIS DCHI N	Disable DCHI port N
ENL DCHI N	Enable DCHI port N
EST DCH N	Establish D-channel N
PLOG DCHI N	Print D-channel statistics log N
RLS DCH N	Release D-channel N
SDCH DCH N	Release a D-channel and switch D-channels
RST DCH N	Reset D-channel N
STAT DCH (N)	Print D-channel status (link status)
TEST-100/101	DCH tests
STAT SERV	Print the current service and service acknowledge message for DCHI N
ENL SERV N	Enable service messages for DCHI N
DIS SERV N	Disable service messages for DCHI N

Maintenance messages

D-channel status and error conditions are reported as DCH messages. These messages can be found in the *X11 System Messages Guide* (553-3001-411)

Maintenance testing

ISL back to back testing (without modems)

For maintenance reasons or testing purposes it is sometimes necessary to connect ISL back to back (without modems). This connection is normally done within the same Meridian 1 system in a lab environment.

Hardware requirements:
A 25-pin female-to-female gender changer is required to connect the NTAK19BA cable back-to-back. The gender changer is not supplied with the Option 11C system. Figure 17 illustrates the connection.

Note: Protocol converters AO378652 and AO381016 supplied with the system are not gender changers.

Figure 17
ISL back-to-back connection
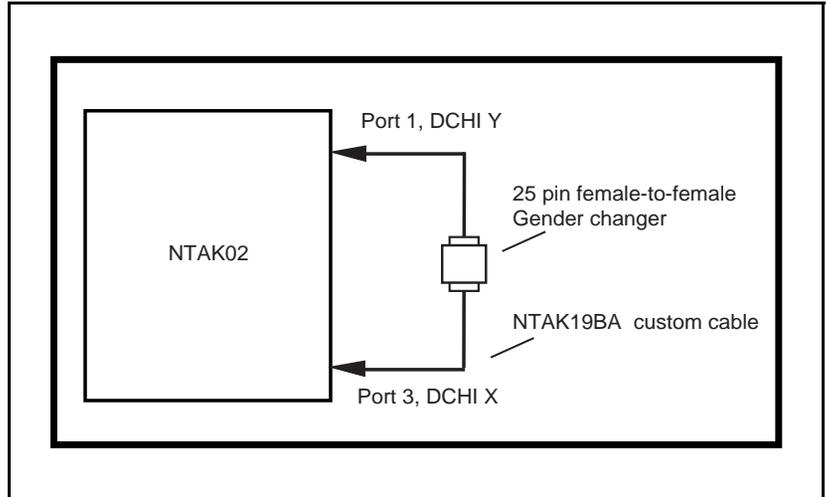
Port settings:

- For port 3, DCHI X, program the following settings in LD 17:

  — CLOK = INT (Internal clock)

  — SIDE = SLAV (Slave)

  Set NTAK02 port 3 jumper plugs to DCE and RS-422.

- For port 1, DCHI Y, program the following settings in LD 17:

  — CLOK = EXT (External clock)

  — SIDE = MAS (Master)

  Set NTAK02 port 1 jumper plugs to DTE and RS-422.

Meridian 1
Option 11C
2.0 Mb DTI/PRI

Publication number: 553-3011-315
Document release: Standard 11.00
Date: April 2000
Printed in Canada

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