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Meridian SL-100

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Line Side T-1 Interface (LTI) for IPE Services Guide

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Table of Contents

About this document

When to use this document

This document provides general information about the line side T-1 line interface card, including hardware information, card replacement procedures, and data schema.

How to check the version and issue of this document

The version and issue of the document are indicated by numbers, for example, 01.01.

The first two digits indicate the version. The version number increases each time the document is updated to support a new software release. For example, the first release of a document is 01.01. In the *next* software release cycle, the first release of the same document is 02.01.

The second two digits indicate the issue. The issue number increases each time the document is revised but rereleased in the *same* software release cycle. For example, the second release of a document in the same software release cycle is 01.02.

This document is written for all MSL-100 offices. More than one version of this document may exist. To determine whether you have the latest version of this document and how documentation for your product is organized, check the release information in *Master Index of Publications*.

References in this document

The following documents are referred to in this document:

- *Commands Reference Manual*
- *Automatic Call Distribution Planning and Engineering Guide*
- *DMS Voice Mail Planning and Engineering Guide*

- *Alarm Clearing Procedures*
- *Meridian Services Module (MSM) Planning and Engineering Guide*

What precautionary messages mean

The types of precautionary messages used in Nortel Networks documents include attention boxes and danger, warning, and caution messages.

An attention box identifies information that is necessary for the proper performance of a procedure or task or the correct interpretation of information or data. Danger, warning, and caution messages indicate possible risks.

Examples of the precautionary messages follow.

ATTENTION - Information needed to perform a task

ATTENTION
If the unused DS-3 ports are not deprovisioned before a DS-1/VT Mapper is installed, the DS-1 traffic will not be carried through the DS-1/VT Mapper, even though the DS-1/VT Mapper is properly provisioned.

DANGER - Possibility of personal injury

DANGER
Risk of electrocution
Do not open the front panel of the inverter unless fuses F1, F2, and F3 have been removed. The inverter contains high-voltage lines. Until the fuses are removed, the high-voltage lines are active, and you risk being electrocuted.

WARNING - Possibility of equipment damage

DANGER
Damage to the backplane connector pins
Align the card before seating it, to avoid bending the backplane connector pins. Use light thumb pressure to align the card with the connectors. Next, use the levers on the card to seat the card into the connectors.

CAUTION - Possibility of service interruption or degradation

CAUTION
Possible loss of service
Before continuing, confirm that you are removing the card from the inactive unit of the peripheral module. Subscriber service will be lost if you remove a card from the active unit.

How commands, parameters, and responses are represented

Commands, parameters, and responses in this document conform to the following conventions.

Input prompt (>)

An input prompt (>) indicates that the information that follows is a command:

```
>BSY
```

Commands and fixed parameters

Commands and fixed parameters that are entered at a MAP terminal are shown in uppercase letters:

```
>BSY CTRL
```

Variables

Variables are shown in lowercase letters:

```
>BSY  CTRL  ctrl_no
```

The letters or numbers that the variable represents must be entered. Each variable is explained in a list that follows the command string.

Responses

Responses correspond to the MAP display and are shown in a different type:

```
FP 3 Busy CTRL 0: Command request has been submitted.

FP 3 Busy CTRL 0: Command passed.
```

Overview

The line side T-1 interface (LTI) card (PEC NT5D11AE) is an intelligent peripheral equipment (IPE) line card that can be installed in the NT8D37 IPE module (up to 8 cards). The LTI card interfaces with a T-1 link, carrying 24 channels to the Meridian SL-100 switch. This card occupies two card slots in the IPE shelf, using 16 channels on slot 1 and 8 channels on slot 2. Because the LTI card emulates an analog line card to the Meridian SL-100 system software, each channel can be independently configured by software control. The LTI card is also equipped with a human-machine interface (HMI) maintenance program that provides diagnostic information about the status of the T-1 link.

Note: Although the LTI card emulates an analog line card, it is important to note that not all diagnostics are supported.

The LTI card differs from other line cards in several major areas. While other peripheral equipment circuit cards connect directly to digital or analog terminal equipment, the LTI line card connects to T-1 compatible terminal equipment through a T-1 link. Other line cards can be either analog or digital, whereas the LTI card supports a DS-1 signal. Other line cards can support up to 16 ports through a separate line interface circuit for each port and occupy one card slot, while the LTI card supports 24 analog ports per card through a single T-1 interface circuit and occupies two card slots. The LTI card emulates an analog line card (XALC/XMLC) to the Meridian SL-100 software.

The following are the characteristics of the LTI card.

PEC	Line type	Circuits	Line type	Message waiting	Architecture
NT5D11	AA	24	T-1	None	IPE

When to use the LTI card

Select a line card based on the type of line and terminal equipment you have. The LTI card is typically selected based on two criteria:

- the terminal equipment has a T-1 interface
- the terminal equipment requires line side feature capability

If the terminal equipment supports a T-1 interface and the application requires support for multiple ports, selecting a T-1 interface between the Meridian SL-100 system and the terminal equipment could provide lower cost and technically superior service.

Additionally, if the terminal equipment requires the ability to provide hook flash and feature capability (such as transfer, hold, or conference) to the Meridian SL-100 system, it must attach to the system as a line interface. Although the Meridian SL-100 system presently does have T-1 compatible cards that plug into the trunk side, they cannot provide line features. And, although analog line cards provide the necessary feature capabilities, they do not support a T-1 interface. The LTI card does both because it attaches to the system on the line side, providing feature capability on a T-1 link.

Applications

The LTI card is designed to integrate with terminal systems that have T-1 interfaces. T-1 interfaces provide a lower cost and technically superior method of connection, compared to individual analog ports. If the terminal equipment requires the ability to provide hook flash and feature capability to the PBX system, it must attach to the PBX on the line side. The LTI card attaches to the PBX on the line side and it supports 24 analog ports per card. An alternative to the LTI card is the use of channel banks. However, this alternative is expensive and bulky, and the performance it provides is poor compared to an all digital connection, because of the conversion of the signal from digital to analog and back to digital.

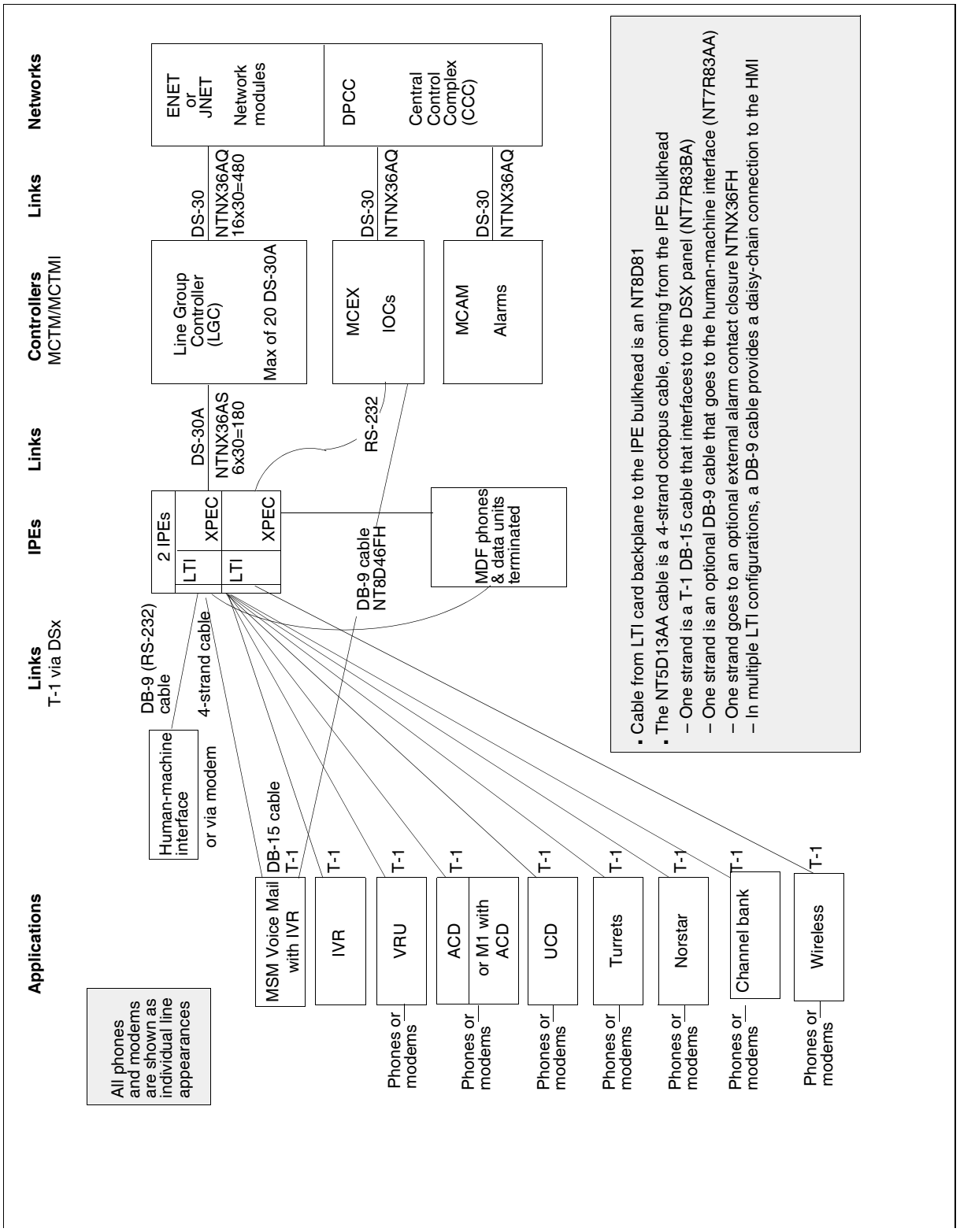
Some examples of applications where a LTI card interfaces to a T-1 link are:

- Voice mail systems
- Integrated Voice Response (IVR) systems
- Voice Response Unit (VRU) systems
- Automatic Call Distribution (ACD) systems
- Meridian 1 system with ACD
- Uniform Call Distribution (UCD) systems

- Turret systems (stock and financial markets)
- Wireless systems
- Remote 2500 sets through T1 to channel bank
- Remote Norstar sites behind SL-100 over T-1

Figure 0-1

LTI applications



Physical description

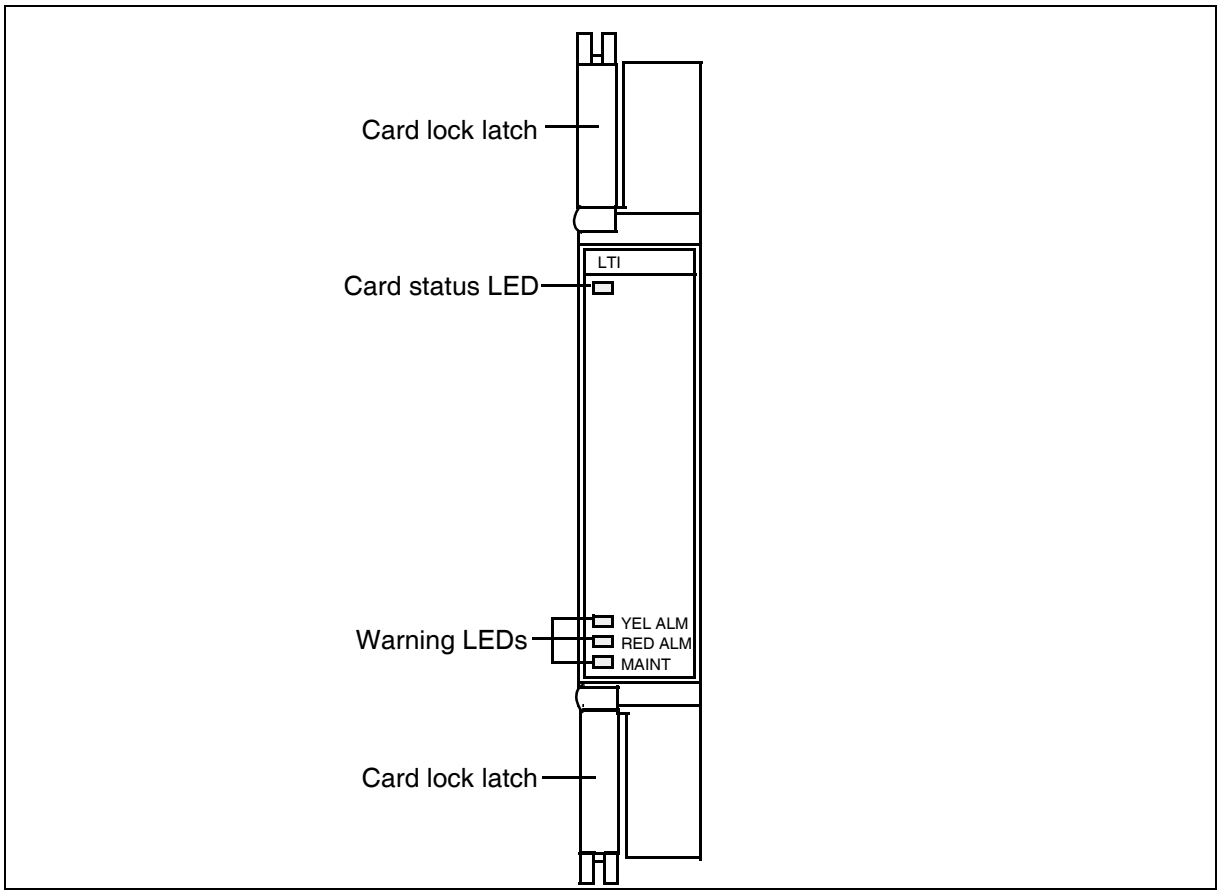
The LTI card consists of a motherboard and daughterboard and mounts into any two *consecutive* IPE slots. (Restrictions apply if your IPE module was manufactured before 1993. See chapter 3, “Installation and cabling,” for more information on IPEs manufactured before 1993.) The motherboard circuit card occupies the first slot and the daughterboard circuit card occupies the second slot. The daughterboard circuit card only receives and transmits voice, signaling data, and communications data for eight channels. All other signaling and programming functions are performed by logic located on the motherboard circuit card. The motherboard circuit card receives and transmits signaling data and communications data for 16 channels and performs the remainder of the logic necessary for all 24 channels to interface with the T-1 link. The LTI card contains two DS-30X interface circuits and two card LAN interface circuits-one of each on the motherboard circuit card and one of each on the daughterboard circuit card. See chapter 3, “Technical information,” for more information.

The motherboard circuitry is contained on a standard 31.75 cm by 25.40 cm (12.5 by 10 inch) printed circuit board. The daughterboard is contained on a 5.08 cm by 15.24 cm (2 by 6 inch) printed circuit board and mounts to the motherboard on six standoffs.

The LTI card uses the NT8D81 tip and ring cable to connect from the IPE backplane to the 25-pair amphenol connector on the I/O panel on the IPE. The I/O panel connector then connects directly to a T-1 link, external alarm, and HMI terminal, or modem using the NT5D13 cable.

Because the LTI card occupies two slots, the faceplate is twice as wide as the other standard analog and digital line cards. The faceplate is equipped with four LED indicators. See Figure 2, "T-1 card faceplate."

Figure 0-2 T-1 card faceplate



The four LED indicators give status indications on LTI card operations:

- The card status LED indicates whether or not the LTI card has successfully passed its self test, and is now functional. When the card is installed, this LED remains lit for 2 to 5 seconds while the self-test runs. If the self-test is successful, the LED flashes three times and remains lit until the card is configured and enabled in software, then the LED goes out. If the LED does not follow the pattern described or operates in any other manner, such as continually flashing or remaining weakly lit, replace the card.

  Note: The status LED simultaneously indicates the enabled/disabled status of both card slots of the LTI card. To properly enable the card, both the motherboard and the daughterboard slots must be enabled. The status LED will turn off as soon as either one of the LTI card slots have been enabled. No LED operation is observed when the second card slot is enabled.

To properly disable the card, both card slots must be disabled. The LED does not turn on until both card slots are disabled.

- The YEL ALM LED lights when the LTI card has detected a yellow alarm signal from the terminal equipment side (far end) of the T-1 link. If the terminal equipment detects a red alarm condition, it can send a yellow alarm signal to the LTI card, depending on whether or not your terminal equipment supports this feature.
  - The LED clears the alarm when the distant end equipment stops sending a yellow alarm to the LTI. See chapter 2, “Human-machine interface,” for more information about alarm clearing.
- The RED ALM LED lights when the LTI card detects an alarm condition from the near end T-1 link. Such conditions include (but are not limited to) receipt of a signal that has exceeded bit error thresholds or frame slip thresholds. Depending on how the HMI is configured, the LED remains lit until the following actions occur:
  - If the self-clearing function has been enabled in the human-machine interface, the LED clears the alarm when the alarm condition is no longer detected. This is the factory default configuration. See chapter 2, “Human-machine interface,” for more information about alarm clearing.
  - If the self-clearing function has been disabled in the HMI, the LED stays lit until the CLEAR ALARM command is typed in the HMI.
- The MAINT LED indicates whether or not the LTI card is fully operational because of certain maintenance commands being issued through the HMI. If the card detects that tests are running or that alarms are disabled through the HMI, the LED lights and remains lit until these conditions are no longer detected. See chapter 2, “Human-Machine Interface,” for information on T-1 link maintenance.

Human-machine interface

The line side T-1 interface (LTI) card human-machine interface (HMI) supplies T-1 link diagnostics and historical information to a data terminal. This chapter describes the features of HMI and explains how to set-up, configure, and use the HMI firmware. See chapter 3, “Installation and cabling," for instructions on how to install the cabling and configure the terminal for the HMI.

The HMI has the following maintenance features:

- comes equipped with default and re-configurable alarm parameters
- provides notification of T-1 link problems by activating alarms
- reports on current and historical T-1 link performance
- provides T-1 tests for T-1 verification and fault isolation to LTI card, T-1 link, or customer premise equipment (CPE)

Alarms

HMI activates alarms for the following T-1 link conditions:

- excessive bit error rate
- frame slip errors
- out of frame condition
- loss of signal condition
- blue alarm condition

The alarms are activated in response to pre-set thresholds and error durations. Descriptions of each of these T-1 link alarm conditions, instructions on how to set alarm parameters and access alarm reporting are in the “Alarm operation and reporting” section of this chapter.

Two levels of alarm severity exist for bit errors. There are two different threshold and duration settings for these conditions. When the first level of severity is reached (alarm level 1), the external alarm hardware

is activated, the RED ALM LED on the faceplate is lit, and an alarm message is created in the alarm log and displayed on the HMI port. When the second level of severity is reached (alarm level 2), the HMI performs all of the same functions as alarm level 1, and also sends a yellow alarm to the distant end CPE or CSU. The LTI card also enters line processing mode. In this mode, the Meridian SL-100 system is sent either all on-hook or all off-hook signals, depending on the setting for the DIP switch for trunk processing (DIP switch 2, position 6).

If the HMI detects T-1 link failures for any of the remainder of the conditions monitored (out of frame condition, loss of signal condition, blue alarm condition, and excess frame slips), the LTI card automatically performs all alarm level 2 functions.

Alarms can be set up to either self-clear or not self-clear when the alarm condition is no longer detected. See “Alarm operation and reporting” in this chapter for information about alarm clearing.

All alarms activated produce a record in an alarm log. The alarm log maintains records for the most recent 100 alarms and can be displayed, printed, and cleared.

T-1 performance counters and reports

HMI maintains performance error counters for the following T-1 conditions:

- errored seconds
- bursty seconds
- unavailable seconds
- frame slip seconds
- loss of frame seconds

HMI retains T-1 performance statistics for the current hour and for each hour for the previous 24 hours. Descriptions of each of these performance error counters and instructions on how to report on them and clear them can be found later in this chapter.

T-1 verification and fault isolation testing

HMI allows you to perform various tests and verifies that the T-1 is working adequately, or helps you to isolate a problem to either the LTI card, the T-1 link, or the CPE equipment.

Commands

The HMI can be accessed through any VT-100 compatible terminal, MAP terminal running EMAP software, PC running a terminal emulation program, or modem. After installing the HMI terminal and card cables, you are ready to access the HMI firmware.

For single card installations, type **L** and press the return key to log in.

For multiple card installations connected as a daisy-chain, access the desired card by entering the following:

L [address]

where

the four-digit address is the two-digit address of the IPE shelf as set by DIP switch positions (switch 1, positions 3 through 6) on the card, plus the two-digit address of the card slot in which the LTI motherboard is installed (0 to 6 and 8 to 14).

For example, to log into a card located in shelf 13, card slot 4, type the following:

L 13 04 <CR>

or

L 13 4 <CR>

Note: There must be a space between the login command (L), the shelf address, and the card slot address.

The HMI prompts you for a password by displaying the `Enter Password` prompt. The password is LTILINK, and it must be typed in uppercase letters.

After you have logged in, the prompt `>LTI::` appears for single card installations.

For multiple card installations, the prompt is `>LTI:sscc`

where

ss is the two-digit shelf address

cc is the two-digit card slot address

You can now enter HMI commands. There are 7 basic commands that can be combined together to form a total of 19 command sets. The seven basic commands are:

- ALARM
- CLEAR
- DISPLAY
- SET
- TEST
- HELP
- QUIT

To execute these commands, you can enter the first letter of the command or the entire command. Command sets are entered by entering the first letter of the first command, a space, and the first letter of the second command, or by entering the entire command set. Table 0-1 shows the possible command sets in alphabetical order.

Table 0-1
HMI commands and command sets (Sheet 1 of 2)

Command	Description
ALARM DISABLE or A D	Disables all alarms.
ALARM ENABLE or A E	Enables all alarms.
CLEAR ALARM or C A	Clears all alarms, terminates line processing, and resets the T-1 bit error rate and frame slip counters.
CLEAR ALARM LOG or C A L	Clears alarm log.
CLEAR ERROR or C E	Clears the error counter for the T-1.
DISPLAY ALARMS [P] or D A [P]	Displays the alarm log which is a list of the most recent 100 alarms, along with time and date stamps. Entering the optional pause (P) command allows you to view the information a screen at a time.

Table 0-1
HMI commands and command sets (Sheet 2 of 2)

Command	Description
DISPLAY HISTORY [P] or D H [P]	Displays performance counters for the past 24 hours. Entering the optional pause (P) command allows you to view the information a screen at a time.
DISPLAY PERFORMANCE or D P	Displays performance counters for the current hour.
Display Status or D S	Displays carrier status, including whether the card is in alarm state and what alarm level is active.
HELP, H, or ?	Displays the help screen.
LOGIN or L	Logs into the HMI terminal when the system has one LTI card.
LOGIN [card address] or L [card address]	Logs into a specific IPE shelf and card slot when the system has more than one LTI card daisy-chained in the network module.
QUIT or Q	Logs the terminal user out. ***Note:*** If multiple LTIs share a terminal, log out when it is not in use. Because there is only one daisy chain link, if an LTI is logged in it overloads the bus, preventing other LTIs from notifying the HMI of alarms.
SET ALARM or S A	Set alarm parameters such as the allowable bit errors per second threshold and alarm duration.
SET CLEARING or S C	Sets the alarm self-clearing function to either “enable" or “disable".
SET DATE or S D	Sets date or verifies current date.
SET TIME or S T	Sets time or verifies current time.
TEST or T	Initiates the T-1 carrier test function. To terminate a test in process, type *S* (STOP TEST) at any time.

Displaying the help screen

To display the help screen, type one of the following commands:

- **?**<CR>
- **H**<CR>
- **HE**<CR>
- **HEL**<CR>
- **HELP**<CR>

A screen similar to the following appears:

```
ALARM     USAGE:  Alarm [Enable | Disable]
CLEAR     USAGE:  Clear [Alarm] | [Error counter] [Log]
DISPLAY   USAGE:  Display [Alarm | Status | Perform | History] [Pause]
HELP      USAGE:  Help | ?
SET       USAGE:  Set [Time | Date | Alarm | Clearing | Name | Memory]
TEST      USAGE:  Test [Carrier All]

QUIT      USAGE:  Quit

Notation Used:
CAPS - Required Letters  [ ] - Optional | - Either/Or
```

Configuring parameters

The HMI is designed with default settings so that no configuration is necessary. However, you can reconfigure it based on your own environment.

Before you begin to configure your HMI, log in to the system and enter the current time and date into the software by using the SET TIME (S T) and SET DATE (S D) commands.

To enter the current time, type

SET TIME

or

S T

Enter the time in the “hh:mm:ss" military time format. HMI displays the time it registered. You can enter a new time or just press return to leave it unchanged.

To set the current date, type

SET DATE

or

S D

Enter the time in the “mm/dd/yy" format. The HMI then displays the date it registered. You can enter a new date or just press return to leave it unchanged..

Alarm parameters

The SET ALARM (S A) command set establishes the parameters by which an alarm is activated, and its duration. There are three alarm levels, as described in the following section:

- *Alarm level 0 (AL0)* consists of activity with an error threshold below the AL1 setting that is considered to be a satisfactory condition and therefore no alarm is activated.
- *Alarm level 1 (AL1)* consists of activity with an error threshold above the AL1 setting but below AL2 setting which is considered to be a minor unsatisfactory condition. In this situation, the external alarm hardware is activated by closing the normally open contact, the appropriate LED on the faceplate lights, and an alarm message is created on the HMI terminal and in the alarm log.
- *Alarm level 2 (AL2)* consists of activity with an error threshold above the AL2 setting which is considered to be a major unsatisfactory condition. In this situation, the external alarm hardware is activated by closing the normally open contact, the appropriate LED on the faceplate lights, an alarm message is created on the HMI terminal and in the alarm log, the LTI card enters line processing mode, and a yellow alarm message is sent to the CPE/CSU. Line processing sends the terminal equipment either all “on-hook" or all “off-hook" signals, depending on the DIP switch setting of the card.

When you select the SET ALARM command set, you are prompted to set the threshold level and duration period for alarm levels 1 and 2. The threshold value indicates the number of bit errors detected per second that is necessary to activate the alarm. The T-1 link processes at a rate of approximately 1.5 Mbyte/s. The threshold value can be set between 3 and 9 and can be different for each alarm level, any other value entered causes the software to display a `Parameter Invalid` message. The threshold number to be entered represents the

respective bit errors per second as a power of 10, as shown in Table 0-2 .

Table 0-2
T-1 bit error rate threshold settings

Alarm threshold bit errors per second in power of 10	Threshold to set alarm (bit error per second)	Allowable duration periods
10*3*	1,500/second	1-21 seconds
10*4*	150/second	1-218 seconds
10*5*	15/second	1-2148 seconds
10*6*	1.5/second	1-3600 seconds
10*7*	1.5/10 seconds	10-3600 seconds
10*8*	1.5/100 seconds	100-3600 seconds
10*9*	1.5/1000 seconds	1000-3600 seconds

Note: The error rate threshold for a level 2 alarm must be greater (a smaller power of 10) than for a level 1 alarm.

The duration value is set in seconds and can be set from 1 to 3,600 seconds (1 hour). This duration value indicates how long the alarm must last before an alarm is declared . Low bit error rates (10^7 through 10^9) are restricted to longer durations since it takes more than one second to detect an alarm condition above 10^6. Higher bit error rates are restricted to shorter durations because the HMI error counter fills at 65,000 errors. The alarm clears automatically after the duration period has expired if the self clearing option has been enabled using the SET CLEARING (S C) command. Otherwise, the alarm continues until the command set CLEAR ALARM (C A) is entered.

Note: A heavy bit error rate can cause 150 bit errors to occur much quicker than 100 seconds. This causes the alarm to be declared sooner.

The following actions occur when an alarm is cleared.

- all activity caused by the alarm is cleared
- the external alarm hardware is deactivated (the contact normally open is reopened)

- the LED light goes out
- an entry is made in the alarm log of the date and time the alarm was cleared
- line processing ceases (for alarm level 2 only)

An alarm is not automatically cleared until the system no longer detects the respective bit error threshold during the corresponding duration period. For example, if AL1 threshold of 6 (representing 10^6) is specified, and a duration period of 100 seconds is specified, an alarm is activated if more than 150 bit errors occur in any 100 second period (1.5 seconds * 100 seconds = 150/100 seconds). As soon as the alarm is activated, the bit counter is reset to 0. If the next 100 seconds pass, and less than 150 bit errors are detected, then the alarm clears after the duration period. However, if more than 150 bit errors are detected in the next 100 seconds, the alarm continues for the designated duration period. The alarm finally clears when the alarm condition is no longer detected for the designated duration period, either by self-clearing (if this function is enabled), or when the CLEAR ALARM command set is entered.

In addition to bit errors, the SET ALARM command sets parameters for detecting frame slip errors by establishing a threshold necessary to activate an alarm. If the threshold value is exceeded, a level 2 alarm is activated. The frame slip threshold is specified from 1 to 255 frame slips per time period. The duration time period is specified from 1 to 24 hours.

When entering the SET ALARM command set, the HMI scrolls through the previously described series of alarm options. These options are displayed along with their current value. Enter a new value, or press the return key to retain the current value. Table 0-3 lists the options available in the SET ALARM command.

Table 0-3
Set alarm options (Sheet 1 of 2)

Option	Description
AL1 threshold	Sets the allowable bit errors per second (from 3 to 9) before alarm level 1 is activated.
AL1 duration	Sets the duration in seconds (from 1 to 3,600 seconds) that alarm level 1 is activated.
AL2 threshold	Sets the allowable bit errors per second (from 3 to 9) before alarm level 2 is activated.

Table 0-3
Set alarm options (Sheet 2 of 2)

Option	Description
AL2 duration	Sets the duration in seconds (from 1 to 3,600 seconds) that alarm level 2 is activated.
Frame slip threshold	Sets the allowable frame slips per time period (from 1 to 255) before alarm level 2 is activated.
Frame slip duration	Sets the duration in hours (from 1 to 24) that the frame slips are counted. After this time period, the counter is reset to 0.

The SET CLEARING (S C) command set enables or disables self-clearing of alarms by answering “Y" or “N" to the question: `Enable Self Clearing? (YES or NO)`. If the enable self-clearing option (Y) is chosen, the system automatically clears alarms after the alarm condition is no longer detected for the corresponding duration period. Otherwise, the disable self-clearing option (N) causes the system to continue the alarm condition until the CLEAR ALARM (C A) command set is entered. However, line processing and yellow alarm indication to the CPE is terminated as soon as the alarm condition clears, even if self clearing is disabled.

Display Configuration

The DISPLAY CONFIGURATION (D C) command set displays the various configuration settings established for the line side T-1 card. Entering the DISPLAY CONFIGURATION (D C) command set causes a screen similar to the following to appear:

```
LTI  S/N 1103  Software Version 1.01    3/03/95  1:50
Alarms Enabled:  YES     Self Clearing Enabled:  YES
Alarm Level 1 threshold value:  E-7   Threshold duration (in seconds):  10
Alarm Level 2 threshold value:  E-5   Threshold duration (in seconds):  1
Frame slips alarm level threshold: 5  Threshold duration (in hours):  2
Current dip switch S1 settings (S1..S8)  On Off Off On Off Off Off On
Current dip switch S2 settings (S1..S8)  On Off On Off Off Off On Off
```

Alarm operation and reporting

HMI monitors the T-1 link according to the parameters established through the SET ALARM command set for the following conditions:

- excessive bit error rate
- frame slip errors
- out of frame condition
- loss of signal condition
- blue alarm (AIS) condition

Refer to the“Configuring parameters” section of this chapter for descriptions of the excessive bit error rate and frame slip errors conditions. These conditions, when detected, activate a level 2 alarm. Bit errors can also activate level 1 alarms.

An out of frame condition is declared if two out of four frame bits are in error. If this condition occurs, the hardware immediately attempts to reframe.

A loss of signal condition is occurs if a full frame (192 bits) of consecutive zeros have been detected at the receive inputs. If this condition occurs, the T-1 link automatically attempts to resynchronize with the distant end. If this condition occurs for more than 2 seconds, a level 2 alarm occurs, and silence is sent to all analog ports. The alarm is cleared if, after 2 seconds, neither a loss of signal, out of frame condition, nor blue alarm condition occurs.

Blue alarm

If a repeating device loses signal, it immediately begins sending an unframed “all ones” signal to the distant end to indicate an alarm condition. This condition is called a blue alarm, or an alarm indication signal (AIS). If an AIS is detected for more than 2 seconds, a level 2 alarm is declared, and silence is sent. The alarm is cleared if no loss of signal, out of frame condition, or blue alarm conditions occur after 2 seconds.

Alarm Disable

The ALARM DISABLE (A D) command set disables the external alarm hardware by preventing the alarm contacts from being disabled. In this mode, alarm messages are still sent on the HMI terminal and the LED light still continues to indicate alarm conditions. When this command set is entered, the HMI displays the message `Alarms Disabled`. No yellow alarms are sent and no further line processing occurs.

Alarm Enable

The ALARM ENABLE (A E) command set does the reverse of the ALARM DISABLE command set by allowing line processing and yellow alarms. It enables the external alarm hardware by opening the normally open alarm contact. When this command set is typed in, HMI displays the message `Alarms Enabled`.

Clear Alarm

The CLEAR ALARM (C A) command set clears all activity initiated by an alarm. The external alarm hardware is deactivated (the contact normally open is reopened), the LED light goes out, an entry is made in the alarm log of the date and time the alarm was cleared, and line processing ceases (for alarm level 2 only). When this command set is typed in, the HMI displays the message `Alarm Acknowledged`. If the alarm condition still exists, the alarm is activated again.

Display Alarms

A detailed report of the most recent 100 alarms with time and date stamps are displayed by entering the DISPLAY ALARMS (D A) command set into the HMI. Entering the DISPLAY ALARMS (D A) command set causes a screen similar to the following to appear:

```
Alarm Log

3/03/95  1:48 Yellow alarm on T-1 carrier
3/03/95  2:33 T-1 carrier level 1 alarm
3/03/95  3:47 T-1 carrier level 2 alarm
3/03/95  4:43 T-1 carrier performance within thresholds
3/03/95 15:49 Log Cleared
```

Clear Alarm Log

You can clear all entries in the alarm log by typing in the CLEAR ALARM LOG (C A L) command set.

Display Status

The DISPLAY STATUS (D S) command set displays the current alarm condition of the T-1 link. Entering the DISPLAY STATUS (D S) command set causes a screen similar to the following to appear:

```
In alarm state:  NO
T-1 link at alarm level 0
Phone status
PORT 0 OFF HOOK     PORT 1 ON HOOK     PORT 2 ON HOOK     PORT 3 ON HOOK
PORT 4 ON HOOK      PORT 5 OFF HOOK    PORT 6 ON HOOK     PORT 7 ON HOOK
PORT 8 ON HOOK      PORT 9 OFF HOOK    PORT 10 OFF HOOK   PORT 11 ON HOOK
PORT 12 ON HOOK     PORT 13 OFF HOOK   PORT 14 OFF HOOK   PORT 15 ON HOOK
PORT 16 ON HOOK     PORT 17 OFF HOOK   PORT 18 OFF HOOK   PORT 19 ON HOOK
PORT 20 ON HOOK     PORT 21 OFF HOOK   PORT 22 OFF HOOK   PORT 23 ON HOOK
```

Performance counters and reporting

HMI retains T-1 performance statistics for the current hour, and for each hour for the previous 24 hours. The HMI monitors the performance of the T-1 link through the T-1 framer chips. Each second, the registers are read and counts are maintained for the following:

- errored seconds-one or more CRC-6 errors, or one or more out of frame errors in a second
- bursty seconds-more than one and less than 320 CRC-6 errors in a second
- severely errored seconds-more than 320 CRC-6 errors, or one or more out of frames in a second. (Counts for this condition are maintained but not reported separately.)
- unavailable seconds-unavailable state starts with 10 consecutive severely errored seconds and ends with 10 consecutive non-severely errored seconds (excluding the final 10 non-severely errored seconds)
- loss of frame seconds-loss of frame or loss of signal for three consecutive seconds
- frame slip seconds-one or more frame slips in a second
- error counter-HMI keeps an error counter for the T-1 link, which is a count of CRC-6 errors plus frame slips plus out of frame. The counter is cleared by the C E CLEAR ERROR COUNTER command set.

Reports on these performance counters are displayed by entering the DISPLAY PERFORMANCE (D P) or the DISPLAY HISTORY (D H) command sets into the HMI.

Display Performance

Entering the DISPLAY PERFORMANCE (D P) command set displays performance counters for the past hour. A screen similar to the following appears:

```
                    LTI T-1 Interface Performance Log
                              3/03/95  1:37

Data for the past 37 Minutes
Errored   Bursty    Unavailable    Loss Frame     Frame Slip      Error
Seconds   Seconds    Seconds        Seconds        Seconds       Counter
 2263       0         2263           2263           352           321
```

Note: The D P log resets all counters except the error counter to 0 at the beginning of each hour and puts the totals for the previous hour in the DISPLAY HISTORY command log.

Display History

Entering the DISPLAY HISTORY (D H) command set displays performance counters for each hour for the past 24 hours. A screen similar to the following appears:

```
                    LTI T-1 Interface History Performance Log
                                3/03/95  8:37 pm


Hour     Errored    Bursty    Unavailable    Loss Frame    Frame Slip    Error
Ending   Seconds    Seconds      Seconds       Seconds       Seconds    Counter
20:00      139         0          129           139            23        162
19:00        0         0            0             0             0          0
18:00        0         0            0             0             0          0
22:00        0         0            0             0             0          0
.
.
.
19:00        0         0            0             0             0          0
```

Clear Error

You can reset the error counter to zero by entering the CLEAR ERROR (C E) command set. Because the error counter can be cleared and examined at any time, it provides a convenient way to determine if the link is performing without errors.

Testing

The TEST CARRIER (T) command allows you to run tests on the LTI card, the T-1 link, or the CPE device. The three tests are designed to provide you with the capability to isolate faulty conditions to any one of these three sources. See Table 0-4, “HMI Tests” for additional information on these three test types. After entering the T command, you are prompted for the test type. The prompt is similar to the following:

```
Test 1:  Local Loopback Test

Test 2:  External Loopback Test

Test 3:  Network Loopback Test

(1,2,3 or S to cancel):
```

Tests can be performed once, for 1 through 98 minutes, or continuously (selected by entering 99 minutes) until the STOP TEST command is entered. Tests continue for the duration specified even if a failure occurs and terminate at the end of the time period or when a STOP TEST command is issued. Only a STOP TEST command stops a test with a duration selection of 99. However, a STOP TEST command can terminate a test set to any duration from 1 to 99. After entering the test number selection, a prompt similar to the following appears:

```
Enter Duration of Test (1-98 Mins, 0 = Once, 99 =
Forever)   Verify the LTI card is disabled. Hit Q to
quit or any Key to continue
```

CAUTION
Possible loss of service
Before running a test, be sure to verify that the LTI card is disabled, since the tests interfere with calls currently in process.

During a test, if an invalid word is received, a failure peg counter is incremented. The peg counter saturates at 65,000 counts. At the end of the test, a message displays, indicating how many failures (if any) occurred during the test.

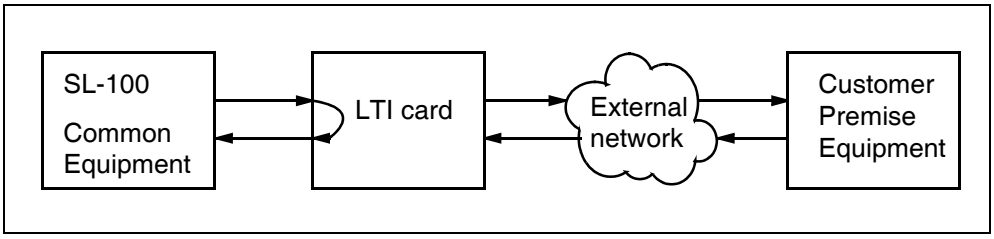
Table 0-4 shows which test to run for the associated equipment:

Table 0-4
HMI Tests

Test number	Equipment Tested	Test Description
1	LTI card	Local loopback
2	T-1 link, LTI card and T-1 network	External loopback
3	CPE device and T-1 network	Network loopback

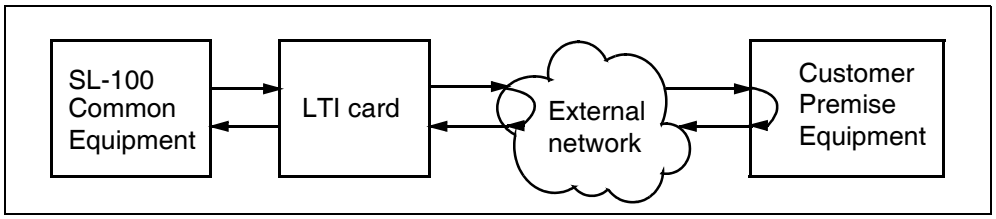
Test 1, local loopback, loops the T-1 link signaling toward itself at the backplane connector, and test data is generated and received on all timeslots. If this test fails, it indicates that the LTI card is defective. Figure 0-1 demonstrates how the signaling is looped back toward itself.

Figure 0-1
Local loopback test



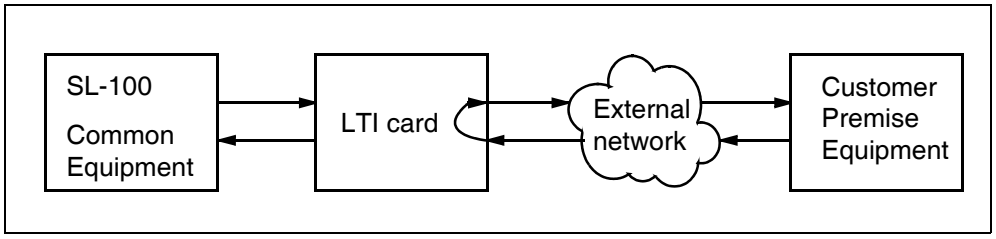
Test 2, external loopback, assumes an external loopback is applied to the T-1 link. Test data is generated and received by the LTI card on all timeslots. If test 1 passes but test 2 fails, it indicates that the T-1 link is defective between the LTI card and the external loopback location. Test 2 requires manual looparound somewhere on the T-1 link. Figure 0-2 demonstrates how an external loopback is applied to the T-1 link.

Figure 0-2
External network/CPE loopback test



Test 3, network loopback, loops the received T-1 data back toward the CPE equipment. No test data is generated or received by the line side T-1 card. This test assists in loopback testing from the CPE equipment. Figure 0-3 demonstrates how the signaling is looped back toward the CPE equipment.

Figure 0-3
Loopback test toward network



Installation and cabling

Line Side T-1 AC to AD

This document summarizes recent changes between the AC and AD versions of the Line Side T-1 product. Field technicians are encouraged to read and apply these changes in order to avoid possible adverse product performance.

Ringing Resource Allocation

DIP switch operation has changed. When using IPE71BC peripheral software and later, that could reside with Meridian SL-100 system software MSL07 and later, changing a DIP switch setting causes the Line Side T-1 to output a new code to the IPE controller that identifies it as a Line Side T-1 card (XLTI) instead of an analog line card (XLAC). This prevents the channels of the Line Side T-1 from being queued for ringing resources.

DIP switch setting S1 position 7 affects this operation. With the switch in the on position (up), the card indicates to the system software that it is an XLTI card. With the switch in the off position (down), the card indicates to the system software that an XALC card is installed. This switch is currently in the off position on all resources shipped from the factory.

Analog line cards are queued for ringing resources by the software. The LTI card does not require ringing resources, but is queued for them since the software recognizes them as analog line cards. The caller hears ringing, but the called number does not ring until it can acquire ringing resources. This causes delayed completion of calls. The new switch setting eliminates this since the LTI is no longer recognized as an analog line card.

Ringing resource allocation is only valid on the AD version Line Side T-1 cards and works only with IPE71BC and later. It can also reside with MSL07 and later system software releases. Previous software releases to IPE71BC should have DIP switch S1 position 7 in the off (down) position.

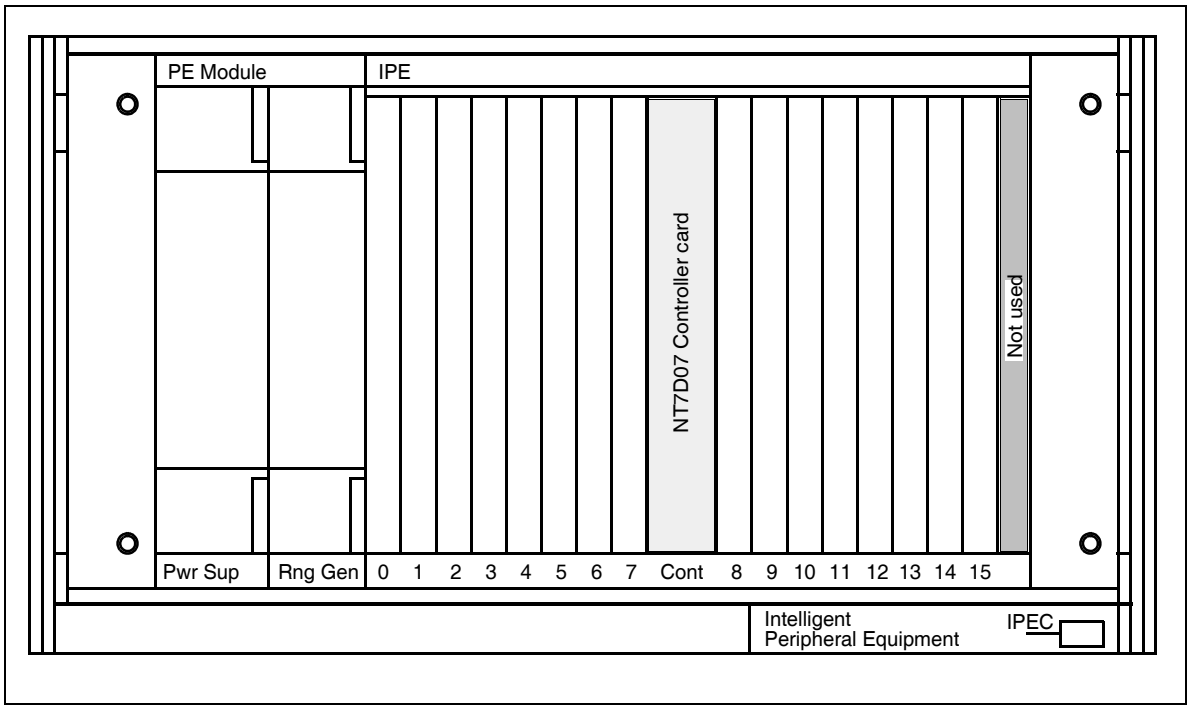
Installation and configuration of the line side T-1 interface (LTI) card consists of six basic steps:

- Prior to MSL05, patches POP26 and POP27 and activate POP27 are required. Contact Meridian SL-100 emergency technical assistance service (ETAS) for activation assistance.
- Configure the DIP switches on the LTI card for your environment.
- Install the line card into the slots that you have selected.
- Connect the appropriate cable from the I/O panel connector to the external T-1 equipment.
- Configure the individual line interface unit equipped using the appropriate software load program for your card type.
- Configure the human-machine interface (HMI) port, if required. See Chapter 2, “Human-machine interface,” for a more detailed description of the HMI.

In Intelligent Peripheral Equipment (IPE) modules manufactured in 1993 or later, the LTI card can be installed in any two *consecutive* slots. For example, the LTI card can be installed in slot 6, occupying slots 6 and 7, but *cannot* be installed in slot 7 because the NT7D07 controller card is situated between slots 7 and 8. See Figure 0-1.

Note: For information about IPEs manufactured before 1993, see the “Modules manufactured before 1993” section.

Figure 0-1
NT8D37 IPE module



Before you install the LTI card into the NT8D37 IPE, you must determine whether the module was manufactured before or after 1993. To determine whether the IPE was manufactured before or after 1993, look at the backplane and the I/O panel. IPE modules manufactured before 1993 cabled only 16 pairs of wires from each card slot to the I/O panel 25-pair connector. Since 1993, IPE modules cable each card slot to the I/O panel using a unique, 24-pair connector on the I/O panel for each card slot.

To determine whether the IPE module was manufactured before or after 1993, look at the PEC code of the IPE module. The PEC code for models manufactured before 1993 is NT8D37DC. Models manufactured in 1993 or later have a PEC code of NT8D37EC. There are no cabling restrictions on the NT8D37EC model.

IPE modules manufactured before 1993 (NT8D37DC)

If you are installing the LTI card into an IPE module manufactured before 1993 (wired with only 16 pairs from the card slot to the I/O panel), certain card slots will not support the LTI card unless the module

is rewired. For installation into these types of modules without rewiring, you can install the LTI card into the following card slot pairs:

- 0 and 1
- 1 and 2
- 4 and 5
- 5 and 6
- 8 and 9
- 9 and 10
- 12 and 13
- 13 and 14

You *cannot* install the LTI card into any other card slot pairs in an NT8D37DC IPE module without rewiring the module.

If you must install the LTI card into one of the card slot pairs not supported (except slots 7 and 8), rewire your IPE module card slot to the I/O panel by installing a cable from the LTI card's motherboard slot to the I/O panel.

Configuring the hardware

All users should read the following information, relating to configuration of the line side T-1 interface (LTI) hardware.

1. If multiple LTIs are to be installed, it is best to locate the LTIs on separate IPE module shelves. Many variables must be considered and calculated in order to determine the correct number of LTIs to be engineered per module shelf. The number of LTIs that can be configured per IPE shelf depends on the actual mix of line types, number of wired lines, and lines per slot.

   Note: In order to calculate the proper number of LTI cards that should be installed in each IPE, the total CCS requirements must be calculated and the impact the total CCS has on the associated LGC links must be analyzed. Even though the physical maximum of LTI cards in an IPE is eight, this calculation needs to be completed to get the correct number of LTI cards that is allowed in your IPE, based on the engineered capacity of your system.

2. After you have installed the new NT5D11AE, release 2 cards and the new IPE07BA load, you should conduct testing to see if a “Dial Tone Disconnect” occurs. This problem occurs when a user is listening to voicemail and a call comes in on the second line, which disconnects the call in progress. If this problem occurs, then the

Meridian Mail patch, which disables “Dial Tone Disconnect”, is needed. This problem is configuration dependent and does not happen at all sites.

3. For engineering support, please contact your Nortel representative.

Capacities of the LTI card

An IPE can handle 20,000 to 30,000 calls per hour. The LTI has no traffic limitation, meaning it can handle any traffic sent to it.

When configuring the LTI for high-capacity applications such as Meridian services module (MSM) voice mail and Automatic Call Distribution (ACD), you must take certain engineering considerations into account.

For detailed traffic data information about MSM, refer to the “Determining Service Requirements” section of NTP 297-7001-100 (release 8), *DMS Voice Mail Planning and Engineering Guide*, or 557-7001-100 (release 9), *Meridian Services Module (MSM) Planning and Engineering Guide* and section 11 of the Meridian SL-100 Configurator Sales Toolkit.

For detailed traffic data information about ACD refer to the “Determining Service Requirements” section of NTP 297-2041-104, *Automatic Call Distribution Planning and Engineering Guide*.

Configuring the software

Prior to MSL05, you must load patches POP26 and POP27 and activate POP27. Contact SL-100 ETAS for activation assistance.

Although much of the architecture and many of the features of the LTI card are drastically different from analog line cards, the LTI card is designed to emulate an analog line card to the SL-100 software. Because of this, the LTI card software configuration is performed exactly the same as an analog card.

All 24 channels carried by the LTI card are individually configured. Refer to Table 0-1 to determine the correct unit number.

The LTI card circuitry routes 16 ports (0-15) on the motherboard and 8 (0-7) ports on the daughterboard to 24 channels on the T-1 link. The motherboard circuit card is located in the left card slot, and the daughterboard circuit card is located in right card slot. For example, if you install the LTI card into card slots 0 and 1, the motherboard resides in card slot 0 and the daughterboard resides in card slot 1. To configure the terminal equipment through the switch software, you must

cross-reference the T-1 channel number to the corresponding card unit number. This mapping is shown in Table 0-1.

Table 0-1
Card unit number to T-1 channel mapping (Sheet 1 of 2)

DX-30 time slot (card slot / unit)	T-1 channel number
Motherboard / 0	1
Motherboard / 1	2
Motherboard / 2	3
Motherboard / 3	4
Motherboard / 4	5
Motherboard / 5	6
Motherboard / 6	7
Motherboard / 7	8
Motherboard / 8	9
Motherboard / 9	10
Motherboard / 10	11
Motherboard / 11	12
Motherboard / 12	13
Motherboard / 13	14
Motherboard / 14	15
Motherboard / 15	16
Daughterboard / 0	17
Daughterboard / 1	18
Daughterboard / 2	19
Daughterboard / 3	20
Note: Daughterboard ports 8 through 15 are not available for use.	

Table 0-1
Card unit number to T-1 channel mapping (Sheet 2 of 2)

DX-30 time slot (card slot / unit)	T-1 channel number
Daughterboard / 4	21
Daughterboard / 5	22
Daughterboard / 6	23
Daughterboard / 7	24
Note: Daughterboard ports 8 through 15 are not available for use.	

After you have configured the software, you are ready to power up the card and verify the self test results. The status LED on the faceplate indicates whether the LTI card has successfully passed its self test and is now functional. When the card is installed, the LED remains lit for 2 to 5 seconds as the self-test runs. If the self-test completes successfully, the LED flashes three times and remains lit until the card is configured and enabled in software. The LED goes out if the software enables the motherboard or the daughterboard. If the LED operates in any other manner, such as continually flashing or remaining weakly lit, replace the card.

Configuring the HMI terminal

For the HMI terminal to be able to communicate to the LTI card, you must set the interface characteristics to:

- Speed-1200 or 2400 bps
- Character width-8 bits
- Parity bit-none

or to:

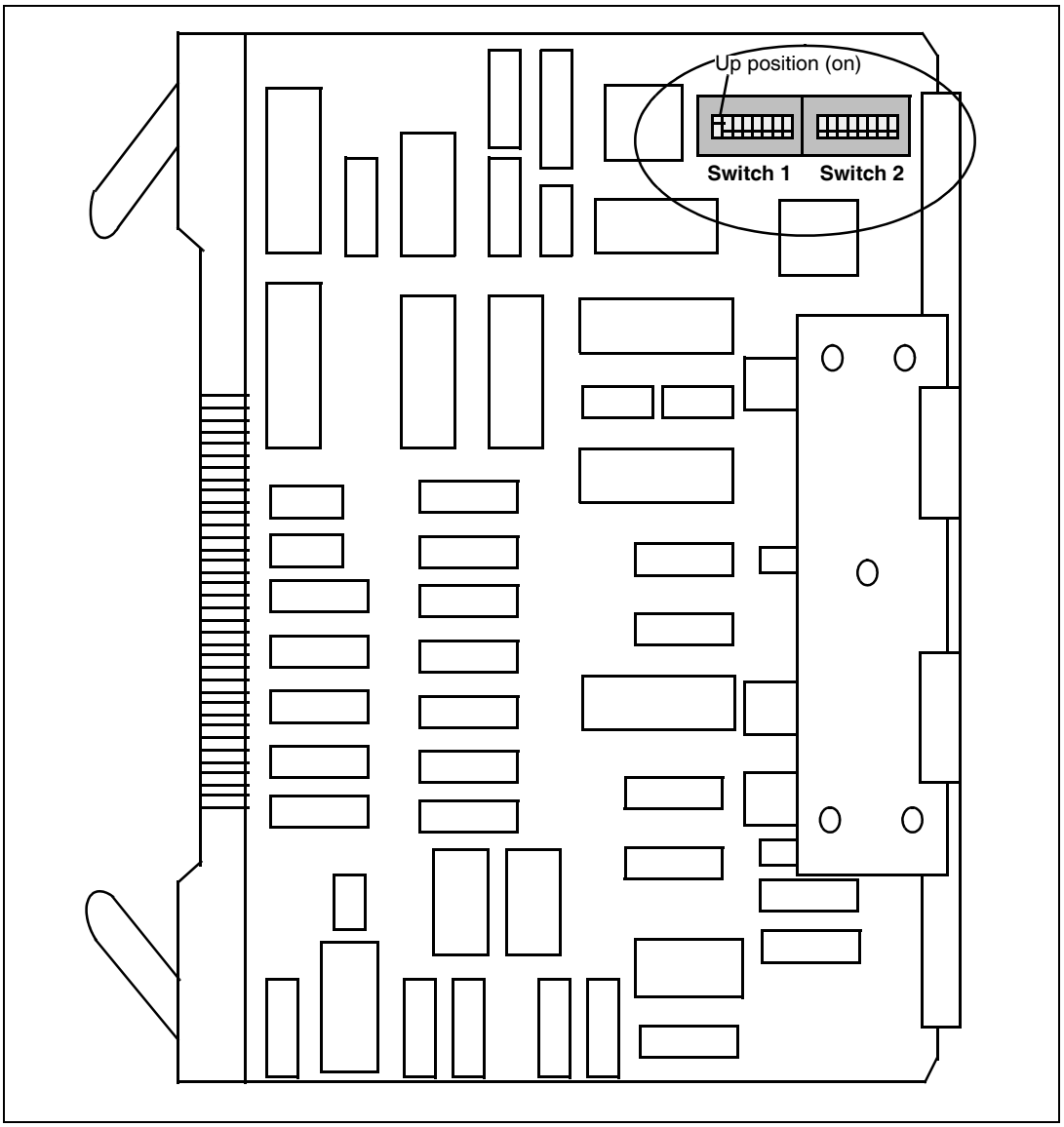
- Speed-1200 or 2400 bps
- Character width-7 bits
- Parity bit-mark
- Stop bits-one

Configuring DIP switch settings

Begin your installation and configuration of the LTI card by selecting the proper DIP switch settings for your environment. The LTI card contains two DIP switches. For each switch setting on both switches, the switch

is set to “on” when it is in the up position, and “off” when it is in the down position. Figure 0-2 shows the location of the DIP switches on the LTI card.

Figure 0-2
Location of DIP switches on the LTI card



The LTI card's DIP switch settings configure your card for the following parameters.

HMI port speed selection

This switch setting selects the appropriate baud rate for a modem connected to the HMI. Valid values are 1200 baud and 2400 baud. For 1200 baud, set switch position 1 on DIP switch 1 to the “on” position. For 2400 baud, set switch position 1 on DIP switch 1 to the “off” position.

DS-1 signaling protocol

This setting determines the type of call processing mode (loop start or ground start). Make your selection for this DIP switch position based on what type of signaling your customer premise equipment (CPE) supports. For ground start mode, set switch position 2 on DIP switch 1 to the “on” position. For loop start mode, set switch position 2 on DIP switch 1 to the “off” position.

IPE shelf address

This setting establishes the IPE shelf address of the LTI card for the human-machine interface (HMI). The shelf address DIP switch setting can be the same as or different from the shelf address established in the software. The address can be from 00-15, 15 being the maximum number of shelves capable of daisy chaining to a single HMI terminal. The settings of switch positions 3 through 6 on DIP switch 1 determine this characteristic. See Table 0-2 for these switch settings.

Table 0-2
IPE shelf addresses (Sheet 1 of 2)

IPE shelf address	Switch 6 position	Switch 5 position	Switch 4 position	Switch 3 position
00	Off	Off	Off	Off
01	Off	Off	Off	On
02	Off	Off	On	Off
03	Off	Off	On	On
04	Off	On	Off	Off
05	Off	On	Off	On
06	Off	On	On	Off
07	Off	On	On	On
08	On	Off	Off	Off

Table 0-2
IPE shelf addresses (Sheet 2 of 2)

IPE shelf address	Switch 6 position	Switch 5 position	Switch 4 position	Switch 3 position
09	On	Off	Off	On
10	On	Off	On	Off
11	On	Off	On	On
12	On	On	Off	Off
13	On	On	Off	On
14	On	On	On	Off
15	On	On	On	On

Note: Switch position 7 on DIP switch 1 is not used and should be set to "off."

Cutoff on disconnect

If your system is configured to allow cutoff on disconnect, the LTI card provides an open tip indication to the CPE when it receives an indication of distant end disconnect from the system. This provides normal ground start protocol call termination. To configure the board to have cutoff on disconnect capability, set switch position 8 on DIP switch 1 to "on." For no cutoff on disconnect capability, set switch position 8 on DIP switch 1 to "off."

Note: For this feature to function, the cutoff on disconnect feature must be configured for each LTI port in the SL-100 system software. Patch WEC05 provides cutoff on disconnect capability and is included in the SL-100 software for BCS34, up to MSL04.

DS-1 framing

The LTI card is capable of interfacing with CPE or channel service unit (CSU) equipment either in D4 or ESF framing mode. Valid values for this characteristic are ESF or D4. Make the selection for this DIP switch position based on the type of framing that the CPE or CSU equipment supports. For D4 framing, set switch position 1 on DIP switch 2 to "on." For ESF framing, set switch position 1 on DIP switch 2 to "off."

DS-1 coding

The LTI card is capable of interfacing with CPE or CSU equipment using either AMI or B8ZS coding. Valid values for this characteristic are AMI or B8ZS. Make your selection for this DIP switch position based on what type of coding your CPE or CSU equipment supports. For B8ZS coding, set switch position 2 on DIP switch 2 to “off.” For AMI coding, set switch position 2 on DIP switch 2 to “on.”

CPE or CSU distance

This setting is the distance between the LTI card and the CPE or CSU equipment it is serving. Make your selection for this switch position based on this distance. See Table 0-3 for these switch settings.

Table 0-3
CPE or CSU distance settings

Distance (feet)	Switch 3 position	Switch 4 position	Switch 5 position
0 - 133	On	Off	Off
134 - 266	Off	On	On
267 - 399	Off	On	Off
400 - 533	Off	Off	On
534 - 655	Off	Off	Off

Line processing on T-1 failure

This setting determines to what state all of the line side T-1 card's ports are set in the case of T-1 link failure. Configure this DIP switch setting depending on how your software is configured. For instance, if your software is configured to automatically forward calls to another extension after a fixed number of rings, you may want to set the DIP switch to its “On-hook” setting. In this case, T-1 link failure forwards your phones to an extension that may be available to answer the call. However, if your software is not configured to forward calls, the “On-hook” setting causes the phone to ring indefinitely, in which case the “Off-hook” setting may be a preferable selection. For “On-hook,” set switch position 6 on DIP switch 2 to “on”. For “Off-hook,” set switch position 6 on DIP switch 2 to “off”.

Daisy chaining to HMI

If you plan to install two or more LTI cards and you plan to use the HMI, daisy chain your cards together to use one HMI terminal or modem. Make your selection for this DIP switch position based on how many LTI

cards you are installing. To select daisy chaining, set switch position 7 on DIP switch 2 to “on”. If the card is not daisy chained, set switch position 7 on DIP switch 2 to “off”. If switch position 7 of DIP switch 2 if set to “off”, the IPE shelf address settings are ignored.

HMI master

This setting determines whether or not the card is connected to the HMI terminal. If configured to be connected to the HMI terminal, the card is a master. All others are slaves. To configure this card as the master, set switch position 8 on DIP switch 2 to “on”. To configure this card as a slave, set switch position 8 on DIP switch 2 to “off.”

After the card has been installed, use the DISPLAY CONFIGURATION (DC) command set to display your DIP switch settings. See chapter 2, “Human-machine interface,” for more information about command sets.

Cabling the LTI card

After you have set your DIP switches, you are ready to cable from the LTI card to the CPE or CSU equipment, the HMI terminal or modem (optional), an external alarm (optional), and other LTI cards for daisy chaining use of the HMI terminal (optional).

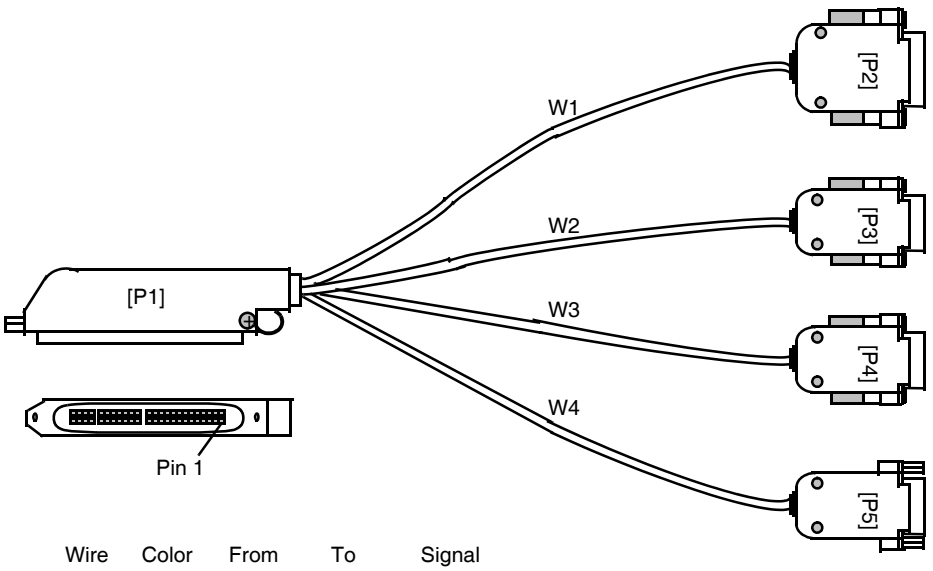
The LTI card is cabled from its backplane connector through connections from the motherboard circuit card only (no cable connections are made from the daughterboard circuit card) to the input/output (I/O) panel on the rear of the IPE module. The connections from the LTI card to the IPE bulkhead are made with the NT8D81 tip and ring cables (provided with the IPE).

The connection from the I/O panel to the T-1 link and other external devices are made with the LTI I/O cable (PEC NT5D13AA). This cable consists of a 25-pair amphenol connector (P1) on one end that plugs into the I/O panel. The other end has 4 connectors:

- a DB15 male connector (P2) that plugs into the T-1 line (maximum 655 feet)
- a DB9 male connector (P3) that plugs into an external alarm system (no maximum length)
- a DB9 male connector (P5) that connects to an HMI terminal or modem (maximum 50 feet)
- a second DB9 female connector (P4) that connects to the next LTI card's P4 connector for HMI daisy chaining (maximum 50 feet)

Figure 0-3 shows the NT5D13AA LTI cable.

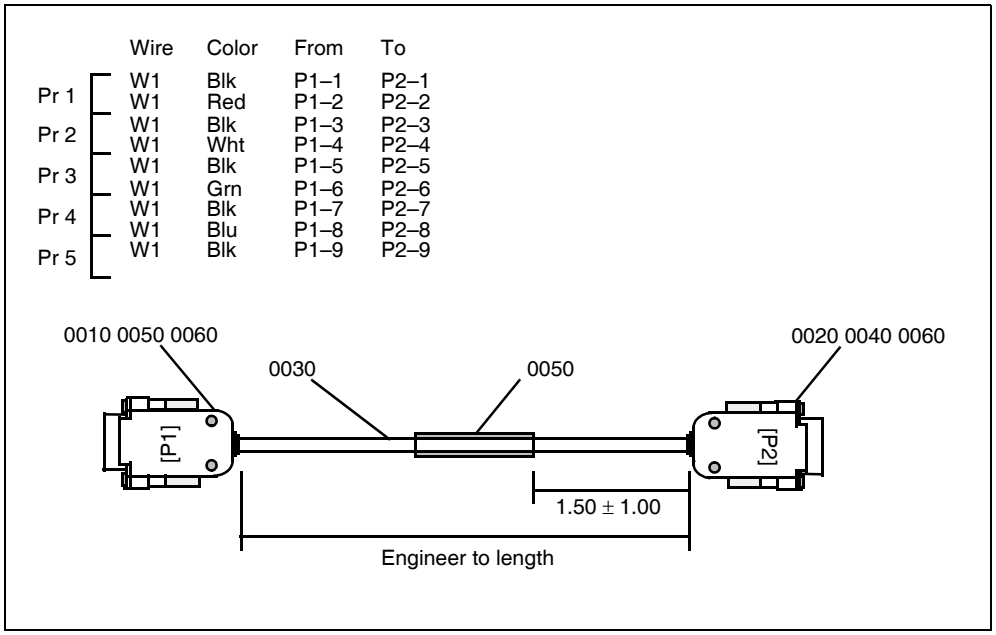
Figure 0-3
LTI cable (NT5D13AA)



Wire	Color	From	To	Signal
W1	Blk	P1–1	P2–11	Tip in
W1	Red	P1–26	P2–3	Ring in
W1	Blk	P1–2	P2–1	Tip out
W1	Wht	P1–27	P2–9	Ring out
			P2–2	Ground (shield)
			P2–4	Ground (shield)
W2	Blk	P1–3	P3–1	Relay no
W2	Wht	P1–28	P3–2	Relay in
W2	Red	P1–4	P3–3	Relay nc
W3	Wht	P1–31	P5-2	SRXD (DCE) MMI terminal
W3	Red	P1–7	P5–3	STXD (DCE) MMI terminal
W3	Blk	P1–33	P4–5	Gnd
W3	Grn	P1–8	P4–7	Con1
W3	Brn	P1–32	P4–9	Con2
W4	Blk	P1–33	P5–5	Gnd
W4	Wht	P1–8	P5–7	Con1
W4	Red	P1–32	P5–9	Con2
W4	Grn	P1–5	P4–2	MTRXD (DTE) Daisychain
W4	Brn	P1–30	P4–3	MRXD (DTE) Daisychain

In multiple LTI configurations, an LTI human-machine interface daisy chain cable (PEC NT7R66BA) is available for daisy chaining the human-machine interface of LTI cards that are co-located in the same IPE column. See Figure 0-4.

Figure 0-4
LTI HMI daisy chain cable (NT7R66BA)

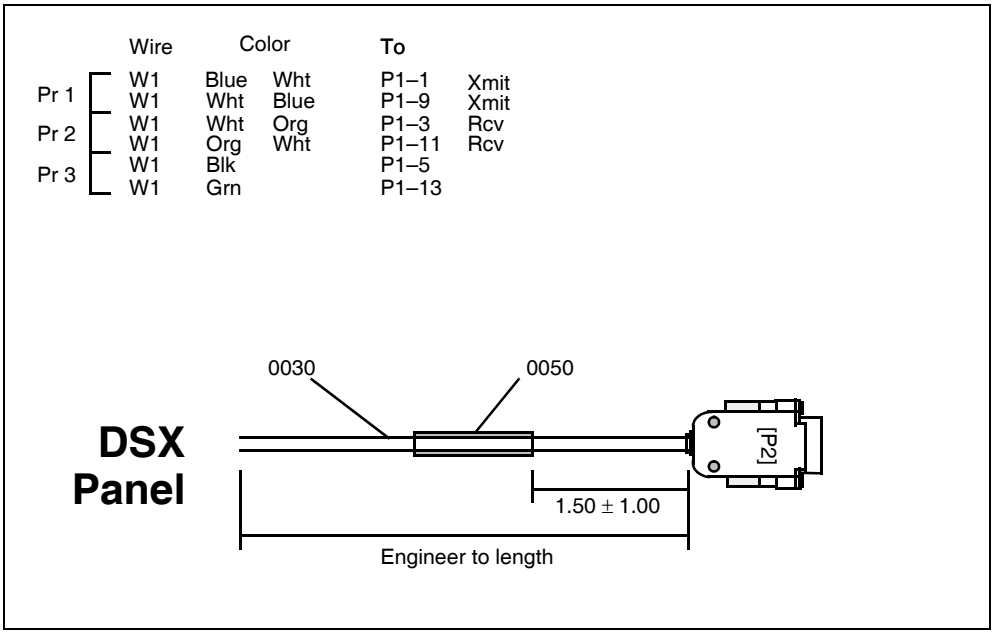


An LTI T-1 extension cable (PEC NT7R83CA) is also available. This cable is used to extend the T-1 interface over long distances (up to 50 feet.) See Figure 0-5.

T-1 Cable Grounding

The T-1 cable between the IPE module and the DSX panel is grounded at the IPE end and open at the DSX end. The T-1 cable between the MSM and the DSX panel is grounded at the MSM end and open at the DSX end.

Figure 0-5
LTI T-1 extension cable (NT7R83CA)



T-1 connections

T-1 signaling for all 24 channels is transmitted over I/O connector pins 1, 2, 26, and 27. Plug the DB15 male connector labeled P2 into the T-1 link.

External alarm connections

I/O connector pins 3, 4, and 28 can be plugged into any external alarm hardware. Plug the DB9 male connector labeled “P3” into the external alarm (auxiliary alarm cable: NT7R86AA). These connections are optional, and the functionality of the LTI card is not affected if they are not made.

The HMI monitors the T-1 link for specified performance criteria and reports on problems detected. One of the ways it can report information

is through this external alarm connection. If connected, the LTI card's microprocessor activates the external alarm hardware if it detects certain T-1 link problems it has classified as alarm levels 1 or 2. See chapter , “Human machine interface,” for a detailed description of alarm levels and configuration. If an alarm level 1 or 2 is detected by HMI, the LTI card closes the contact that is normally open, and opens the contact that is normally closed.

HMI connections

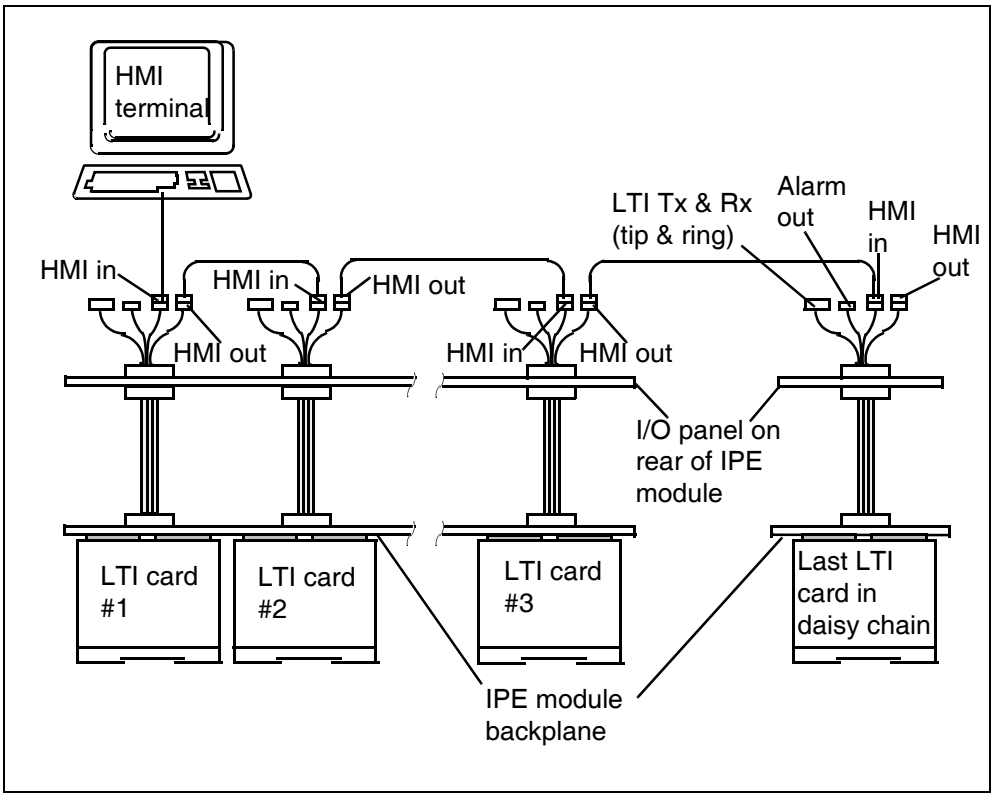
I/O connector pins 6, 7, 8, 30, 31 and 32 are used to connect the LTI card to the HMI terminal and daisy chain LTI cards together for access to a shared HMI terminal. As with the external alarm connections, HMI connections are optional.

You can daisy chain up to 128 LTI cards, located in up to 16 separate IPE shelves, to one HMI terminal.

If you are installing only one LTI card, cable from the DB9 male connector labeled “P5” (HMI IN) to one of the COM ports on the back of any VT-100 compatible terminal, a PC running a terminal emulation program, or a modem. For installations of only one card, no connection is made to the DB9 female connector labeled “P4” (HMI OUT).

If you are installing two or more LTI cards into your Meridian 1 system, you can daisy-chain the HMI port connections together so that only one HMI terminal is required for up to 128 LTI cards. You can start with any card slot in the IPE shelf and connect to any other card slot. Card slots connected together do not need to be consecutive.

Figure 0-6
Connecting two or more cards to the HMI



After the cards have been installed in the IPE, follow Procedure 1, "Connecting two or more LTI cards to the HMI" for connecting two or more LTI cards to the HMI terminal.

Procedure 0-1
Connecting two or more LTI cards to the HMI

1 Cable the DB9 female connector labeled “P5” (HMI IN) to one of the COM ports on the back of any VT-100 compatible MAP terminal running EMAP software, PC running a terminal emulation program, or modem.

2 Make the connection from the first card to the second card by plugging the DB9 male connector labeled “P4” (HMI OUT) from the first card into the DB9 female connector of the second card labeled “P5” (HMI IN).

3 Repeat step 2 for the remaining cards.

4 When you get to the last card in your daisy chain, make no connection from the DB9 male connector labeled “P4” (HMI OUT).

LTI card replacement

This chapter gives instructions for replacing the NT5D11 card. There is a procedure containing the following information:

- explanatory and context-setting information
- summary flowchart
- step-action instructions

Recording card replacement activities

When a card is replaced, the following information should be noted in office records:

- the serial number of the replaced card
- the date of replacement
- the reason for the replacement

Explanatory and context-setting information

In each procedure, the section titled “Application” identifies the card product engineering code's (PEC) (including suffixes) and the shelves or frames to which this procedure applies. Read this section before you perform the step-action instructions. If the “Application” section does not identify the card and shelf you are looking for, go to the “Index” where all card and shelf combinations included in this book are listed.

The “Common procedures” section lists common procedures that you may be asked to perform as you follow the step-action instructions. Go to these common procedures only when directed to do so.

Summary flowchart

The flowchart is a summary of the main actions, decision points, and possible paths you may take. Do not use the summary flowchart to perform the procedure. Instead, use it to preview what you will be doing and to prepare. For example, if you see that the instructions will involve another office, you will know to advise that office before you begin the step-action instructions.

Step-action instructions

The step-action instructions tell you how to change a card. Normally, you perform the steps in order, but you may be directed to return to a previous step and repeat a sequence. The successful completion of a step in a sequence may depend on previous steps; therefore always perform the steps in the order specified.

The step-action instructions provide the command syntax and machine output you use or see while performing this procedure. For help on DMS commands or output, see *Commands Reference Manual*.

NT5D11 in an IPE

Application

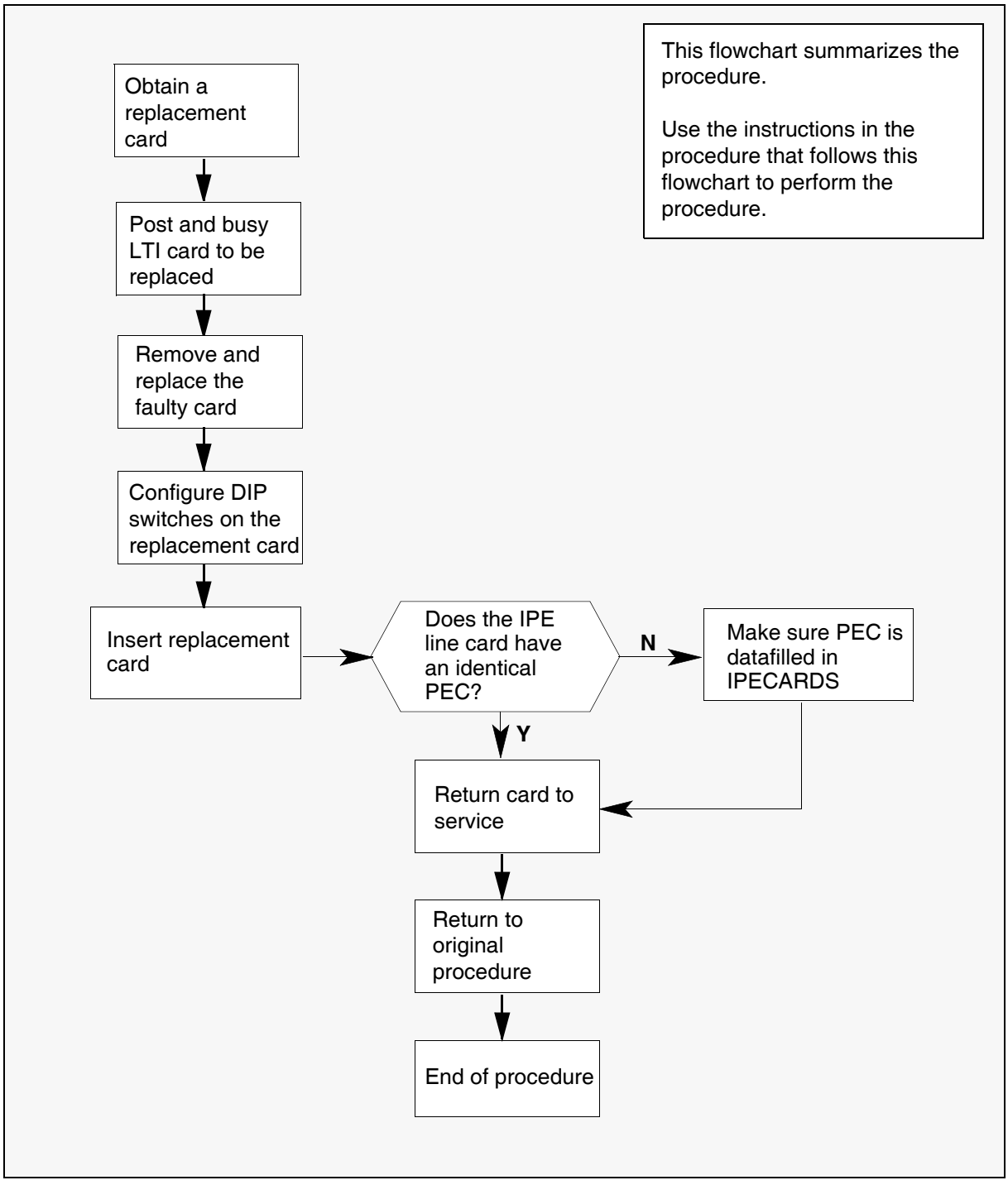
Use this procedure to replace the cards in the shelves or frames identified in the following table.

PEC	Suffixes	Cardname	Shelf/frame name
NT5D11	AA, AB, AC	Line Side T-1 Interface card	IPE

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

Summary of card replacement procedure for NTD511 card in an IPE



Replacing an NT5D11 card

DANGER
Module front and rear covers are not hinged
Module front and rear covers are *not* hinged; *do not let go of the cover.* Lift the cover away from the module, and set the cover out of the work area.

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Obtain a replacement card. Ensure that the replacement card has the same product engineering code (PEC), including suffix, as the card to be removed.

At the MAP terminal

3 Set the MAP terminal to the peripheral module (PM) level by typing the following string:

```
>MAPCI;MTC;PM;POST IPE ipec_no shelf_no
```

and pressing the Enter key.

where

ipec_no is the number of the IPE column (0-127)

shelf_no is the number of the IPE column (0-127)

Example of a MAP response:

```
        CM     MS      IOD     Net     PM      CCS    Lns   Trks    Ext  APPL
         .   RExByp  1CkEr  16PSLK  3ESA    1 RSC     .    3 GC     .    .
                                             *C*          *C*
PM
                                                  SysB  ManB  OffL  CBsy  ISTb  InSv
0 Quit                                               0     5     2     0     5    42
2 Post_                  PM
3
4                      PM:
5
6
7
8
9
10
11 Disp_
12
13 Status
14 IPML
15 PES
16
17
18
```

4

CAUTION

The BSY command takes subscribers out of service

Removing an in-service line card takes all subscribers on that line card out of service. If the failure is severe, replace the card immediately. Otherwise, do this procedure during low traffic periods.

Busy the IPE line card by typing the following string:

```
>BSY CARD slot_no
```

where

slot_no
is the slot number of the IPE line card (0-15)

and pressing the Enter key.

At the IPE shelf

5

CAUTION
Static electricity damage
Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the frame supervisory panel of the IPE frame. This protects the equipment against damage caused by static electricity.

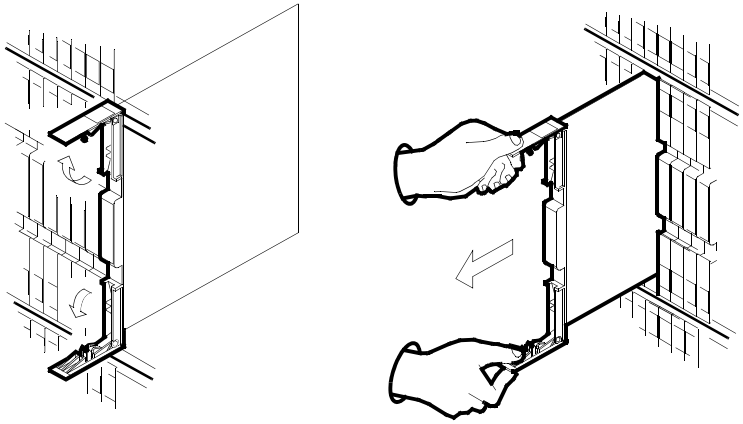
Put on a wrist strap.

6 Locate the card to be removed on the appropriate shelf.

7

CAUTION
Equipment damage
When inserting or removing a card, do not apply direct pressure to the components or force the cards into the slots.

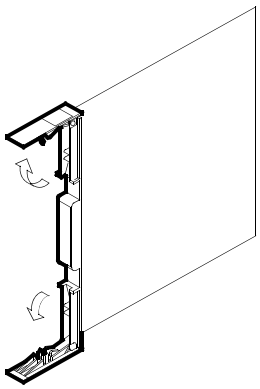
Open the locking levers on the card to be replaced and gently pull the card towards you until it clears the shelf.

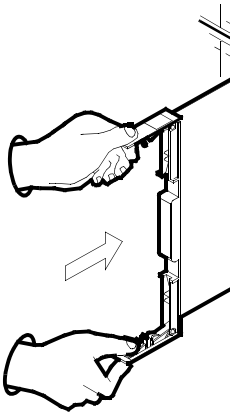


8 Ensure that the replacement card has the same PEC, including suffix, as the card you just removed.

9 Configure the DIP switches on the replacement card as appropriate for your environment according to the settings shown in Tables1-4 in the “Card settings” section of this chapter.

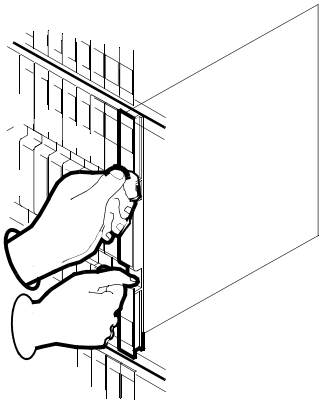
10 Open the locking levers on the replacement card. Align the card with the slots in the shelf and gently slide the card into the shelf.





11 Using your fingers or thumbs, push on the upper and lower edges of the faceplate to ensure that the card is fully seated in the shelf.

12 Close the locking levers.



Note: If the new IPE card does not have a PEC identical to the one replaced, make sure PEC is datafilled in the IPECARDS table before returning the card to service.

At the MAP terminal

13 Return the IPE to service by typing the following string:

```
>RTS CARD slot_no
```

where

>slot_no is the slot number of the IPE line card (0—15)

14 Send any faulty cards for repair according to local procedure.

15 Record the following items in office records:

- date the card was replaced
- serial number of the card
- symptoms that prompted replacement of the card

16 You have completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

17 Continue as directed.

Card settings

The following tables give the switch settings for the DIP switches on the line side T-1 card. These switches must be configured for your environment before you install the T-1 card, as explained in Step 9 of this procedure.

TableSettings for DIP switch 1

Switch position	Characteristic	Selection	Switch setting
1	HMI port speed selection	1200 baud 2400 baud	On Off
2	T-1 signaling	Ground start Loop start	On Off
3 - 6	IPE shelf address	See Table 2	
8	Cutoff on disconnect	COD enabled COD disabled	On Off

Note: Switch 7 is not used and should be left in the “off” position.

IPE shelf addresses

IPE shelf address	Switch 6 position	Switch 5 position	Switch 4 position	Switch 3 position
00	Off	Off	Off	Off
01	Off	Off	Off	On
02	Off	Off	On	Off
03	Off	Off	On	On
04	Off	On	Off	Off
05	Off	On	Off	On
06	Off	On	On	Off
07	Off	On	On	On
08	On	Off	Off	Off
09	On	Off	Off	On
10	On	Off	On	Off
11	On	Off	On	On
12	On	On	Off	Off
13	On	On	Off	On
14	On	On	On	Off
15	On	On	On	On

Settings for DIP switch 2

Switch position	Characteristic	Selection	Switch setting
1	T-1 framing	D4	On
		ESF	Off
2	T-1 coding	B8ZS	Off
		AMI	On
3 - 5	CPE or CSU distance	See Table 4	
6	Line processing on T-1 link failure	On-hook	On
		Off-hook	Off
7	Daisy chaining to the HMI	Yes	On
		No	Off
8	HMI master	Yes (master)	On
		No (slave)	Off

CPE or CSU distance settings

Distance (feet)	Switch 3 position	Switch 4 position	Switch 5 position
0 - 133	On	Off	Off
134 - 266	Off	On	On
267 - 399	Off	On	Off
400 - 533	Off	Off	On
534 - 655	Off	Off	Off

LTI data schema

This chapter provides datafill information for the line side T-1 interface for IPE (LTI) card. Table LNINV is the only table that applies to the LTI card.

LNINV

Line Circuit Inventory Table.

Functional description

Table LNINV lists the data for each line card slot for various peripheral module (PM) types, including the following:

- asynchronous interface module (AIM)
- digital line module (DLM)
- enhanced line concentrating module (ELCM)
- intelligent peripheral equipment (IPE)
- international line concentrating module (ILCM)
- ISDN line concentrating module (LCMI)
- line concentrating module (LCM)
- line digital trunk (LDT)
- line module (LM)
- remote carrier urban (RCU)
- remote concentrator SLC-96 (RCS)
- remote concentrator terminal (RCT)
- remote digital terminal (RDT)
- remote line concentrating module (RLCM)
- remote switching center second series (RSC-S)
- server service (SVR)

- small remote unit (SRU)
- virtual line concentrating module (VLCM)

For information on line testing, refer to the *Lines Maintenance Guide*.

Datafill sequence and implications

The following tables must be datafilled before table LNINV:

- LMINV
- LCMINV
- LCMDRINV
- LDTINV
- LNTDM
- ISGTDM

Field LEN must be datafilled in the PM inventory tables (for example, RDTINV) prior to datafilling table LNINV.

Additional datafill information

A remote switching center (RSC) must be provided as the site of an enhanced line concentrating module with ISDN (LCME).

For ISDN and RCU Meridian business set (MBS) lines, the value of field STATUS is set to WORKING.

Remote carrier urban (RCU) special-service, coin, MBS, and ISDN lines use only even-numbered circuits in table LNINV. Before a special-service line can be deleted from this table, the associated nailed-up cross-connection must be deleted from table PSNAILUP.

Special services module (SSM) channel units can be datafilled only if the RCU is equipped with SSMs and fields SSM1, SSM2, or both, are datafilled appropriately in table RCUINV. Circuit numbers 24 to 31 are not used on SSMs, so these must not be datafilled. At least three voice channel units must be datafilled for every SSM, or a carrier group alarm may be caused.

If SSM1 is configured, lines cannot be datafilled for slot 1 of control shelf 1, since a bus extender occupies the slot. If SSM2 is configured, lines cannot be datafilled for slot 2 of control shelf 1, since a bus extender occupies the slot.

Channel units that are part of special-service connections and are datafilled in table SPECCONN cannot be deleted from table LNINV.

If the integrated bit error rate test (IBERT) is datafilled only in table LNINV, the state when it is posted in the line test position (LTP) of the MAP display is installation busy (INB). If the idle (IDL) state is desired, then the IBERT must also be datafilled in table KSETINV with the DATA format.

When datafilling table LNINV for IPE analog lines, fields PADGRP, STATUS, GND, and BNV are datafilled the same as IPE digital lines, with the following exceptions:

- Fields LSG and CIRCUIT must correspond to an IPE analog line card that supports only 16 circuits (numbered 0 to 15).
- Field MNO must be datafilled as N for IPE analog lines.

GPPs use virtual line addressing of lines connected to access nodes (AN). For more information about GPP virtual line addressing, see the “Lines” section in the “Supplementary information” section at the end of this module.

Table IPEINV must be datafilled for the IPE before analog lines associated with that IPE can be datafilled in table LNINV. Once tables IPEINV and LNINV are datafilled, table IBNLINES can be datafilled for IPE analog lines.

ATTENTION
ISDN line drawer for remotes (ILDR) is first available for RSC-S and RSC configurations in the NA007/XPM08 timeframe. ILDR is first available for RLCM, outside plant module (OPM), and outside plant access cabinet (OPAC) configurations in the NA008/XPM81 timeframe.

The restrictions in adding or changing an ILDR line in table LNINV are

- ILDR drawers must be datafilled in table LCMDRINV before ILDR lines are datafilled in table LNINV.
- Verify that if the respective drawer is defined as ILDR in table LCMDRINV, the line card is suitable for an ILDR, that is, NTBX27.
- Verify that the line card number is in the range of 0 through 13. This is because ILDR supports up to 28 lines in a physical drawer (2 lines per line card x 14 slots = 28).
- Set the line state to WORKING, even if operating company personnel write a different state. This is because, unlike an LCME

line, the ILDR does not require a special connection to the enhanced D-channel handler (EDCH) to be set up.

- The state of the drawer remains unchanged while the ILDR is defined. Defining the first line of an ILDR or deleting the last line of an ILDR does not change the state of the drawer. The state of the drawer is changed to Unequipped (NILDRWR) only when the ILDR is deleted from table LCMDRINV.

ISDN lines cannot be datafilled in table LNINV unless the access multiplexer capability (AMC) in which they reside has an incoming start to dial delay (ISDD) C-channel defined. Please note that the opposite direction is also checked. It is not possible to delete a C-channel from an AMC unless there are no ISDN lines defined for that AMC in this table. The same is true for public switched telephone networks (PSTN).

ISDN lines defined using a V5 interface in table LNINV are moved to status WORKING. This is true even if the operating company personnel have datafilled the line as HASU.

Table size

0 to 32 767 tuples.

Memory is automatically allocated.

Datafill

The following table lists datafill for table LNINV.

Field descriptions

Field	Subfield or refinement	Entry	Explanation and action
LEN		see subfields	*Line equipment number* This field defines the physical location of the equipment that is connected to a specific telephone line. Because field LEN is common to more than 60 tables, it is documented in a single section to avoid unnecessary duplication. Refer to section “Common entry field LEN” for a complete description of field LEN and associated subfields. Field LEN consists of subfields SITE, FRAME, UNIT, DRAWER or LSG, SHELF, SLOT, and CIRCUIT. For the integrated channel bank (ICB) that connects to the Expanded Subscriber Carrier Module-100 Access (ESMA) (also known as the SMA2), the LEN consists of the following subfields: SITE, FRAME, UNIT, RDTLINK, and CHANNEL.

Field descriptions

Field	Subfield or refinement	Entry	Explanation and action
			For GPPs, field LEN consists of SITE, FRAME, GROUP (CAS) or UNIT (V5), LINE CARRIER (CAS) or LAYER 3 ADDRESS1 (V5), and CHANNEL (CAS) or LAYER 3 ADDRESS 2 (V5). ***Note:*** For more information about GPP addressing see the "Lines" section of the "Supplementary information" section.
CARDCODE		2X03AA 2X17AB 2X17AC 2X17AD 2X18AC 2X18AD 2X18AE 3A06AA 3A06BA 3A07AA 3A07BA 3A12AB 3A13AB 3A13AC 3A19AB 3A27AA 5D11AA 6X17AA 6X17AC 6X17BA 6X18AA 6X18AB 6X18BA 6X19AA 6X19AB 6X20AA 6X21AA 6X21AB 6X21AC 6X21AD 6X21BC 6X23AA 6X33AA 6X71AA 6X71AB	*Card code* Enter the product engineering code (PEC) of the line card. Entry values other than those listed in this field description can also be valid. Refer to the switch range for a comprehensive list of valid entry values. The 2X-based PECs refer to the LM-based PMs, while the 6X-based PECs refer to the ILCM-based PMs. QPP codes are for RCT; PSAP codes are for E911; and SCD and SSM codes are for RCU. NAILUP also applies to RCS modules. If submitting datafill for final lines enter ("). If field MEMSIZE of the LCM hosting the line card, in table LCMINV has a value of 4M 4M, for Japan only. The only acceptable entries in field CARDCODE are 6X21AA, AB, AC, AD or BC. All other entries create an error message and the tuple is rejected. ***Note:*** In the RLCM-EDC application for Japan only, line card slot 0 of line drawer 0 is allowed by table control to support a 6X21 line card and will not impact functions of the RLCM-EDC.

Field descriptions (Sheet 1 of 6)

Field	Subfield or refinement	Entry	Explanation and action
CARDCODE (continued)		6X71AC 6X76AA 6X76AC 6X87AB 6X87BA 6X88AB 6X88BA 6X93AA 6X93BA 6X93CA 6X93DA 6X93EA 6X93FA 6X94AA 6X94AB 6X94BA 6X94BB 6X94CA 6X94DA 6X95AA 6X95AB 6X98AA 6X99AA 7A20AA 7A21AA 7A22AA 7A23AA 7A25AA 7A26AA 7A27AA 7A31AA 7A33AA 8X47BA 8X73AA 8D02AA 8D02AB 8D02CC 8D02EA	Table card codes datafilled in table LNINV represent line card carriers, not line cards, for RCU, POTS, frequency selective ringing (FSR), and MPDR. For example, 3A06AA refers to the POTS line card carrier that holds POTS line cards. If the entry in field CARDCODE is 3A06BA or 3A07BA, datafill subfield CARDINFO. Enter RCUPOTS (for a POTS card) or RCUEPOTS (for an EPOTS card). Foreign exchange with battery office end (FXBO) and foreign exchange with battery station end (FXBS) use card codes that represent line cards. Different card codes cannot be datafilled in the same RCU slot. FXBS and FXBO cards are an exception to this rule, and can be mixed in the 6X11AB carrier. All two-wire and four-wire cards can be mixed in the 6X11BA carrier. All two-wire, four-wire, MBS, and ISDN cards can be mixed in the 6X11CA carrier. To datafill a world line card (WLC), the template name, which reflects the hardware characteristics rather than the hardware itself, is used to represent the card code.

Field descriptions (Sheet 2 of 6)

Field	Subfield or refinement	Entry	Explanation and action
CARDCODE (continued)		8D09AA 8D03AB 8D03AE 8D03AH 8D03AJ 8D09AB 8D09AD 8D09AG 8D09AH 8D09AJ BX04AA BX25AA BX25AB BX26AA BX27AA DC5A DC5ADD EX17AA EX17BA GX51AN GX51AS GX52BN GX52BS MUX15C NAILUP PSAPNN PSAPWA PSAPWN QPP405 QPP407 QPP409 QPP440 QPP445 QPP541 VLCMCD VLCMPR RDTCONRDT ICB RDTISD RDTLS RDTLSG RDTEBS RDTLRB SCD203	If the entry in field CARDCODE is EX17AA or EX17BA, the line drawer must have an NTEX54AA data enhanced bus interface card (DBIC) and must not exceed the engineering rules for the Nortel 1-Meg Modem Service. A PM181 log report is generated when the engineering rules are exceeded. Refer to the *DMS-100 Log Report Reference Manual* for a description of the PM181 log report. Only BX04AA is valid on an LCMI. For field CARDCODE, all entry values that begin with the characters GX (such as GX51AN) are template names for German only world line cards. Entries VLCMCD and VLCMPR apply to the VLCM. VLCMCD is the cardcode for the CSV VLCM. VLCMPR is the cardcode for the Proximity-I VLCM.

Field descriptions (Sheet 3 of 6)

Field	Subfield or refinement	Entry	Explanation and action
CARDCODE (continued)		SCD221 SCD233 SCD271 SCDFSR SSM2WV SSM4WD UKPSTN UKPTN1 UKPTN2 V5BRI WLBEAL WLBEAS WLBEBL WLBEBS WLBRAC WLBRAL WLBRAN WLBRBC WLBRBN WLBRBL WLITAX WLITBX WLNLAL WLNLAS WLNLBL WLNLBS WLPEAX WLPEBX WLPOAX WLPOBX WL17AC WL33AA WL9002 WL902B WL93AA WL93BA WL93CA WL93DA WL93EA WL94AA WL94AB WL94BB WL1740 WL98AA or WL9A40	For field CARDCODE, all entry values that begin with the characters UK (such as UKPSTN) are template names for UK only world line cards. For field CARDCODE, all entry values that begin with the characters WL (such as WL9002 or WL98AA) are template names for world line cards. Card types T1LOOP, T1ERTH, and V5LOOP are valid only on access nodes connected to a Global Peripheral Platform (GPP). For more information about this field, and details concerning specific CARDCODE entry values, refer to the “Supplementary information” section in this document under the subheading “General line card information.”

Field descriptions (Sheet 4 of 6)

Field	Subfield or refinement	Entry	Explanation and action
PADGRP		alphanumeric	*Pad group* Enter the name of the pad group that is assigned to the line circuit in table PADDATA. For digital line modules (DLM) and NT8X47BAs, only NPDGP (no pad group) can be assigned. Field PADGRP contains the name of the pad group in table PADDATA that lists the value of the pad circuits that can be switched into the line when the line is involved in a call. Different values for the pad circuits can be specified when the circuit connects to an agent with a different pad group. The name can be one of the pre-defined names from table PADDATA or a name specified by the operating company and assigned in table PADDATA.
STATUS		CUTOFF, HASU, RESERVED, UNEQUIP, or WORKING	*Line inventory availability status* Enter the line inventory availability status. Valid entries are CUTOFF (cutoff), HASU (hardware assigned/software unassigned), RESERVED (reserved), UNEQUIP (unequipped), and WORKING (working). For DLMs and NT8X47BAs, only HASU or RESERVED can be assigned. To disable configuration alarms, ensure that every line datafilled for a line card carrier has the state of UNEQUIP. To return to an alarm status, operating company personnel can either change field STATUS of a line to HASU through the table editor or add the directory number (DN) and change field STATUS to WORKING through the Service Order System (SERVORD). If the status of a line and the line configuration are correct, a configuration alarm is not raised.
GND		Y or N	*Ground* If the line is ground start, enter Y (yes). If the line is loop start, enter N (no). Enter loop start (N) for VLCMCD, VLCMPR, DLM, or NT8X47BA. ***Note:*** At final line time, the operating company can submit datafill to Nortel for all ground start line equipment in order to change the value of field GND from N to Y.

Field descriptions (Sheet 5 of 6)

Field	Subfield or refinement	Entry	Explanation and action
BNV		L or NL	*Balanced network value* Enter L if the line circuit is configured for a loaded network. Enter NL for a non-loaded network. Enter NL for VLCMCD, VLCMPR, DLM, or NT8X47BA.
MNO		Y or N	*Manual override* Enter Y if the unhook balance network test is to be prevented from updating field BNV in table LNINV. Enter N to allow the off-hook balance network test to update field BNV. Enter N for VLCMCD, VLCMPR, NT8D03AB, or NT8D09AB. Enter Y for DLM or NT8X47BA.
CARDINFO		see subfield	*Card information* This field consists of subfield CARDTYPE and its refinements.

Field descriptions (Sheet 6 of 6)

Field	Subfield or refinement	Entry	Explanation and action
	CARDTYPE	ISLCC, SSLCC, RCUEPOTS, RCUPOTS, or NIL	*Card type* The NIL value is the default. If the line card is contained in an RCU and the entry for field CARDCODE is not 3A06AA or 3A07AA, enter the following values: If CARDCODE is 3A06BA, enter RCUPOTS (for an NT3A10AA/AB card) or RCUEPOTS (for an NT3A10HA card). If CARDCODE is 3A07BA, enter RCUPOTS (for an NT3A10AA/AB card) or RCUEPOTS (for an NT3A10HA card). If CARDCODE is 3A12AB, 3A13AB, or 3A13AC, and is contained in a two-wire line card carrier, enter NIL. If CARDCODE is 3A12AB, 3A13AB, 3A13AC, 7A20AA, 7A21AA, 7A22AA, 7A23AA, 7A25AA, 7A26AA, or 7A27AA and is contained in a four-wire special services line card carrier (SSLCC), enter SSLCC and datafill refinements FCN and INSVC. If CARDCODE is 3A12AB, 3A13AB, 3A13AC, 7A20AA, 7A21AA, 7A22AA, 7A23AA, 7A25AA, 7A26AA, or 7A27AA, and is contained in an integrated services line card carrier (ISLCC), enter ISLCC and datafill refinements FCN and INSVC. If CARDCODE is VLCMCD or VLCMPR, enter NIL as the card type.
	CARDTYPE (continued)		If CARDCODE is RDTICB, and table RDTINV, field VARTYPE is datafilled as ICB, enter ICB. After ICB is entered, the switch prompts for FXS. If RDT is selected, the system prompts for C or S, where C represents coded ringing and S represents superimposed ringing. You can enter RDT C or RDT S if table RDTINV, field VARTYPE contains GENTMC. Although MBS and ISDN lines can only be in an ISLCC, enter NIL as the card type for either of these line types.

CARDTYPE = SSLCC or ISLCC

If the entry in subfield CARDTYPE is SSLCC or ISLCC, datafill refinements FCN and INSVC as described below.

Field descriptions for conditional datafill

Field	Subfield or refinement	Entry	Explanation and action
	FCN	DPO, DPT, DX, EM, ETO, FXO, FXS, OCU, PLR, SM, TANDEM, or TO	*Function* This value defines the function of the two-wire and four-wire special service card (in the four-wire line card carrier). For the NT3A12AB card, enter FXS. For the NT3A13AB/AC card, enter FXO. For the NT7A22AA card, enter SM. For the NT7A23AA card, enter OCU. For the NT7A20AA card, enter FXO, FXS, ETO, TO, EM, PLR, or TANDEM. For the NT7A21AA card, enter DX, ETO, TO, EM, PLR, or TANDEM. ***Note:*** If EM, PLR, or TANDEM is entered, it is part of a paired configuration with the SM card in the next position. If the value SSLCC or ISLCC is datafilled for field CARDTYPE, or a value for field CARDCODE of 6X12AB, 6X13AB, or 6X13AC is datafilled with a CARDTYPE of NIL, a tuple in table LNINVEXT is automatically created. The value datafilled in field FCN determines the table default values for field FCN in table LNINVEXT.
	INSVC	Y or N	*In-service* Field INSVC enables or disables configuration alarms. Enter Y to indicate that the card has a special connection established. Alarms are produced if the card fails diagnostics. Enter N to indicate that the special connection is taken down. Trunk conditioning is applied and alarms are not produced if the card fails diagnostics.

Datafill example

The following example shows sample datafill for table LNINV.

MAP display example for table LNINV

```
              LEN    CARDCODE PADGRP   STATUS   GND BNV MNO        CARDINFO
-------------------------------------------------------------------------------
HOST   05 0 17 01    6X17AB   STDLN   WORKING    N  NL   N             NIL
HOST   05 0 17 02    6X17AA   STDLN   WORKING    N  NL   N             NIL
HOST   05 0 17 03    6X17AB   STDLN   WORKING    N  NL   N             NIL
HOST   05 0 17 04    6X17AA   STDLN   WORKING    N  NL   N             NIL
HOST   05 0 17 05    6X17AB   STDLN   WORKING    N  NL   N             NIL
HOST   05 0 17 06    6X17AB   STDLN   WORKING    N  NL   N             NIL
HOST   05 0 17 10    6X17AC   STDLN   WORKING    N  NL   N             NIL
HOST   05 0 21 01    6X17AA   STDLN   WORKING    N  NL   N             NIL
HOST   05 0 21 02    6X17AB   STDLN   WORKING    N  NL   N             NIL
HOST   05 0 21 03    6X17AB   STDLN   WORKING    N  NL   N             NIL
HOST   05 0 21 04    6X17AA   STDLN   WORKING    N  NL   N             NIL
HOST   05 0 21 05    6X17AA   STDLN   WORKING    N  NL   N             NIL
HOST   05 0 21 06    6X17AA   STDLN   WORKING    N  NL   N             NIL
HOST   05 0 21 09    6X21AC   PPHON   WORKING    N  NL   Y             NIL
HOST   05 0 22 00    6X71AB   NPDGP   WORKING    N  NL   Y             NIL
HOST   05 0 23 00    6X17AC   NPDGP   WORKING    N  NL   N             NIL
HOST   05 0 23 01    6X17AB   STDLN   WORKING    N  NL   N             NIL
HOST   05 0 23 02    6X17AB   STDLN   WORKING    N  NL   N             NIL
HOST   05 0 23 03    6X17AB   STDLN   WORKING    N  NL   N             NIL
HOST   05 0 23 04    6X17AC   NPDGP   WORKING    N  NL   N             NIL
HOST   05 0 23 05    6X17AB   STDLN   WORKING    N  NL   N             NIL
HOST   05 0 23 06    6X17AA   STDLN   WORKING    N  NL   N             NIL
HOST   05 0 23 07    6X21AC   PPHON   WORKING    N  NL   Y             NIL
HOST   05 0 23 08    6X17AB   STDLN   WORKING    N  NL   N             NIL
HOST   05 0 23 09    6X17AC   NPDGP   WORKING    N  NL   N             NIL
HOST   05 0 23 10    6X21AC   PPHON   WORKING    N  NL   Y             NIL
HOST   00 1 00 01    VLCMCD   STDLN   WORKING    N  NL   N             NIL
HOST   00 1 00 01    VLCMPR   STDLN   WORKING    N  NL   N             NIL
```

The following example shows datafill for table LNINV when field MEMSIZE of table LCMINV has a value of 4M 4M, for Japan only.

MAP display example for table LNINV in remote with extended distance capability application

```
              LEN    CARDCODE PADGRP   STATUS   GND BNV MNO        CARDINFO
_____________________________________________________________________________
REM1   00 0 00 00    6X21AD   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 00 01    6X21AB   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 00 02    6X21AA   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 00 03    6X21AB   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 00 04    6X21AA   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 00 05    6X21AB   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 00 06    6X21AC   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 00 10    6X21AC   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 01 01    6X21AA   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 01 02    6X21AB   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 01 03    6X21AB   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 01 04    6X21AA   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 01 05    6X21AA   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 01 06    6X21AA   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 01 09    6X21AC   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 02 00    6X21AB   STDLN   WORKING    N  NL   Y            NIL
REM1   00 0 02 00    6X21AC   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 02 01    6X21AD   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 02 02    6X21AD   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 02 03    6X21AD   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 02 04    6X21AC   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 02 05    6X21AB   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 03 06    6X21AA   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 03 07    6X21BC   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 03 08    6X21AB   STDLN   WORKING    N  NL   N            NIL
REM1   00 0 03 09    6X21AC   STDLN   WORKING    N  NL   N            NIL
```

The following example shows sample datafill for table LNINV with Nortel 1-Meg Modem Service.

MAP display example for table LNINV with Nortel 1-Meg Modem Service

```
            LEN    CARDCODE PADGRP   STATUS   GND BNV MNO        CARDINFO
-------------------------------------------------------------------------
HOST   00 0 00 00    EX17AA  STDLN  WORKING    N  NL   N             NIL
HOST   00 0 00 01    EX17AA  STDLN  WORKING    N  NL   N             NIL
HOST   00 0 00 02    EX17AA  STDLN  WORKING    N  NL   N             NIL
HOST   00 0 00 03    EX17AA  STDLN  WORKING    N  NL   N             NIL
HOST   00 0 00 04    EX17AA  STDLN  WORKING    N  NL   N             NIL
HOST   00 0 00 05    EX17AA  STDLN  WORKING    N  NL   N             NIL
HOST   00 0 00 06    EX17AA  STDLN  WORKING    N  NL   N             NIL
HOST   00 0 00 07    EX17AA  STDLN  WORKING    N  NL   N             NIL
HOST   00 0 00 08    EX17AA  STDLN  WORKING    N  NL   N             NIL
HOST   00 0 00 09    EX17AA  STDLN  WORKING    N  NL   N             NIL
HOST   00 0 00 10    EX17AA  STDLN  WORKING    N  NL   N             NIL
HOST   00 0 00 11    6X17AA  STDLN  WORKING    N  NL   N             NIL
HOST   00 0 00 12    EX17AA  STDLN  WORKING    N  NL   N             NIL
HOST   00 0 00 13    EX17AA  STDLN  WORKING    N  NL   N             NIL
HOST   00 0 00 14    EX17AA  PPHON  WORKING    N  NL   Y             NIL
HOST   00 0 00 15    6X17AA  NPDGP  WORKING    N  NL   Y             NIL
```

Supplementary information

This section provides additional information on datafilling table LNINV.

General line card information

Nortel 1-Meg Modem Service

A new card code for the Nortel (Nortel Networks) 1-Meg Modem Service (NTEX17AA) line card is added to the available cards list. This card can be configured to any LCM variant capable of supporting Nortel 1-Meg Modem Service. A check is done to determine if the Drawer of the LCM supports the Nortel 1-Meg Modem Service. A warning message with a confirmation request is displayed if the LCM does not support the Nortel 1-Meg Modem Service, feature (AF6472).

The NTEX17AA is a two-slot card that requires customer premise equipment (CPE) to interface the subscriber's line to extension telephones and a personal computer when used as a POTS and data line. However, if the NTEX17AA card is used for POTS service only, no CPEs are required.

An NTEX54AA data enhanced bus interface card (DBIC) is required in the line drawer (LD) and datafilled in table LCMDRINV before an

NTEX17AA is datafilled in table LNINV. An error message is displayed if the LCM drawer does not support the Nortel 1-Meg Modem Service.

AIM line cards
The NT6X76AA (asynchronous interface line card) interfaces with the asynchronous interface module (AIM) using an RS422 protocol 5 volt link, and does not support ringing voltages or loop voltages of -48V. The link is intended for internal use within a building; maximum distance of 1219.2 m (4000 ft). The AIM communicates with data equipment through an RS232 link.

The NT6X76AC (DMS/SL-100 asynchronous interface line card) has a four-wire RS422 interface. Data terminal equipment (DTE) devices that are RS422 compatible can connect directly to the four-wire loop. RS232 compatible DTE can interface by an asynchronous interface line unit (AILU) or an AIM that performs the RS422 to RS232 conversion. The NT6X76AC card allows users access to simultaneous voice and low speed data communications over a two-wire facility provided through the use of integrated voice and data modems (IVDM) located in the DMS switch and on the customer premises.

DLM line cards
The NT8X47BA digital port card is used with the digital line module for M2000 digital telephones and the M3000 digital telephones. The NT8X47BA is a 32-channel port card equivalent to a line drawer that supports 16 M2000 digital telephones or M3000 digital telephones, each capable of simultaneous voice and data transmission.

GPP line cards
Unlike DMS switch physical line cards that are identified by Nortel Networks product codes, cards datafilled on generic access nodes (AN) are represented by the following equivalent virtual types:

- DC5A
- DC5ADD
- T1ERTH
- T1LOOP
- V5LOOP (for ANs with V5.2 interfaces)

In general, MDC station features are applicable only to GPP lines that serve subscriber stations using line card (LC) signaling (card code T1LOOP), not to GPP lines that serve PBXs using EC signaling (card code T1ERTH). The exceptions are routing features, such as Hunting.

E911 line cards (LDT)

The following card codes are used for Enhanced 911 Emergency Service (E911) LDTs to designate that the LEN belongs to a public safety answering point (PSAP). An LDT card code, along with field ANISPILL in the LDTPSAP option data of table HUNTGRP, defines the automatic number identification (ANI) protocol between the E911 tandem and an LDT PSAP. Field ANISPILL must correspond to the appropriate LDT card code datafilled for each LDT line assigned to a PSAP hunt group, as outlined below.

- PSAPNN is used for PSAPs that do not send a wink and do not expect ANI.
- PSAPWA is used for PSAPs that send a wink and expect ANI.
- PSAPWN is used for PSAPs that send a wink but do not expect ANI.

International line cards

The NT6X21BC (A-law international proprietary business set [P-phone] line card) is used in the international line concentrating module (ILCM), international remote line concentrating module (IRLCM), and very small remote (VSR).

Line card NT6X33AA (General use line card SMD type A, Japan) provides a single party voice and signaling interface between a two-wire analog subscriber line and the DMS-100.

NT6X93CA (line card type A China) and NT6X93EA (line card type A - Australia) POTS lines can be datafilled on LCME.

The NT6X93BA international type A line card provides the signaling and transmission interface required between BT700 series telephone sets and DMS-100/Caribbean local offices. It can be datafilled in any slot in any line drawer of the ILCM.

The NT6X94AB (international type B line card) is used by single party PBX and coin subscribers on the ILCMs. The current international type B diagnostic consists of the following parts:

- International type A line card diagnostic NT6X93AA (line card type A Turkey)
- Metering pulse test for the 12-kHz metering signal
- Reversal relay test as used for the North American type B line cards.

The major differences between the NT6X94AA and NT6X94AB cards are:

- A third relay has been added. This is the isolation relay for the NT6X94AB card.
- The NT6X94AB card uses less power.

The international line cards NT6X93BA, NT6X94BA, NT6X94BB, and NT6X95AB are used for the Caribbean expansion program.

The NT6X94BA international type B line card provides the signaling and transmission interface between the GEC-5600 coin box and the DMS-100E switch. It can be datafilled for any slot in any line drawer of the ILCM.

The NT6X94BB (international type B line card), like the NT6X94AB, is used by single party PBX and coin subscribers on the ILCMs and IRLCMs. The current international type B diagnostic consists of the following:

- International type A line card diagnostic NT6X93AA (line card type A Turkey)
- Metering pulse test for the 12-kHz metering signal
- Reversal relay test as used for the North American type B line cards.

The major differences between the NT6X94BA and NT6X94BB, identical to differences between the NT6X94AA and NT6X94AB, are:

- A third relay has been added. This is the isolation relay for the NT6X94BB card.
- The NT6X94BB card has a lower power consumption.

The NT6X95AB metering tone generator (MTG) card provides a 12- or 16-kHz sinusoidal tone for use with the NT6X94BA line card with metering. The MTG provides the metering tone for each physical ILCM drawer, and occupies slot 0 of the odd numbered ILCM drawer.

The international line cards NT6X93CA and NT6X94CA are for China. They have functionality that is identical to the NT6X93AA and NT6X94AA. The NT6X94CA has the capabilities of the NT6X93CA plus the following additional capabilities:

- battery reversal
- 16-kHz meter pulse generation for coin, PBX, and subscriber premise meter (SPM)

The NT6X93EA (line card type A - Australia) is for POTS and IBN lines.

The NT6X93DA type A and NT6X94DS type B cards are for use in Morocco. Diagnostics for the NT6X94DA type B are the same as those run for the NT6X93DA type A line card with the addition of a metering pulse test, an isolation relay test, and a battery reverse relay test.

The NT6X95AA (international metering tone card) provides the metering tone for an entire physical international LCM (ILCM) drawer. It is datafillable only in slot 0 of the odd numbered logical ILCM drawer. This ensures separation from the +48V power card.

IPE line cards

The intelligent peripheral equipment (IPE) supports the following cards for analog lines: NT8D03AB and NT8D09AB. The NT8D03AB (extended analog line card) supports 500/2500 sets without message waiting lamps. The NT8D09AB (extended message waiting line card) supports 500/2500 sets with message waiting lamps.

The NT5D11AA line card allows the IPE to interface a T1 with voicemail and voice response equipment. The operator must ensure that ports 8-15 of the second card slot are not used.

LCM line cards

For the LCM peripheral module line card, the following PECs apply:

- NT6X17AA (standard line circuit type A with cadaver)
- NT6X17AD (current limiting POTS type A line card)
- NT6X18AA and NT6X18AB (line cards type B)

The NT6X18AB card gets the +48 V supply from the NT6X23AA power converter card, which is also used to provide the +48 V for Digitone fraud prevention. The NT6X23AA card can be datafilled only for slot 0 of the odd numbered drawer. The card takes up two slots and occupies slot 16 as well as slot 0. Both slots must be vacant before the NT6X23AA card can be datafilled.

The NT6X18AA line card is the LCM version of the LM POTS type B (NT2X18AE) line card and the NT6X18AB is the LCM version of the LM POTS type B (NT2X18AD) line card. The NT6X18AB differs from NT6X18AA in that it has an additional relay to handle the +48 V used for Digitone fraud prevention.

Card NT6X93FA (extended range line card) takes up three vertical slots in an LCM drawer. The primary slot for this card is the topmost of the three slots.

The following rules must be followed when assigning an NT6X93FA card:

- The primary ERLC slot can be placed only in the odd-numbered LCM drawers. The following message is displayed at the MAP terminal if an attempt is made to datafill an ERLC in an even LCM drawer:

```
ERROR - CAN ONLY ASSIGN  6X93FA IN ODD DRAWERS
```

- The two physical slots directly below the primary NT6X93FA slot must be empty. The following message is displayed at the MAP terminal if an attempt is made to datafill an NT6X93FA card and a card occupies one or both of the two slots physically below the primary ERLC slot:

```
ERROR - THE 3 SLOTS REQUIRED ARE NOT ALL FREE
```

- If the ERLC primary slot is in the range 0 to 15 of an odd numbered drawer, then the card in the slot directly above must not be an NT6X93FA. The following message is displayed if an attempt is made to datafill an NT6X93FA card in slots 0 to 15 when the slot above is occupied by an NT6X93FA card:

```
ERROR - OCCUPIED BY A 3-SLOT 6X93FA CARD
```

The following restriction applies when assigning a non-NT6X93FA card if NT6X93FA cards are available in the DMS-100:

- A non-N6X93FA card cannot be datafilled in the two slots directly below the primary NT6X93FA slot. The following message is displayed when attempting to datafill a non-NT6X93FA card in a slot one or two rows directly below an NT6X93FA card:

```
ERROR - OCCUPIED BY A 3-SLOT 6X93FA CARD
```

The NT6X99AA (datapath bit error rate tester - two-slot) line card is used for the integrated bit error rate test (IBERT) for testing of datapaths (data units) and is not used for network or speech links in the DMS switch. An IBERT test measures the transmission quality of a data loop. A known stream of data is sent over a given loop and the reflected data received is compared with the sent data, thereby giving a measure of the transmission quality. By looping back the data at different points in the loop and measuring the transmission quality at different points,

faults that exist on the loop can be isolated. The IBERT can be used to test any type of line card that supports the TLINK protocol. This includes data units, data above voice, AIM, coax eliminator data units, and loop extender data units. The IBERT must be located in an LCM or RLCM.

If an NT6X71AA (data line card DMS-100/SL-100) is added to table LNINV, field PADGRP is forced to entry value NPDGP and field MNO is forced to entry value Y.

The NT6X71AC (CSA/UL compliant line card) has enhanced front-end loop interface protection circuitry to support 600-V power cross safety.

LCM with world line cards

The NT6X17BA type A world line card (WLC) and NT6X18BA type B WLC are software programmable POTS line cards for LCMs. The WLC parameters, such as the card's transmission and signaling characteristics, loop current limit, and automatic loss equalization, are controlled by software in the central control (CC) module. Each software template has a unique name that can be datafilled against any WLC line in table LNINV. The data contained in each template is sent to the LCM at static data download when an LCM is returned to service (RTS) or when WLC-specific datafill is changed while the LCM is in service. The template data is also used to program the WLC when the LCM line card audit detects parameter loss (card reseated) and during diagnostics.

The WLC template requires the NT6X17BA and NT6X18BA WLCs and the Extended Memory LCM processor card (6X51AB). When card code entries 6X17BA and 6X18BA are datafilled in field CARDCODE, the WLC operates as an NT6X17AC card and NT6X18AA card respectively.

The WLC Type B WLC inherently supports metering and does not require the NT7X95 Metering Tone Generator Card.

The following WLC templates are suggested for use in North America (note that the Template Name identifies the Cardcode entered in table LNINV and the Linecard identifies the physical card):

Template name	When to use	Line Card
6X17BA	POTS	NT6X17BA
6X18BA	POTS Ground/Loop Start, coin.	NT6X18BA
WL9002	Type A interface to DLCs	NT6X17BA
WL90A40	Type A DLC interface – 40 mA limit	NT6X17BA
WL902B	Type B interface to DLCs	NT6X18BA
WL1740	POTS with 40 mA current loop limit	NT6X18BA
MLTCAL	Calibration target for AT&Ts MLT	NT6X17BA

6X17BA Template Details

(Sheet 1 of 2)

Template Characteristics	6X17BA
Input Impedance	300 ohms+2.16 uF
Balance Impedance	NL: 800 ohms II (100 ohms + 50 nF)
	LD: 1650 ohms II (100 ohms + 5 nF)
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	u-law
Current Limit	75 mA
Equalization Loss	No

(Sheet 2 of 2)

Template Characteristics	6X17BA
Metering level	N/A
Metering Duration	N/A
Metering Frequency	N/A

6X18BA Template Details

Template Characteristics	6X18BA
Input Impedance	900 ohms+2.16 uF
Balance Impedance	NL: 800 ohms II (100 ohms + 50 nF)
	LD: 1650 ohms II (100 ohms II 5 nF)
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	u-law
Current Limit	75 mA
Equalization Loss	No
Metering level	N/A
Metering Duration	N/A
Metering Frequency	N/A

WL93AA Template Details

Template Characteristics	WL93AA
Input Impedance	600 ohms+2.16 uF
Balance Impedance	600 ohms II (100 ohms + 50 nF)
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	A-law
Current Limit	75 mA
Equalization Loss	No
Metering level	N/A
Metering Duration	N/A
Metering Frequency	N/A

WL93BA Template Details

(Sheet 1 of 2)

Template Characteristics	WL93BA
Input Impedance	300 ohms + (1000 ohms II 220 nF)
Balance Impedance	370 ohms + (620 ohms II 310 nF)
A-D gain at 1004Hz	–4 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law
Current Limit	75 mA

(Sheet 2 of 2)

Template Characteristics	WL93BA
Equalization Loss	No
Metering level	N/A
Metering Duration	N/A
Metering Frequency	N/A

WL93CA Template Details

Template Characteristics	WL93CA
Input Impedance	200 ohms + (680 ohms II 100 nF)
Balance Impedance	160 ohms + (780 ohms II 115 nF)
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law
Current Limit	50 mA
Equalization Loss	No
Metering level	N/A
Metering Duration	N/A
Metering Frequency	N/A

WL93DA Template Details

Template Characteristics	WL93DA
Input Impedance	600 ohms + 2.16 uF
Balance Impedance	210 ohms + (880 ohms II 150 nF)
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law
Current Limit	75 mA
Equalization Loss	No
Metering level	N/A
Metering Duration	N/A
Metering Frequency	N/A

WL93EA Template Details

(Sheet 1 of 2)

Template Characteristics	WL93EA
Input Impedance	220 ohms + (820 ohms II 120 nF)
Balance Impedance	210 ohms II + (880 ohms II 120 nF)
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	–2 dB
Off-Hook Supervision threshold	6 mA
PCM Encoding	A–law
Current Limit	75 mA

(Sheet 2 of 2)

Template Characteristics	WL93EA
Equalization Loss	No
Metering level	N/A
Metering Duration	N/A
Metering Frequency	N/A

WL94AB Template Details

Template Characteristics	WL94AB
Input Impedance	600 ohms + 2.16 uF
Balance Impedance	600 ohms II (100 ohms + 50 nF)
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law
Current Limit	75 mA
Equalization Loss	No
Metering level	2.3 Vrms
Metering Duration	148 ms
Metering Frequency	12 Khz

WL94BB Template Details

Template Characteristics	WL94BB
Input Impedance	300 ohms + (1000 ohms II 220 nF)
Balance Impedance	370 ohms + (620 ohms II 310 nF)
A-D gain at 1004Hz	–4 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law
Current Limit	75 mA
Equalization Loss	No
Metering level	2.3 Vrms
Metering Duration	100 ms
Metering Frequency	12 Khz

WL94CA Template Details

(Sheet 1 of 2)

Template Characteristics	WL94CA
Input Impedance	200 ohms + (680 ohms II 100 nF)
Balance Impedance	160 ohms + (780 ohms II 115 nF)
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law

(Sheet 2 of 2)

Template Characteristics	WL94CA
Current Limit	50 mA
Equalization Loss	No
Metering level	2.0 Vrms
Metering Duration	148 ms
Metering Frequency	16 Khz

WL94DA Template Details

Template Characteristics	WL94DA
Input Impedance	600 ohms + 2.16 uF
Balance Impedance	210 ohms + (880 ohms II 150 nF)
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law
Current Limit	75 mA
Equalization Loss	No
Metering level	2.0 Vrms
Metering Duration	100 ms
Metering Frequency	12 Khz

WL98AA Template Details

Template Characteristics	WL98AA
Input Impedance	300 ohms + (1000 ohms II 220 nF)
Balance Impedance	370 ohms + (620 ohms II 310 nF)
A-D gain at 1004Hz	–1 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law
Current Limit	75 mA
Equalization Loss	No
Metering level	N/A
Metering Duration	N/A
Metering Frequency	N/A

WL9002 Template Details

(Sheet 1 of 2)

Template Characteristics	WL9002
Input Impedance	900 ohms + 2.16 uf
Balance Impedance	900 ohms + 2.16 uf
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	u–law

(Sheet 2 of 2)

Template Characteristics	WL9002
Current Limit	75 mA
Equalization Loss	No
Metering level	N/A
Metering Duration	N/A
Metering Frequency	N/A

WL902B Template Details

Template Characteristics	WL902B
Input Impedance	900 ohms + 2.16 uf
Balance Impedance	900 ohms + 2.16 uf
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	u–law
Current Limit	75 mA
Equalization Loss	No
Metering level	N/A
Metering Duration	N/A
Metering Frequency	N/A

WL33AA Template Details

Template Characteristics	WL33AA
Input Impedance	600 ohms + 1.0 uF
Balance Impedance	150 ohms + (830 ohms II 72 nF)
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	u–law
Current Limit	85 mA
Equalization Loss	No
Metering level	N/A
Metering Duration	N/A
Metering Frequency	N/A

WLBEAL Template Details

(Sheet 1 of 2)

Template Characteristics	WLBEAL
Input Impedance	150 ohms +(830 ohms II 72 nF)
Balance Impedance	150 ohms + (830 ohms II 72 nF)
A-D gain at 1004Hz	7 and 0 dB for R and T pads
D-A gain at 1004Hz	7 and 0 dB for R and T pads
On/Off hook threshold	12 mA
PCM Encoding	A–law
Current Limiting	55 mA

(Sheet 2 of 2)

Template Characteristics	WLBEAL
Equalization Loss	No
Loop resistance	2 kohms
Battery voltage	44.5 – 53 V
Metering level, duration, frequency	Not applicable

WLBEAS Template Details

Template Characteristics	WLBEAS
Input Impedance	150 ohms + (830 ohms II 72 nF)
Balance Impedance	600 ohms + (0 ohms / 0 nF)
A-D gain at 1004Hz	7 and 0 dB for R and T pads
D-A gain at 1004Hz	7 and 0 dB for R and T pads
On/Off hook threshold	12 mA
PCM Encoding	A–law
Current Limit	55 mA
Equalization Loss	No
Loop resistance	2 kohms
Battery voltage	44.5 – 53 V
Metering level, duration, frequency	Not applicable

WLBEBL Template Details

Template Characteristics	WLBEBL
Input Impedance	150 ohms +(830 ohms II 72 nF)
Balance Impedance	150 ohms + (830 ohms II 72 nF)f
A-D gain at 1004Hz	7 and 0 dB for R and T pads
D-A gain at 1004Hz	7 and 0 dB for R and T pads
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law
Current Limit	55 mA
Equalization Loss	No
Loop resistance	2 kohms
Battery voltage	44.5 – 53 V
Metering level, duration, frequency	2.3 Vrnsm, 150 ms, 16KHz

WLBEBS Template Details

Template Characteristics	WLBEBS
Input Impedance	150 ohms + (830 ohms / 72 nF)
Balance Impedance	600 ohms + (0 ohms / 0 nF)
A-D gain at 1004Hz	7 and 0 dB for R and T pads
D-A gain at 1004Hz	7 and 0 dB for R and T pads
On/Off hook threshold	12 mA
PCM Encoding	A–law
Current Limit	55 mA
Equalization Loss	No
Loop resistance	2 kohms
Battery voltage	44.5 – 53 V
Metering level, duration frequency	2.3 Vrms, 150 ms, 16kHz

WLBRAN Template Details

(Sheet 1 of 2)

Template Characteristics	WLBRAN
Input Impedance	900 ohms
Balance Impedance	800 ohms II 50 nF
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law

(Sheet 2 of 2)

Template Characteristics	WLBRAN
Current Limit	75 mA
Equalization Loss	No
Metering Level	N/A
Metering Duration	N/A
Metering Frequency	N/A

WLBRAL Template Details

Template Characteristics	WLBRAL
Input Impedance	900 ohms
Balance Impedance	300 ohms + (1650 ohms II 5 nF)
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
On/Off hook threshold	12 mA
PCM Encoding	A–law
Current Limit	75 mA
Equalization Loss	No
Metering Level	N/A
Metering Duration	N/A
Metering Frequency	N/A

WLBRAC Template Details

Template Characteristics	WLBRAC
Input Impedance	900 ohms
Balance Impedance	900 ohms
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law
Current Limit	75 mA
Equalization Loss	No
Metering Level	N/A
Metering Duration	N/A
Metering Frequency	N/A

WLBRBN Template Details

(Sheet 1 of 2)

Template Characteristics	WLBRBN
Input Impedance	900 ohms
Balance Impedance	800 ohms II 50 nF)
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
On/Off hook threshold	12 mA
PCM Encoding	A–law
Current Limit	75 mA

(Sheet 2 of 2)

Template Characteristics	WLBRBN
Equalization Loss	No
Metering Level	2.3 Vrms
Metering Duration	148 ms
Metering Frequency	12 KHz

WLBRBL Template Details

Template Characteristics	WLBRBL
Input Impedance	900 ohms
Balance Impedance	300 ohms + (1650 ohms II 5 nF)
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law
Current Limit	75 mA
Equalization Loss	No
Metering Level	2.3 Vrms
Metering Duration	148 ms
Metering Frequency	12 KHz

WLBRBC Template Details

Template Characteristics	WLBRBC
Input Impedance	900 ohms
Balance Impedance	900 ohms
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
On/Off hook threshold	12 mA
PCM Encoding	A–law
Current Limit	75 mA
Equalization Loss	No
Metering Level	2.3 Vrms
Metering Duration	148 ms
Metering Frequency	12 KHz

WLITAX Template Details

(Sheet 1 of 2)

Template Characteristics	WLITAX
Input Impedance	180 ohms + (630 ohms II 60 nF)
Balance Impedance	0 ohms + (750 ohms / 18 nF)
A-D gain at 1004Hz	0 dB (7 and 0 dB for R and T pads)
D-A gain at 1004Hz	–7 dB (7 and 0 dB for R and T pads)
On/Off Hook threshold	12 mA
PCM Encoding	A–law

(Sheet 2 of 2)

Template Characteristics	WLITAX
Current Limit	55 mA
Equalization Loss	No
Loop Resistance	1880 ohms
Battery Voltage	44 – 52 V
Metering level, duration, frequency	Not applicable

WLITBX Template Details

Template Characteristics	WLITBX
Input Impedance	180 ohms + (630 ohms // 60 nF)
Balance Impedance	0 ohms + (750 ohms / 18 nF)
A-D gain at 1004Hz	0 dB (7 and 0 dB for R and T pads)
D-A gain at 1004Hz	–7 dB (7 and 0 dB for R and T pads)
On/Off hook threshold	12 mA
PCM Encoding	A–law
Current Limit	55 mA
Equalization Loss	No
Loop Resistance	1880 ohms
Battery voltage	44 – 52 V
Metering level, duration frequency	2.3 Vrms, 125 ms, 12KHz

WLNLAL Template Details

Template Characteristics	WLNLAL
Input Impedance	150 ohms + (830 ohms II 72 nF)
Balance Impedance	600 ohms + (830 ohms II 72 nF)
A-D gain at 1004Hz	7 and 0 dB for R and T pads
D-A gain at 1004Hz	7 and 0 dB for R and T pads
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law
Current Limit	55 mA
Equalization Loss	No
Loop Resistance	2 kohms
Battery Voltage	44.5 – 53 V
Metering level, duration frequency	Not applicable

WLNLAS Template Details

(Sheet 1 of 2)

Template Characteristics	WLNLAS
Input Impedance	150 ohms + (830 ohms II 72 nF)
Balance Impedance	600 ohms + (0 ohms / 0 nF)
A-D gain at 1004Hz	7 and 0 dB for R and T pads
D-A gain at 1004Hz	7 and 0 dB for R and T pads
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law

(Sheet 2 of 2)

Template Characteristics	WLNLAS
Current Limiting	55 mA
Equalization Loss	No
Loop Resistance	2 kohms
Battery Voltage	44.5 – 53 V
Metering level, duration, frequency	Not applicable

WLPOAX Template Details

Template Characteristics	WLPOAX
Input Impedance	600 ohms + 2.16 uF
Balance Impedance	600 ohms II + (100 ohms + 50 nF)
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law
Current Limiting	55 mA
Equalization Loss	No
Metering Level	N/A
Metering Duration	N/A
Metering Frequency	N/A

WLPOBX Template Details

Template Characteristics	WLPOBX
Input Impedance	600 ohms + 2.16 uF
Balance Impedance	600 ohms II (100 ohms + 50 nF)
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law
Current Limit	55 mA
Equalization Loss	No
Metering Level	2.3 Vrms
Metering Duration	125 ms
Metering Frequency	16 KHz

WLPEAX Template Details

(Sheet 1 of 2)

Template Characteristics	WLPEAX
Input Impedance	600 ohms + 2.16 uF
Balance Impedance	600 ohms II (100 ohms + 50 nF)
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law
Current Limit	75 mA

(Sheet 2 of 2)

Template Characteristics	WLPEAX
Equalization Loss	No
Metering Level	N/A
Metering Duration	N/A
Metering Frequency	N/A

WLPEBX Template Details

Template Characteristics	WLPEBX
Input Impedance	600 ohms + 2.16 uF
Balance Impedance	600 ohms II (100 ohms + 50 nF)
A-D gain at 1004Hz	0 dB
D-A gain at 1004Hz	0 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law
Current Limit	75 mA
Equalization Loss	No
Metering Level	2.3 Vrms
Metering Duration	125 ms
Metering Frequency	12 Khz

UKPSTN Short Loop Template Details

Template Characteristics	UKPSTN
Input Impedance	As per BTNR 306 specification
Balance Impedance	As per BTNR 306 specification
A-D gain at 1004Hz	–1 dB
D-A gain at 1004Hz	–6 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law
Current Limit	40 mA
Equalization Loss	Yes
Metering Level	N/A
Metering Duration	N/A
Metering Frequency	N/A

UKPTN1 Long Line Heavy Gauge Template Details

(Sheet 1 of 2)

Template Characteristics	UKPTN1
Input Impedance	As per BTNR 306 specification
Balance Impedance	As per BTNR 306 specification
A-D gain at 1004Hz	–1 dB
D-A gain at 1004Hz	–6 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law
Current Limit	40 mA

(Sheet 2 of 2)

Template Characteristics	UKPTN1
Equalization Loss	Yes
Metering Level	N/A
Metering Duration	N/A
Metering Frequency	N/A

UKPTN2 Long Line Small Gauge Template Details

Template Characteristics	UKPTN2
Input Impedance	As per BTNR 306 specification
Balance Impedance	As per BTNR 306 specification
A-D gain at 1004Hz	–1 dB
D-A gain at 1004Hz	–6 dB
Off-Hook Supervision threshold	12 mA
PCM Encoding	A–law
Current Limit	40 mA
Equalization Loss	Yes
Metering Level	N/A
Metering Duration	N/A
Metering Frequency	N/A

LCM with ISDN line cards

The NTBX04AA is the optical ISDN line card (OISLC) that is used in the LCMI equipped with optical line drawers. Due to power supply and heat dissipation requirements, each optical line drawer can support a maximum of 64 OISLCs.

Only the card code BX04AA is valid on an LCMI. All other card codes are blocked from datafill. When going to release NA002, delete all existing tuples created prior to NA002 relating to the LCMI and not having the entry BX04AA in field CARDCODE.

The NTXBX25AB is the ISDN ISLC-1C line card used in the LCMI drawer. The ISLC-1C can be mixed with the ISLC-1B line cards in the same drawer. When used in the LCMI drawer, a maximum of 20 ISLC-1C cards can be put into each physical drawer because of heat dissipation requirements, even though the drawer can house 24 ISLC-1C cards.

The NTX26AA (ISDN S/T line card) provides the ISDN basic rate access (2B+D) S/T-bus network interface. It is used in the LCMI and LCME drawer and occupies two slots.

The BX26AA card can be datafilled for lines on LCMIs that connect to a PRCC with an ISP.

The NTBX27AA (2B1Q U-interface ISDN line card) is used in the LCME drawer as well as the LCM, RLCM, OPM, or OPAC's ILDR.

The coin line card is a large card supporting four subscribers.

Line module line cards
Line card 0 in line drawer 0 on each line module must be equipped with an NT2X17AB, AC, or AD line card. This card is required for diagnostics and cannot be assigned to a station.

PBX line cards
Coin first ground start lines must have a card with product engineering code (PEC) NT2X18AD or AE. Private branch exchange (PBX) ground start lines must have a card with a PEC of NT2X18AC, AD, or AE. If subscriber telephones are sensitive to ringing voltage polarity, a type B line card must be used (for example, PEC NT2X18).

For PBXes equipped with the Message Center feature, use PEC NT6X19AA message waiting line cards and PEC NT6X20AA message waiting converter cards. The NT6X20AA card occupies two card slots, slot 0 and slot 16 of the odd-numbered drawers.

The NT6X20AA card is assigned to slot 0 of the odd-numbered drawers. Both slots 0 and 16 must be vacant before they can be datafilled.

The NT6X98AA line card provides the transmission and signaling nterface required between BT700 series telephone sets and the SL-100 digital PBX.

P-phone line cards

For P-phone integrated line cards, use PECs NT6X21AA (replaces NT6X58AA) and NT6X21AD.

The NT6X21BC (A-law international P-phone line card) is used in the international line concentrating module (ICLM), international remote line concentrating (IRCLM), and very small remote (VSR).

RCS line cards

The remote concentrator SLC-96 (RCS) supports the following cards:

- single-part (SCD203)
- multiparty (SCD221)
- coin (SCD233)
- frequency selective ringing (SCDFSR)
- special plain ordinary telephone service, SPOTS(SCD271)
- special-service (NAILUP)

Datafill SCD222 900-ohm and SCD252 1500-ohm FSR cards as SCDFSR for frequency selective ringing. Multiparty cards cannot be used in an RCS that is set up for frequency selective ringing.

The SPOTS card can be used for single-party or special services. If used for special services, it must be datafilled as NAILUP. Prior to BCS35, both circuits in the SPOTS card were required to be datafilled as either loop start or ground start. SPOTS cards may now be datafilled with split service (for example, field GND can be set to Y for one circuit and to N for the other).

Datafilling SPOTS cards in a mode III RCS is not recommended because equipment in mode III multiplexes 48 time slots onto two DS-1 lines and expects only single-circuit cards. If SPOTS cards are datafilled, only even- numbered circuits for the cards can be used.

RCT line cards

The remote concentrator terminal (RCT) supports the following cards (the card code datafill appears in parentheses:

- single-party remote (QPP405)
- universal remote (QPP407)
- frequency selective remote (QPP440 and QPP541))
- superimposed remote, four lines per card(QPP445)
- universal coin remote(QPP409)

RCU line cards

The remote carrier urban (RCU) supports the line cards and special-service channel units listed below. The card code datafill appears in parenthesis:

- POTS (3A06AA)
- EPOTS (3A06BA)
- FSR (3A07AA)
- EFSR (3A07BA)
- MPDR (3A19AB)
- FXBS (3A12AB)
- FXBO (3A13AB/AC)
- coin (3A27AA)
- FXB voice frequency (7A20AA, 7A25AA, 7A26AA, 7A27AA))
- duplex voice frequency (7A21AA)
- signaling module (7A22AA)
- office channel unit data port (7A23AA)
- ISDN (7A31AA)
- RCU MBS (7A33AA)
- dial pulse originating with extended range, QPP354E1(SSM2WV)
- dial pulse terminating with extended range, QPP356G1(SSM2WV)
- two-wire foreign exchange station end with gain transfer, QPP501B,(SSM2WV)
- two-wire foreign exchange office end with gain transfer, QPP502B,(SSM2WV)
- four-wire E&M with pulse link repeater, QPP537B,(SSM4WV)

- two-wire E&M 600-ohm, QPP538C,(SSM4WV)
- four-wire FXS, QPP473A,(SSM2WV)
- four-wire FXO, QPP474A,(SSM4WV)
- four-wire ETO, QPP475A,(SSM4WV)
- four-wire DX, QPP476B,(SSM4WV)
- two-wire DX, QPP477A,(SSM2WV)
- 2.4 Kbit/s OCU, QPP550A,(SSM4WD)
- 4.8 Kbits/s OCU, QPP476B,(SSM4WD)
- 9.6 kbit/s OCU, QPP552A,(SSM4WD)
- 56 kbit/s OCU, QPP553A (SSM4WD)
- DS-0/DP D50 level dataport, QPP554A (SSM4WD)
- 56 kbit/s OCU without error correction, QPP575A (SSM4WD)
- datapath extension (QPP628)

RCU special-service line cards
Special services for the RCU can be provided using the NT7A20AA, NT7A21AA, NT7A22, and NT7A23 cards, and the NT3A11BA (special services line card carrier). By using this configuration, the special services module (SSM) is not required.

The existing FXB line card carrier (NT3A11AB) can house only the existing two-wire FXB line cards (NT3A12 and NT3A13), while the BCS30 special services line card carrier (NT3A11BA) can house both the BCS30 four-wire special service line cards and the existing two-wire special service line cards.

The NT7A20AA card provides FX and equalized transmission services. The NT7A21AA card provides three services: duplex, transmission only, and equalized transmission only.

The NT7A22AA card must be paired with an NT7A20AA or NT7A21AA card. When paired with one of these cards, E&M, PLR, and tandem signaling is provided. To configure these combinations, an NT7A20AA or NT7A21AA card is inserted in positions 1, 3, or both of the carrier, and a companion NT7A22AA card is inserted in positions 2, 4, or both of the carrier.

The NT7A23 card provides digital data services.

The NT7A20AA card is for four-wire FXS, FXO, ETO, TO, EM, PLR, or TANDEM. The NT7A21AA card is for four wire DX, ETO, TO, EM, PLR,

or TANDEM. The NT7A22AA card is for four-wire signaling. The NT7A23AA card is for four-wire OCU.

The NT7A33AA card is used for RCU MBS lines using D-channel signaling. The NT7A31AA card is used for ISDN lines.

For more information on special service line cards for the RCU, refer to the *Subscriber Carrier Module-100 Urban Maintenance Manual*, 297-8241-550.

RDT line cards

Card codes RDTLS and RDTLSG are used for POTS lines. RDT line tuples datafilled in table LNINV with either RDTLS or RDTLSG in field CARDCODE cannot have any corresponding tuples datafilled in the KSET tables. Corresponding tuples can be datafilled in tables IBNLINES and LENLINES.

Card code RDTEBS is used for an RDT EBS. The table VARTYPE field in RDTINV must be NTPROP for a tuple datafilled in table LNINV with card code equal to RDTEBS.

Card codes RDTLS, RDTLSG, RDTCON, RDTEBS, RDTISD, and RDTLRB are only valid for an RFTRDT.

RSCS line cards
The DAV line cards, NT6X87AB, NT6X87BA, NT6X88AB, and NT6X88BA, incorporate voice (POTS or EBS) and data transmission circuits on a single card. Cards NT6X87AB and NT6X87AB, NT6X88AB (four-slot) can only be assigned to lower slots (0 to 15) of even-numbered drawers and upper slots (16 to 31) of odd-numbered drawers.

VLCM line cards
The CSV VLCMs and Proximity-I VLCMs do not use the existing LCM line cards. Therefore, card codes VLCMCD and VLCMPR are used to differentiate a VLCM line. The CSV VLCM uses card code VLCMCD and the Proximity-I VLCM uses card code VLCMPR.

Lines The ISDN line concentrating module (LCMI) supports both POTS and MDC lines. LCMIs can support ISDN, data unit, IBERT, Meridian business set (MBS), and POTS/MDC lines.

Note: ISDN and non-ISDN line types cannot share the same drawer.

Each physical line drawer has three logical drawers. Each logical drawer can be equipped with a maximum 16 POTS/MDC lines or 8 ISDN lines.

Therefore, each physical drawer can house 24 ISDN lines. Due to heat dissipation requirements, the number of ISDN line cards must be limited to a maximum of 20.

MDPR lines cannot be datafilled on an RCU that employs FSR, nor can FSR lines be datafilled on an RCU that employs coded ringing.

On an RCU, line subgroup 11, circuits 16 to 31 must stay unequipped.

The operating company can datafill lines that are not two-or four-wire lines for an RCU in table LNINV if field STATUS is set to UNEQUIP. This ensures that alarms are not raised. The operating company can also use field UNEQUIP to indicate that actual line hardware is not present in the RCU.

When the operating company decides to add line hardware and assign a directory number, the Service Order System (SERVORD) must be used and the line must be immediately set to WORKING. Operating company personnel can also use the table editor and change field STATUS to hardware assigned/software unequipped (HASU).

Coin lines sharing the same slot must have the same value for field GND.

The maximum population of each shared slot may contain one of the following combinations:

- four coin, two-wire (6X12 or 6X13) lines
- four four-wire ISDN lines
- four MBSB lines

The circuit number of LENs for coin line cards, 2WFXB LCs, and 4WSSLCs can assume the values of 0, 2, 4, and 6 as of BCS34. Prior to BCS34, the old values of 0, 1, 2, and 3 apply.

Line shelves 1 and 2, and control shelf 2 are optional on an RCU. These shelves can support subscriber lines. For these lines to be datafilled in table LNINV, the associated shelf must be datafilled as equipped in table RCUNV.

When provisioning remote fiber terminal (RFT) lines, line datafill in table LNINV are automatically added or deleted through SERVORD. If line

datafill does not exist, the SERVORD transaction adds the datafill based on user input, office parameter values, and default values. If line datafill exists, the SERVORD transaction alters the data to conform to the service requested. This auto-create capability is an option that is enabled or disabled through parameter RDT_SO_AUTOCREATE_LNINV.

Note: The RFT is also known as the remote digital terminal.

From the time that an ILDR line is defined in table LCMDRINV, its state is set to WORKING.

Lines on generic access notes (AN) connected to the Global Peripheral Platform (GPP) If a channel associated (CAS) AN is datafilled in table GPPTRNSL, the GPP P-side links to that AN are allocated when a line on the AN is datafilled in table LNINV. On GPPs with CAS interfaces, a dedicated P-side channel exists for each line attached to the AN. The non-concentrating channels are mapped one to one to a physical line on the AN. P-side time slot1 is mapped to card slot 1.

The location of the PCM30 channel in CAS interfaces is identified by the following values:

- group number
- line carrier number
- channel number

For CAS non-concentrating interfaces, the line equipment number (LEN) fields represent the following three subfields:

- Subfield GRP represents one of six PCM30 quad carrier cards (NTMX87) the line is assigned to.
- Subfield LINE CARRIER represents one of eight carriers on dual carrier packets (NTMX82) that are located on the NTMX87 card.
- Subfield CHANNEL represents 1 of 32 channels on a PCM30 carrier.

CAS line card codes are datafilled only on slots 1–15 and 17–31 of each PCM30 carrier. Slot 0 is reserved for maintenance, and slot 16 is reserved for ABCD signaling on each carrier. Different types of line card codes can be defined on the same carrier.

On V5.2 interfaces the number of lines datafilled in table LININV must not exceed field MAXLINES in table GPPTRNSL.

V5.2 interfaces use bearer channel control (BCC) to allocate the PCM30 carrier channels needed. There is no direct relationship of lines to physical PCM30 channels. During BCC allocation, the LAPV5 virtual address of a line is sent to the AN on the BCC C-channel. The AN must be datafilled with the same line information as the DMS switch for correct call processing.

For V5.2 concentrating interfaces, field LEN represents the following three subfields:

- Subfield UNIT represents one of ten possible ANs connected to the GPP.
- Subfield LAYER 3 ADDRESS 1 represents the link access protocol for V5.2 (LAPV5) virtual upper address (thousands and hundreds digits) assigned to the line (range is 0 to 20).
- Subfield LAYER 3 ADDRESSw represents LAPV5 virtual lower address (tens and units) assigned to the line (range is 0 to 99).

POTS lines on an AN are datafilled from zero to a maximum of 2047. Table control insures that adding a V5.2 line in table LNINV does not exceed the value in field MAXLINES in table GPPTRNSL. Table control checks when adding a CAS line to insure the number of lines on the GPP does not exceed 6400.

Error messages ISDN lines on an LCMI and an LCME connect to PRCCs equipped with an ISDN signaling preprocessor (ISP). Only the LEN is used to determine the location of the line card. Using the LEN, table control determines the extended multiprocessor system (XMS)-based PM (XPM) onto which the LCM is attached.

If the following reply appears when a new TDM connection is either added or deleted, this s due to the tuple change on a line of an LCME or LCMI under reconfiguration.

```
NO CHANGE TO TDM CONNECTION IS ALLOWED DURING
RECONFIGURATION OF LCME/LCMI #
```

The tuple change must be attempted again when the reconfiguration is finished.

If an attempt is made to delete a LEN that is assigned as a DRTU call back path, the following error message is displayed:

```
THIS LEN HAS BEEN ASSIGNED AS THE DRTU CALL BACK LEN
```

If the LEN of the tuple is an RDT LEN and the card code is not RDTCON, RDTLS, RDTLSG, RDTISD, or RDTEBS, the following error message is displayed:

```
LINE CARD SPECIFIED NOT VALID FOR AN IDT
```

If the card code is RDTCON, RDTLS, RDTLSG, RDTISD, or RDTEBS and the LEN is not an RDT LEN, the following error message is displayed:

```
LINE CARD SPECIFIED NOT VALID FOR AN <peripheral
name>
```

If the card code is RDTEBS and the RDT is not NT proprietary, the following error message is displayed:

```
INVALID CARD CODE CARD CODE MUST BE {RDTCON, RDTLS,
RDTLSG, RDTISD}
```

The LEN help prompt is displayed for the following errors:

```
The value entered for field SHELF is smaller than 2.

The value entered for field SHELF is larger than the
range set in table RDTINV

The value entered for field SLOT is smaller than 1.

The value entered for field SLOT is larger than the
range set in table RDTINV.

The value entered for field SLOT is larger than the
range set in table RDTINV.
```

If an attempt is made to assign a LEN in table LENLINES that is already assigned to card type of SSLCC and a field FCN value of TN, the following error message is displayed.

SPECIAL SERVICES UNITS CANNOT BE DATAFILLED IN LENLINES

Note: This is not true for 3A12AB cards.

If the card code is other than 7A20AA, 7A21AA, 7A22AA, 7A23AA, 3A12AB, 3A13AB, or 3A13AC and the card type is SSLCC, the following error message is displayed:

```
THE CARDCODE CANNOT HAVE THE SPECIFIED FCN
```

If the card code is 7A23AA and entry n field FCN is not SM, the following error message is displayed:

```
THE CARDCODE CAN ONLY HAVE AN FCN OF SM
```

If the entry in field FCN is EM, PLR, or TANDEM and the LEN is on an odd-numbered circuit, the following error message is displayed:

```
THE LEN MUST BE ON AN EVEN CIRCUIT FOR THIS CARDCODE
```

If the entry in field FCN is EM, PLR, or TANDEM and the LEN-1 does not have an entry in field FCN equal to SM, the following error message is displayed:

```
THE NEXT LEN MUST HAVE AN FCN OF SM
```

If the card code is 7A22AA and the LEN is on an even circuit, the following error message is displayed:

```
THE LEN MUST BE ON AN ODD CIRCUIT FOR THIS CARDCODE
```

If the entry in field FCN is SM and the preceding entry is still EM, PLR, or TANDEM, the following error message is displayed.

```
THE PRECEDING EM, PLR, OR TANDEM CARD MUST BE DELETED
FRST OR PROVISIONED AS OUT OF SERVICE (INSVC = N)
```

If the card code is 7A23AA and the entry in field FCN is not OCUDP, the following error message is displayed:

```
THE CARDCODE CAN ONLY HAVE AN FCN OF OCUDP
```

If the card code is 3A12AB and the entry for field FCN is not 2WFXO, the following error message is displayed:

```
THE CARDCODE CONA ONLY HAVE AN FCN OF FXO
```

If an attempt is made to change field FCN through a change (CHA) command, the following error message is displayed:

```
THE FCN CANNOT BE CHANGED
```

If the card code s 7A20AA, 7A21AA, or 7A23AA and card type is not SSLCC, the following error message is displayed:

```
THE CARDCODE MUST HAVE A CARDTYPE OF SSLCC
```

If the card code is not 7A20AA, 7A21AA,7A22AA, 7A23AA, 3A12AB, 3A13AB, or 3A13AC and the card type is ISLCC, the following error message is displayed:

```
THE CARDCODE CANNOT HAVE A CARDTYPE OF ISLCC
```

If the card code s 7A20AA, 7A21AA, 7A22AA, or 7A23AA and the card type is not SSLCC or ISLCC, the following error message is displayed:

If the card code is 7A33AA or 7A31AA and the SMU does not have an ISP provisioned in table LTCINV, the following error message is displayed:

```
THE CARDCIDE REQUIRES AN ISP ON THE SMU
```

If the card code is 7A31AA or 7A33AA and the card type is not NIL, the following error message is displayed:

```
THE CARDCODE MUST HAVE A CARDTYPE OF NIL
```

The ISDN and RCU MBS card codes cannot be changed. An attempt to do this results in the following error message:

```
RCU 7A31AA OR 7A33AA CARDCODES CANNOT BE CHANGED
```

With a card code entry value of 3A12AB, 3A13AB, or 3A13AC, the card type cannot be changed from SSLCC or ISLCC to NIL. Any attempt to do this results in the following error message:

```
THE CARDTYPE CANNOT BE CHANGED FROM SSLCC OR ISLCC TO
NIL
```

An MBS line cannot be changed to HASU from WORKING unless the line state is LMB or INB. An attempt to do so results in the following error message:

```
LINE CANNOT BE CHANGED TO HASU IF THE LINE IS NOT INB
OR LMB
```

An MBS line cannot be deleted from WORKING unless the line state is LMB or INB. An attempt to do so results in the following error message:

```
LINE CANNOT BE DELETED F THE LINE IS NOT INB OR LMB
```

The card type cannot be changed from ISLCC to any other card type. An attempt to do this results in the following error message.

```
CANNOT CHANGE CARD TYPE
```

If an ISDN or MBS line is datafilled, then only an ISDN, MBS, or SM (7A22AA) card can be provisioned in the last card position in the same ISLCC. An attempt to do otherwise results in the following error message:

```
ONLY THE SDN/MBS/SM/E2W LINE CARDS CAN BE IN THE LAST
CARD POSITION AND THE LAST CIRCUIT IN THE LINE CARD
CARRIER CANNOT BE ASSIGNED IF AN ISDN OR MBS LINE IS
PROVISIONED ON THE LINE CARD CARRIER
```

If an ISDN or MBS line Is datafilled on an ISLCC, where a two-wire or four-wire card (other than 7A22AA) is provisioned in the last card position in the same ISLCC, the following error message is displayed:

```
ISDN OR MBS CANNOT BE ADDED IF THE LAST CARD POSITION
OF THE LINE CARD CARRIER HAS A NON-SM/E2W SPECIAL
SERVICES CARD PROVISONED OR LAST CIRCUIT IN THE LINE
CARD CARRIER IS ASSIGNED
```

The card type check error message is:

```
CARDCODE/CARDTYPE IS NOT COMPATIBLE WITH
CARDCODE/CARDTYPE OF EXISTING LINES IN LINE CARRIER
```

The LEN check error message is:

```
GND IS NOT SUPPORTED BY THIS CARDCODE/FUNC
```

If the entry in field CARDCODE is one of 7A25AA, 7A26AA, or 7A27AA, then field CARDTYPE must be datafilled as either SSLCCX or ISLCC. Otherwise, the following error message is displayed:

```
THE CARDCODE CANNOT HAVE THE SPECIFIED FCN
```

If the odd and even number of the circuit is not contained within the same card code, the following error message is displayed:

```
EVEN AND ODD LEN MUST HAVE THE SAME CARDCODE
```

If the entry in field CARDCODE is one of the 7A20AA or 7A21AA, the value for field FCN is either EM, PLR, or TANDEM, and the card is not

placed as the first or third card in the carrier, then the following error message is displayed:

```
THE LEN MUST BE THE 1ST OR 3RD CARD IN THE CARRIER
```

The error message below will be displayed if the following three conditions are met:

- the entry in field CARDCODE is 7A22AA
- the entry in field FCN is SM
- the card is not the second or fourth card in the carrier

```
THE LEN MUST BE THE 2ND OR 4TH CARD IN THE CARRIER
```

If an attempt is made to change field GND to Y when the entry in field CARDCode is 7A25AA and the COD is datafilled for the line, the following error message is displayed:

```
MUST REMOVE COD OPTON FROM THIS LNE BEFORE CHANGNG
GND FIELD TO Y
```

If a new TDM connection is required to be added or deleted due to a tuple change on a line of an RCU under reconfiguration, the following error message is displayed.

```
NO CHANGE TO TDM CONNECTION S ALLOWED DURING
RECONFIGURATION OF RCU
```

If an attempt is made to datafill a LEN with an invalid line card code on an LCMI, the following error message is displayed:

```
LINE CARD SPECIFIED NOT VALID FOR AN LCM

THE LCMI ONLY SUPPORTS BX04AA LINE CARD
```

If the Talk Battery Alarm feature is enabled, the following warning message is displayed prior to the regular confirmation prompt when one of the following occurs:

- the last available WCL on an LCM shelf is deleted from table LNINV using the DEL command
- the last available WLC is changed to a non-WLC pack code using the CHA command

```
Deleting the last available WLC from the LCM shelf.
Loss of Talk Battery cannot be detected on the LCM
shelf. A minor alarm and ISTb reason will be raised
for the LCM shelf.
```

In the above warning message, available WLC refers to a WLC in either the HASU ore InSV state that can be used to perform the talk battery audit/test.

If the Talk Battery Alarm feature is enabled and one of the following conditions applies, the following notification message is displayed:

- the first available WLC is added to an LCM shelf using the ADD command
- the first available WLC is created by changing an existing non-WLC to a WLC pack code using the CHA command

```
Adding the first available WLC to the LCM shelf. Loss
of Talk Battery can now be detected on the LCM shelf.
The minor alarms and ISTb reason will be cleared for
the LCM shelf.
```

When attempting to add or change a line to an ILDR with cardcode other than BX27, the following error message is displayed:

```
Line card specified not valid for an ILDR.
```

When attempting to add or change a line to an ILDR with the card number not within the range of 0 through 13, the following error message is displayed:

```
Line card number must be 0-13 for an ILDR.
```

When attempting to define an LDR line with status other than WORKING, the following warning message is displayed:

```
*WARNING* line status changed to WORKING.
```

UK002 error messages If more than eight templates are assigned to an LCM, the following error message is displayed:

```
Can not assign more than 8 templates per LCM. Current
supported templates are: WL93AA, WL93BA, WL93CA,
WL93EA, WL98AA, WL33AA, and WL17AC.
```

Miscellaneous Table LNINV must be restricted for some UK telephone companies, as it details the pad group that each line belongs to.

Table history APC009

Added the VLCMPR and VLCMCD card codes.

EUR008

Added the following template names to field CARDCODE for Belgium, Netherland, and Italian WLC templates:

- WLBEAL
- WLBEAS
- WLBEBL
- WLBEBS
- WLITAX
- WLITBX
- WLNLAL
- WLNLAS
- WLNLBL
- WLNLBS

NA008

Removed the information under the “Additional datafill information” section that directs operating company personnel to not set the STATUS field to WORKING for SDN lines served from an RDT with card code of RDTISD. The RDT ISDN line must be set to WORKING to operate properly.

Added information to support the integrated channel bank n fields LEN, CARDCODE, and CARDINFO.

NA007

Added card code for the Nortel 1-Meg Modem Service on LCM line cards EX17AA and EX17BA.

Added datafill sequence information for table LCMDRINV.

Added new restrictions as a result of the introduction of the ILDR.

EUR006

Added new line card entry, V5BRI, to field CARDCODE in table LNINV.

APC07

Added option WL94AB to field CARDCODE in table LNINV.

APC06

Added restrictions to datafill when field MEMSIZE in table LCMINV has a value of 4M 4M and example datafill, for Japan only. The only acceptable card codes supported are 6X21AA, AB, AC, AD, and BC. All other card codes are rejected with an appropriate message.

APC05.1

Added the following line card types which are only valid for lines connected to generic access nodes (AN) attached to the Global Peripheral Platform (GPP):

- T1ERTH
- T1LOOP
- V5LOOP

NA005

The 6X93AA PEC was added in field CARDCODE.

The following changes were made to table LNINV for feature AD7656. These changes apply to MSL100 software loads only:

- Added a description of a new line-side interface card for the IPE under “Supplementary information.” Reorganized table LNINV.
- Added the following PECs as options in field CARDCODE:
  - 8D02CC
  - 8D02EA
  - 5D11AA

NA004

Added error message information in accordance with feature AF5912, Talk Battery Alarm.

UK002

The following changes were made to table LNINV:

- Added DC5A and DC5ADD entries to field CARDCODE.
- Added WL98AA entry to field CARDCODE.

- For the release BCS33, deleted value WL17AC (from field CARDCODE) was added.
- Added error code message: `Can not assign more than 8 templates per LCM. Currently supported templates are: WL93AA, WL93BA, WL93CA, WL93DA, WL93EA, LW98AA, and WL17AC.`

NA002

The following changes were made to table LNINV:

- Added a datafill explanation for the BX04AA entry in field CARDCODE.
- Added LCMI-related card code (BX04AA) datafill information for field CARDCODE. Added LCMI-related card code restriction for existing LNINV tuples.
- Added error code message `LCMI supports only BX0rAA line card`.
- Added WL01AX, WL01BX, WL1740, and WL9A40 to field CARDCODE (World Line Card templates).
- Added the required features for WLC templates.
- Added Type B's WLC support of metering, which explains why it does not require the NT6X95 Metering Tone Generator card.
- Added a note to the "Lines" section describing how to use SERVORD to add or delete datafill in table LNINV when provisioning remote fiber terminal (RFT) lines.
- Deleted values WL17AC and WL18AA from field CARDCODE. These values are replaced by values 6X17BA and 6X18BA, respectively. This change was made in accordance with PRS BX26823.

BCS36

The following changes were made to table LNNV:

- Revised reference to SPOTS cards to specify that the DMS switch allows these cards to have split service.
- Added error code message (for changes to TDM connections during RCU configuration).
- Added the following template names to field CARDCODE (WLC templates):
  - WL33AA
  - WLBRAN
  - WLBRAL
  - WLBRAC
  - WLBRBN
  - WLBRBL
  - WLBRBC
  - WLPEAX
  - WLPEBX
  - WLPOAX
  - WLPOBX

LTI hardware description

This chapter contains descriptions of the NT5D11 card.

In this chapter, you will find the following information:

- functional description of the card
- information about the features of the card and technical information about the features
- technical data, such as physical characteristics and environmental conditions

NT5D11AA description

The NT5D11AA Line Side T-1 Interface (LTI) card is an intelligent peripheral equipment (IPE) line card that interfaces with a T-1 link, carrying 24 channels to the SL-100 switch.

Location

The LTI card can be installed in either the NT8D37 IPE module (up to 8 cards), or the NT8D11 CE/PE module (up to 5 cards). This card occupies 2 card slots in the IPE shelf, utilizing 16 channels on slot 1 and 8 channels on slot 2.

Functional description

The LTI card emulates an analog line card to the SL-100 system software. While other peripheral equipment circuit cards connect directly to digital or analog terminal equipment, the LTI card connects to T-1 compatible terminal equipment through a T-1 link.

Signaling

Signaling data is information directly related to the operation of each analog channel. Signaling commands include the following:

- Off-hook/on-hook
- hook flash
- ringing signal on/off
- dial pulse digit collection

The signaling and control circuits on the LTI card establish, supervise, and take down call connections. These circuits work with the system controller to operate the T-1 line interface circuit during calls. The circuits receive outgoing call signaling messages from the controller and return incoming call status information to the controller over the DS-30X network loop. The Mux/Sequencer circuit steers each DS-30X time slot into the correct T-1 time slot.

Table 1 shows the pin assignments from the I/O panel relating to the pin assignments of the LTI cable (NT5D13AA), and Figure Figure , “NT5D11AA pin outs,” on page -142 shows how to connect the pins from the I/O panel. The custom cable consists of a 25-pair amphenol connector on one end that plugs into the I/O panel. The other end has a DB15 female connector that plugs into the T-1 line, a DB9 male connector that plugs into an external alarm system, a DB9 female connector and a second DB9 male connector that can plug into the HMI or the next DB9 connector in sequence, depending on your daisy-chaining arrangement.

Backplane pinouts (Sheet 1 of 2)

I/O panel connector pin	Signal	Cable conector	Cable connector pin
1	T-1 tip receive data	DB15 female to T-1	11
26	T-1 ring receive data	DB15 female to T-1	3
2	T-1 tip transmit data	DB15 female to T-1	1
27	T-1 ring transmit data	DB15 female to T-1	9

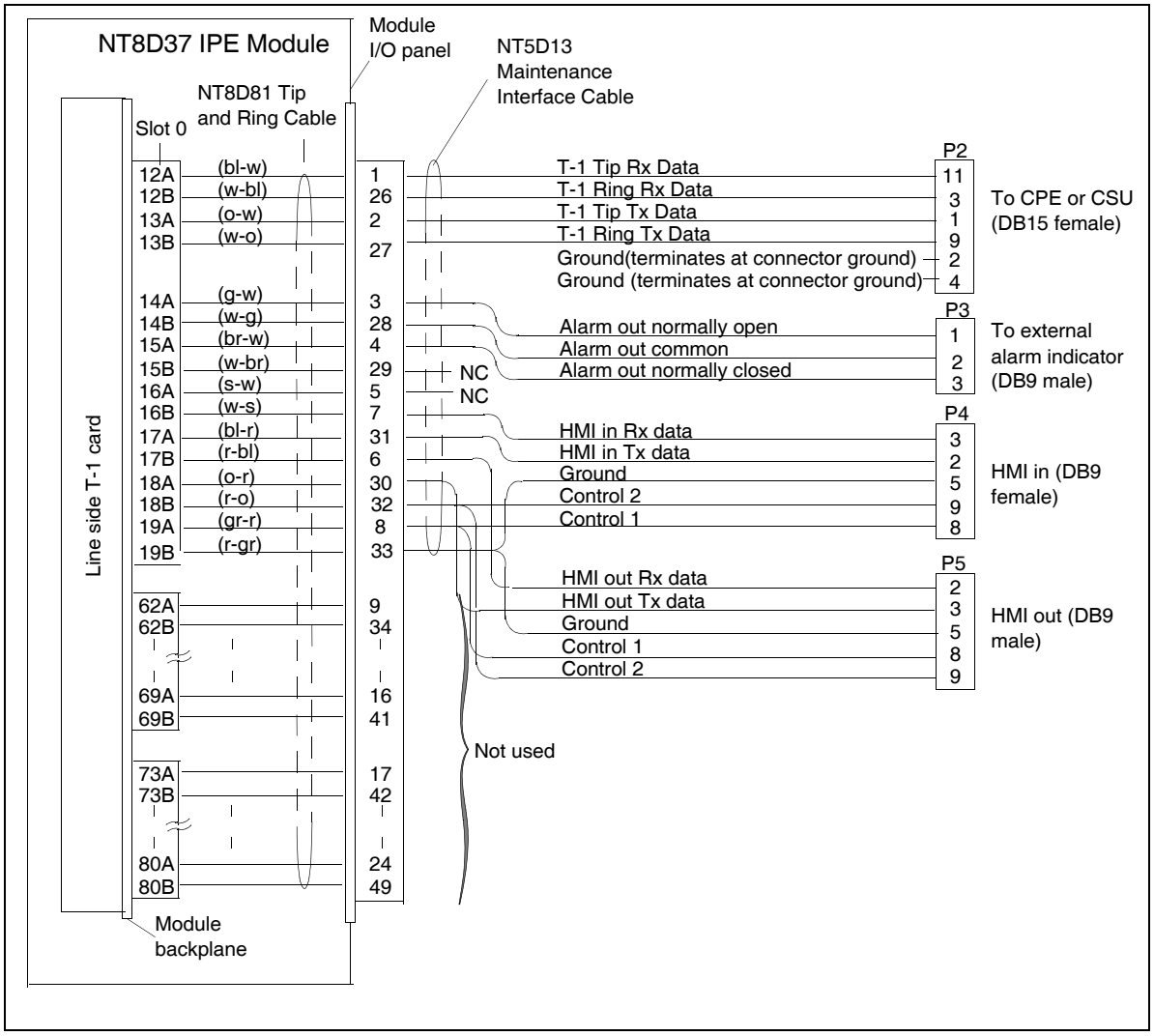
Backplane pinouts (Sheet 2 of 2)

I/O panel connector pin	Signal	Cable conector	Cable connector pin
3	Alarm out common	DB9 male to external alarm	1
28	Alarm out (normally open)	DB9 male to external alarm	2
4	Alarm out (normally closed)	DB9 male to external alarm	3
7	HMI in receive data	DB9 female to HMI in	3
31	HMI in transmit data	DB9 female to HMI in	3
33	Ground	DB9 female to HMI in, DB9 male to HMI out	5
8	Control 1	DB9 female to HMI in	8
32	Control 2	DB9 female to HMI in, DB9 male to HMI out	9
8	Control 1	DB9 male to HMI out	8
6	HMI out receive data	DB9 male to HMI out	2
30	HMI out transmit data	DB9 male to HMI out	3

Pin outs

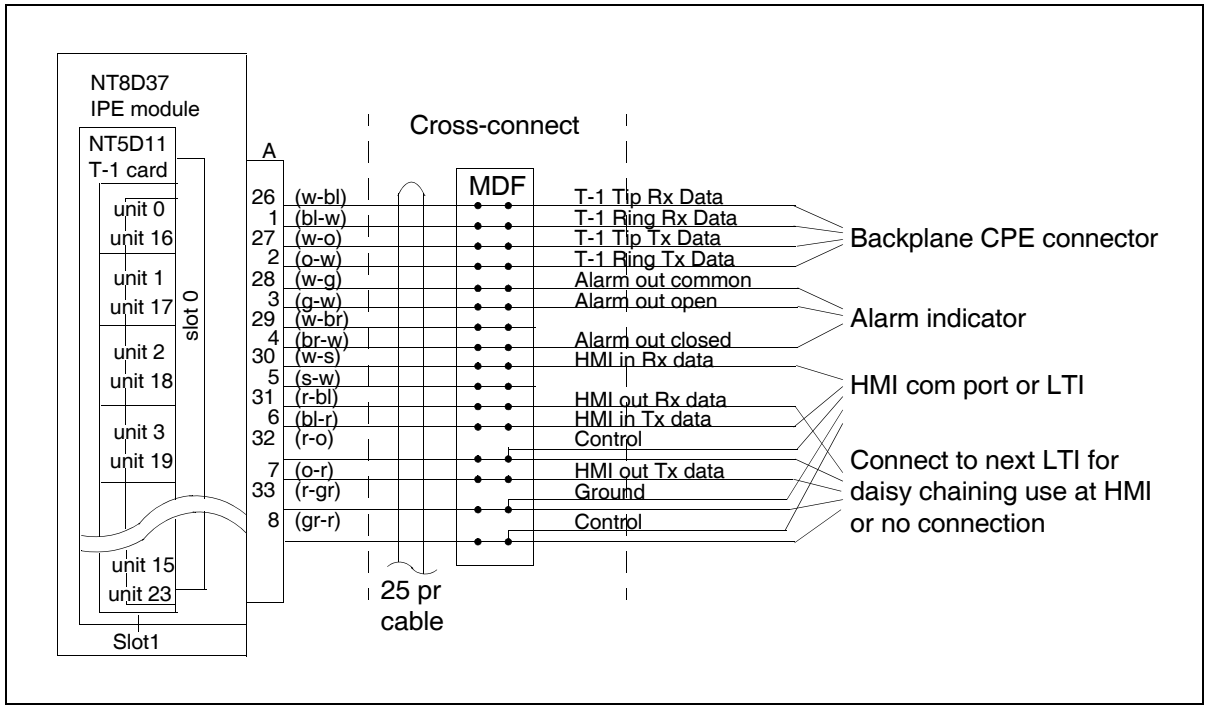
Figure Figure , “NT5D11AA pin outs,” on page -142 shows the pin outs for NT5D11AA.

NT5D11AA pin outs



Note: If you do not use the NT5D13 LTI cable, you must cable at least the top 16 pins (8 pairs) to a cross-connect block. Figure 3 shows a typical cross-connect example.

Cross-connect example



T-1 connections

This controls DS-1 signaling for all 24 channels is transmitted over connector pins 1, 2, 26, and 27. These signal transmissions remain constant across these pins whether your other line cards are installed connecting all 24 pairs to the I/O panel, or connecting only 16 pairs to the I/O panel.

External alarm connections

Connector pins 3, 4, and 28 can be plugged into any external alarm hardware. These connections are optional and the functionality of the LTI card is not affected if these connections are not made.

HMI interface connections

Connector pins 6, 7, 8, 30, 31, and 32 are used to connect the LTI card to the HMI terminal and daisy chain LTI card together for access to a shared HMI terminal. As with the external alarm connections, HMI connections are optional.

Timing

Not applicable for NT5D11AA.

Technical data

This section describes the environmental specifications and power requirements of the LTI card.

Physical dimensions

The motherboard circuitry is contained on a standard 31.75 by 25.40 cm. (12.5 by 10 inch) printed circuit board. The daughterboard is contained on a 5.08 by 15.24 cm (2 by 6 inch) printed circuit board and mounts to the motherboard on 6 standoffs.

Power requirements

The NT5D11 LTI card requires +15 V, -15 V, and +5 V from the backplane. See Table 2 for maximum currents for each voltage.

Table 0-1
LTI card - power requirements

Voltage	Maximum current
5.0 V dc	1.6 Amp
+ 15.0 V dc	150 m/A
- 15.0 V dc	150 m/A

Environmental specifications

Table 3 shows the environmental specifications of the LTI card.

LTI card environmental specifications

Parameter	Specifications
Operating temperature-normal	15° to +30°C (+59° to 86°F), ambient
Operating temperature-short term	10° to +45° C (+50° to 113°F), ambient
Operating humidity-normal	20% to 55% RH (non-condensing)
Operating humidity-short term	20% to 80% RH (non-condensing)
Storage temperature	-50° to +70°C (-58° to +158°F), ambient
Storage humidity	5% to 95% RH (non-condensing)

Technical information

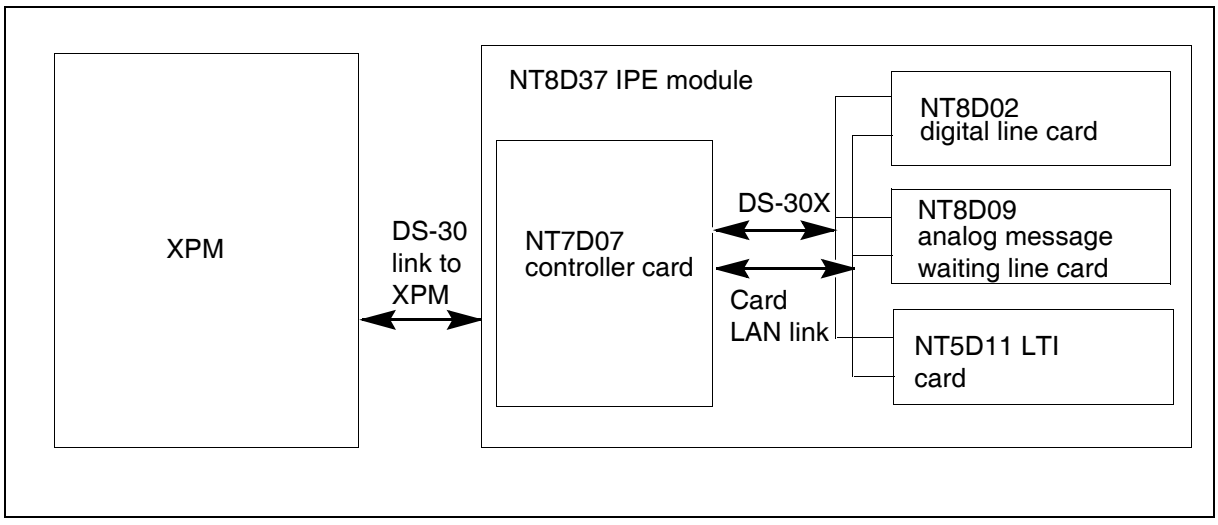
Host interface bus

This section describes how the line side T-1 interface (LTI) card fits into the Meridian SL-100 architecture, the busses that carry signals to and from the line card, and how the line card connects to the terminal equipment.

Like other intelligent peripheral equipment (IPE) line cards, the LTI card has a built-in microcontroller that is used to perform local diagnostics (self-test), configure the card according to instructions issued by the Meridian SL-100 system processor, and report back to the Meridian SL-100 system processor information such as card identification (type, vintage, and serial number), firmware version, and programmed configuration status.

The following Figure shows the network connections to the IPE module.

Network connections to the IPE module



Note: For information about alarms capabilities applicable to IPE cards, including the LTI card, refer to *Commercial Systems Alarm Clearing Procedures,* or *DSN Alarm Clearing Procedures* .

The Meridian SL-100 system communicates with the LTI card over two separate interfaces. Voice and signaling data are sent and received over DS-30X loops and maintenance data is sent over a separate asynchronous communications link called the card local area network (LAN) link.

Signaling data is information directly related to the operation of each analog channel. Signaling commands include

- off-hook/on-hook
- hook flash
- ringing signal on/off
- distant end disconnect
- dial pulse digit collection

Maintenance data is data relating to the setup and operation of the IPE card, and is carried on the card LAN link. Maintenance data includes, but is not limited to, the following:

- polling
- reporting of self-test status
- CPU initiated card reset
- reporting of card ID (card type and hardware vintage)
- downloading line interface unit configuration
- reporting of line interface unit configuration
- enabling/disabling of the DS-30X network loop bus
- reporting of card status

Note: The PCM loopback test is not performed on lines datafilled off of the LTI card.

The motherboard circuit card receives and transmits signaling data and communications data for 16 channels and performs the remainder of the logic necessary for all 24 channels to interface with the T-1 link. The LTI card contains two S-30X interface circuits and two card LAN interface circuits-one of each on the motherboard circuit card and one of each on the daughterboard circuit card.

The mux/sequencer circuitry steers each DS-30X timeslot to the correct T-1 timeslot. The DS-30X to T-1 timeslot map is fixed and under microprocessor control according to the timeslot map shown in the tables entitled “Technical information” and “Timeslot mapping” in Chapter 7.

Timeslot mapping (Sheet 1 of 2)

Card slot and port number	T-1 timeslot number
1-1	1
1-2	2
1-3	3
1-4	4
1-5	5
1-6	6
1-7	7
1-8	8
1-9	9
1-10	10
1-11	11
1-12	12
1-13	13
1-14	14
1-15	15
1-16	16
2-1	17
2-2	18

Note: Card slot 1 is the motherboard card slot. Card slot 2 is the daughterboard, and is located to the right of the motherboard.

Timeslot mapping (Sheet 2 of 2)

Card slot and port number	T-1 timeslot number
2-3	19
2-4	20
2-5	21
2-6	22
2-7	23
2-8	24
Note: Card slot 1 is the motherboard card slot. Card slot 2 is the daughterboard, and is located to the right of the motherboard.	

When the LTI card receives the DS-30X PCM data from the network loop, the DS-30X interface circuits convert it from the 2.56 Mbyte/s DS-30X signaling bit streams into the 1.544 MHz protocol necessary for transmission over the T-1 link.

The LTI card contains a single T-1 interface circuit that provides the 1.544 MHz interface to the T-1 link. This circuit communicates using transmit tip, transmit ring, receive tip, and receive ring signals. Unlike the analog and digital line interface units, the LTI card line interface circuitry does not convert 4-wire transmission path to a 2-wire path, since a 4-wire path is required for T-1 connection.

Card LAN link

Maintenance communications is the exchange of control and status data between IPE line cards and the common equipment (CE) CPU by way of the NT7D07 controller card. Maintenance data is transported using the card LAN link. This link is composed of two asynchronous serial busses. The controller uses the output bus for output of control data to the line card. The controller uses the input bus for input of line card status data.

A card LAN link bus is common to all of the line card slots within an IPE module. This bus is arranged in a master/slave configuration where the controller card is the master and the other cards are the slaves. The module backplane provides each line card slot with a unique, hardwired slot address. This slot address enables a slave card to respond when addressed by the controller card. The controller card communicates with only one slave at a time.

In normal operation, the controller card continually scans (polls) all of the slave cards connected to the card LAN to monitor their presence and operational status. The slave card sends replies to the controller on the input bus along with its card slot address for identification. In this reply, the slave informs the controller if any change in card status has taken place. The controller can then prompt the slave for specific information. Slaves only respond when prompted by the controller, they do not initiate exchange of control or status data on their own.

When the LTI card is plugged into the backplane, it runs a self test. When the self test is completed, a properly functioning card responds to the next controller card poll with the self-test status. The controller then queries for card identification and other status information. The controller then downloads all applicable configuration data to the line card, initializes it, and puts it into an operational mode.

Control functions

Control functions are provided by a microcontroller and the card LAN link. A sanity timer is provided to automatically reset the card if the microcontroller stops functioning for any reason.

Microcontroller

The LTI card contains a microcontroller that controls the internal operation of the card and the serial card LAN link to the controller card. The microcontroller performs the following control functions:

- reporting of the following to the CE CPU through the card LAN link:
  - card identification (card type, vintage, serial number)
  - firmware version
  - self-test results
  - programmed configuration status
- receipt and implementation of card configuration, including the following:
  - control of the T-1 interface
  - enabling/disabling of individual units or an entire card
  - programming of interface control circuits for administration of channel operation
  - maintenance diagnostics
- interfacing with the line card circuit by converting on/off-hook and ringer control messages from the DS-30X loop into A/B bit

manipulations for each time slot in the T-1 data stream, using robbed bit signaling

- the front panel light-emitting diode (LED) when the card is enabled or disabled by instructions from the NT8D01 controller card

Sanity timer

The LTI card also contains a sanity timer that resets the microcontroller in the event of a loss of program control. The microcontroller services the sanity timer every 1.2 seconds. If the timer is not properly serviced, it times out and causes the microcontroller to be hardware reset.

T-1 interface circuit

The LTI card contains an interface circuit that provides 24 individually configurable voice interfaces to one T-1 link in 24 different time slots. The circuit demultiplexes the 2.56 Mbyte/s DS-30X Tx signaling bitstreams from the DS-30X network loop and converts it into 1.544 MHz DS-1 Tx signaling bit streams onto the T-1 link. It also does the opposite, receiving Rx signaling bitstreams from the T-1 link and transmitting Rx signaling bitstreams onto the DS-30X network loop.

The T-1 interface circuit provides the following:

- industry standard DSX-1 (0 to 655 feet) interface
- conversion of DS-30X signaling protocol into FXO A and B robbed bit signaling protocol
- switch-selectable transmission and reception of T-1 signaling messages over a T-1 link in either loop or ground start mode
- transmission and reception of T-1 signaling messages over a T-1 link in either loop or ground start mode

Automated datafill and resource allocation

The Meridian SL-100 system polls the IPE line card and dynamically datafills the line card information into table LNINV. Meridian SL-100 users can perform immediate upgrades of existing card types for the IPE without software intervention.

This feature includes two functions for the intelligent peripheral equipment (IPE):

- Ringing resource allocation
- Automated datafill for IPE line cards
- Flexible Voice/Data LEN

Ringing resource allocation

Ringing resource allocation exploits the full capability of the IPE's ringing generator. Currently there are two types of ringing generators available for IPE use, NT6D42 and NT7D03. Each ringing generator supports simultaneously ringing analog sets. NT6D42 supports eight and NT7D03 supports 16.

This feature makes more efficient use of ringing resources within the IPE. Due to hardware limitations of ringing generators for analog phone sets, concurrent ringing can only be supplied to a limited number of phones without physically damaging the ringing generators.

Table control is used to differentiate between ringing generators. The IPE now only recognizes the ringing generator that can ring eight phones. The throttling that the IPE currently uses is based on the actual ringing generator and notification is sent to the IPE setting its maximum ringing resource (MRR). In order to trace resource inadequacies for phones needing the resource, but failing to get it, a log is produced indicating this failure. Additionally, an operational measurement is pegged to keep statistics.

Automated datafill for IPE line cards

This feature eliminates the need for manually datafilling upgraded IPE line cards for table LNINV in the MSL-100 switch. It allows the MSL-100 system to poll the IPE line card and dynamically datafill the line card information into table LNINV. This capability allows MSL-100 users to make immediate upgrades of existing card types for the IPE without software intervention.

This automatic datafill procedure provides the following benefits:

- Minimal software patches are needed.
- Accurate and up-to-date product inventory is provided on the user's switch.
- Support can accurately identify and resolve field problems.
- It minimizes human error.

Automated datafill is a plug and play design. It allows automatic datafill of a line card's product engineering code (PEC) in table LNINV and maps proper test and diagnostic procedures to the line card.

To accomplish this functionality, the automated datafill operation of this feature is concerned primarily with polling cards within the IPE, creating a table for compatible cards, and binding diagnostic routines for compatible cards. The new table containing the compatible cards is considered the kernel of this feature. Information taken from it provides

the data needed to properly automate the process of datafilling the IPE's line cards.

The automated datafill for IPE line cards assumes that new line card version codes will be one of the following types:

- 8D02, digital line card
- 8D03, analog line card
- 8D09, analog/message waiting line card
- 5D11, line side T1
- 5D51, Meridian integrated conference bridge (MICB)

Accompanying features

This feature works in conjunction with the following features:

- AD9695, CCM: Automated Datafill for IPE Line Cards.
- AD9724, IPE: Automated Datafill and Resource Allocation for the IPE.
- AX0947, MSL: Flexible Voice/Data LEN

Hardware requirements

Automated datafill and resource allocation has the following hardware requirements:

- MSL-100 Enhanced Core/SuperNode Small Edition (ECORE/SNSE) switch
- line group controller (LGC), line trunk controller (LTC), or remote cluster controller (RCC) peripheral module
- IPE peripheral module
- NT5D11, NT8D02, NT8D03, or NT8D09 line cards
- Ringing generators NT6D42 or NT7D03

Signaling and control

The LTI card contains signaling and control circuits that establish, supervise, and take down call connections. These circuits work with the system controller to operate the T-1 link. The circuits receive outgoing call signaling messages from the controller and return incoming call status information to the controller over the DS-30X network loop.

Call operation

The LTI card performs call operation differently, depending on how the T-1 link is configured. The T-1 link can be configured to process calls in either loop start or ground start mode. The mode is configured through dual in-line package (DIP) switch settings on the LTI card.

The LTI card performs call processing separately on each of its 24 channels. The signaling is performed through A/B robbed bit signaling, which is standard for T-1 communication. A/B robbed bit signaling simulates standard analog signaling by sending a meaningful combination of ones and zeros across the link that correlate to the electrical pulses that standard analog signaling sends. For example, to represent that an analog line interface unit is idle, the analog line card provides a ground on the tip lead and -48 V dc on the ring lead. The LTI card accomplishes the same result by sending its A bit as 0 (translated as ground on the tip lead) and its B bit as 1 (translated as -48 V dc on the ring lead). However, measuring the voltage of the ring lead on the T-1 line does not return -48 V dc, since actual electrical pulses are not sent.

The call operation types discussed in this section are as follows:

- idle (on-hook)
- incoming calls
- outgoing calls
- calls disconnected by the central office (CO)
- calls disconnected by customer premise equipment (CPE)

Loop start mode

This section describes call processing in loop start mode. For loop start, the A and B bits have the following meaning:

- Transmit to T-1 link
  - A bit = 0 (tip ground on)
  - B bit = ringing (0=on, 1=off)
- Receive from T-1 link
  - A bit = loop (0=open, 1=closed)
  - B bit = 1 (no ring ground)

When a T-1 channel is idle, the LTI card simulates a ground on the tip lead and -48 V dc on the ring lead to the terminal equipment by setting its transmit A bit to 0 and transmit B bit to 1. Accordingly, an on-hook channel on the terminal equipment simulates an open loop toward the LTI card, causing the LTI card receive bits to be set to A = 0 and B = 1.

Incoming calls to terminal equipment attached to a LTI card can originate either from stations that are local (served by the SL-100 system), or remote (served through the public switched telephone network). To provide the ringing signal to a telephone, the LTI card simulates an additional 90 V on the ring lead to the terminal equipment by alternating the transmit B bit between 0 and 1 (0 during ring on, 1 during ring off). When an incoming call is answered by the terminal equipment going off-hook, the terminal equipment simulates tripping the ringing and shutting off ringing, causing the LTI card receive A bit to be changed from 0 to 1.

For outgoing calls from the terminal equipment, a channel is seized when the station goes off-hook, simulating a low-resistance loop across the tip and ring leads toward the LTI card. This causes the LTI card's receive A bit to be changed from 0 to 1. This bit change prepares the LTI card to receive digits. Outward address signaling is then applied from the terminal equipment in the form of loop (interrupting) dial pulses, or dual tone multi frequency (DTMF) tones that are signaled by the receive A bit.

While a call is in process, the CO may disconnect the call due to inactivity (no digits dialed or pulsed in) by dropping loop current momentarily. If cutoff on disconnect is enabled, this causes the LTI card to change the transmit A bit to 1. When the terminal equipment sees the transmit A bit go to 1, it responds, causing the LTI card receive A bit to be changed from 1 to 0. The LTI card responds by setting the transmit A bit back to 0. The call is now terminated and the interface is in the idle (on-hook) state.

Alternatively, while a call is in process, the terminal equipment may disconnect by going on-hook. The terminal equipment detects no loop current and sends signaling to the LTI card that causes its receive A bit to change from 1 to 0. The call is now terminated.

Table 2 outlines the card's A and B bit settings in each state of call processing.

Loop start call processing A/B bit settings

Heading	Tx A	Tx B	Rx A	Rx B
Idle	0	1	0	1
Incoming calls to terminal equipment:				
Idle	0	1	0	1
Ringing is applied from LTI card	0	1/0	0	1
Terminal equipment goes off-hook	0	1	1	1
LTI card goes off-hook	0	1	1	1
Outgoing calls:				
Idle	0	1	0	1
Terminal equipment goes off-hook	0	1	1	1
Call disconnect from CO:				
Steady state (call in progress)	0	1	1	1
CO disconnects by dropping loop current and LTI card changes Transmit A bit.	1	1	1	1
	1	1	0	1
Terminal equipment responds causing Receive A bit to change.	0	1	0	1
LTI card responds by changing its Transmit A bit. Call is terminated and set to idle state.				
Call disconnect from telephone:				
Steady state (call in progress)	0	1	1	1
Terminal equipment goes on-hook causing the Receive A bit to change. Call is terminated and set to idle state.	0	1	0	1

Ground start mode

This section describes call processing in ground start mode. In this mode, the A and B bits have the following meaning:

- Transmit from LTI
  - A bit = tip ground (0=grounded, 1=not grounded)
  - B bit = ringing (0=on, 1=off)
- Receive to LTI:
  - A bit = loop (0=open, 1=closed)
  - B bit = ring ground (0=grounded, 1=not grounded)

When a T-1 channel is idle, the LTI card simulates an open loop on the tip lead and -48 V dc on the ring lead to the terminal equipment by setting the transmit A bit to 1 and transmit B bit to 1. Accordingly, an on-hook telephone simulates an open loop toward the LTI card, causing the LTI card receive bits to be set to A = 0 and B = 1.

Incoming calls to terminal equipment connected to a LTI card can originate either from stations that are local (served by the SL-100 system), or remote (served through the public switched telephone network). To provide the ringing signal to the terminal equipment, the LTI card simulates an additional 90 V on the ring lead by alternating the transmit B bit between 0 and 1 (0 during ring on, 1 during ring off) and ground on the tip lead by setting the transmit A bit to 0. When an incoming call is answered by the terminal equipment going off-hook, the terminal equipment simulates tripping the ringing and shutting off ringing by causing the card's receive A bit to change from 0 to 1. In response to this message, the LTI card terminates ringing by holding the transmit B bit constant at 1.

For outgoing calls from the terminal equipment, a channel is seized when the terminal equipment goes off-hook, simulating a ground to the ring lead toward the LTI card by causing the card receive B bit to change from 1 to 0. In turn, the LTI card simulates grounding its tip lead by changing the transmit A bit to 0. The terminal equipment responds to this message removing the ring ground (card's receive B bit is changed to 1) and simulating closed loop at the terminal equipment (card's receive A bit is changed to 0).

While a call is in process, the CO may disconnect the call due to inactivity (no digits dialed or pulsed in) by removing the ground from the tip lead. If cutoff on disconnect (COD) is is enabled, this causes the LTI card to change the transmit A bit to 1. When the terminal equipment sees the transmit A bit go to 1, it responds by simulating an open loop,

causing the LTI card's receive A bit to change to 0. The call is terminated and the interface returns to the idle condition.

Alternatively, while a call is in process, the terminal equipment can disconnect by going on-hook. This causes the card receive A bit to change to 0. In response to this message, the LTI card simulates the removal of ground from the tip by changing its transmit A bit to 1. The call is terminated and the interface returns to the idle condition.

Ground start call processing A/B bit settings (Sheet 1 of 2)

State	Transmit		Receive	
	A	B	A	B
Chapter , “Technical information,” on page -147xGround start call processing A/B bit settings				
idle	1	1	0	1
incoming calls (to terminal equipment):				
idle	1	1	0	1
Ringing is applied from LTI card by simulating ground on tip lead and ringing on ring lead.	0	0/1	0	1
	0	0/1	1	1
Terminal equipment goes off-hook by simulating ground on tip lead and ringing on ring lead.	0	1	1	1
LTI card goes off-hook simulating loop closure.				
Outgoing calls (from terminal equipment):				
idle	1	1	0	1
Terminal equipment goes off-hook	1	1	0	0
The LTI simulates grounding its tip lead	0	1	0	0
Terminal equipment simulates ground on its tip lead thereby simulating open loop.	0	1	1	1

Ground start call processing A/B bit settings (Sheet 2 of 2)

State	Transmit		Receive	
	A	B	A	B
call disconnect from CO:				
steady state (call in progress)	0	1	1	1
CO disconnects by removing ground from tip lead causing the LTI to change its transmit A bit.	1	1	1	1
	1	1	0	1
Terminal equipment simulates lifting the ground on its tip lead opening loop. Call is terminated and set to idle state.				
call disconnect from telephone:				
steady state (call in progress)	0	1	1	1
Terminal equipment goes on-hook.	0	1	0	1
LTI card receives message and simulates removing ground from its tip lead. Call is terminated and set to idle state.	1	1	0	1

Ground start restrictions

If you are using the LTI card in ground start mode, certain restrictions should be considered. The Meridian SL-100 system treats the LTI card as a standard loop start analog line card. Because of this, the ground start operation of the LTI card has operational limitations, compared to typical ground start interface equipment. These limits relate to distant end disconnect and glare potential.

If the distant end disconnect feature is not available in your software, or cutoff on disconnect is not enabled, the LTI card cannot indicate to the customer premise equipment (CPE) that the distant end has terminated a call. In this case, the LTI card continues to provide a grounded tip indication (A=0) to the CPE until it detects an open loop indication (A=0) from the CPE. It then provides an open tip indication (A=1). Without distant end disconnect software, the LTI card is not capable of initiating the termination of a call to the CPE.

If your software provides the distant end disconnect feature, this restriction does not apply. With distant end disconnect software installed and cutoff on disconnect enabled on the LTI, the LTI card provides an open tip indication to the CPE when it receives an

indication of distant end disconnect from the system. This provides normal ground start protocol call termination.

In ground start mode, glare conditions must be considered if both incoming and outgoing calls to the CPE are to be encountered. In the event that both the Meridian SL-100 system and the CPE simultaneously attempt to originate a call, the system completes the call origination, rather than allowing the CPE to do so.

Environmental specifications

The following table shows the environmental specifications of the LTI card.

LTI card environmental specifications

Parameter	Specifications
Operating temperature-normal	15° to +30°C (+59° to 86°F), ambient
Operating temperature-short term	10° to +45° C (+50° to 113°F), ambient
Operating humidity-normal	20% to 55% RH (non-condensing)
Operating humidity-short term	20% to 80% RH (non-condensing)
Storage temperature	-50° to +70°C (-58° to +158°F), ambient
Storage humidity	5% to 95% RH (non-condensing)

Electrical specifications

This section provides information about power requirements.

Power requirements

The LTI card requires +15 V, -15 V, and +5 V from the backplane. One NT8D06 Peripheral Equipment Power Supply ac or NT6D40 Peripheral Equipment Power Supply dc can supply power to a maximum of 8 LTI cards.

T-1 Cable Grounding

The T-1 cable between the IPE module and the DSX panel is grounded at the IPE end and open at the DSX end. The T-1 cable between the

MSM and the DSX panel is grounded at the MSM end and open at the DSX end.

LTI card - power requirements

Voltage	Maximum current
+5.0 V dc	2.0 Amp
+15.0 V dc	50 m/A
-15.0 V dc	50 m/A

Note: The LTI card does not provide in-circuit protection against power line crosses or lightning. It does, however, have protection against accidental shorts to -52 V dc analog lines. When the card is used to service off-premise terminal equipment through the public telephone network, install a channel service unit as part of your terminal equipment to provide external line protection.

DIP switch settings

DIP switches control the electrical characteristics of the LTI card interface. The LTI card contains two DIP switches, each containing eight switch positions. They are located in the upper right corner of the motherboard circuit card. They must be configured for your environment when the card is installed. Refer to chapter 3, “Installation and cabling," for information about DIP switch settings.

Acronyms, abbreviations, and terms

B8ZS

Binary 8 zero substitution. A technique used to accommodate the ones density requirement for digital T-carrier facilities in the public network, while allowing 65 Kbyte/s clear data per channel. Rather that inserting a one for every seven consecutive zeroes, B8ZS inserts two violations of the bipolar line encoding technique for digital transmission links.

CO

central office

CPE

customer premise equipment

CSU

Channel service unit

DIP switch

A small switch, usually attached to a circuit board. A DIP switch has two settings, on (1) or off (0).

D4 framing

A framing format in which signaling for voice channels is carried in-band by every channel, along with the encoded voice. Robbed-bit signaling is a technique used in D-4 channel banks to convey signaling information. With this technique, the eighth bit (least significant bit) of each of the 24 8-bit time slots is “robbed" every sixth frame to convey voice-related signaling information for each voice channel. *See also* ESF, robbed-bit signaling.

DS-1

The 8-bit 24-channel 1.544-Mbit/s digital signaling format used in the DMS-100 Family switches. The DS-1 signal is the North American standard for digital trunks. It is a closely specified bipolar pulse stream. DS-1 is the standard signal used to interconnect Northern Telecom digital systems. DS-1 carries 24 information channels of 64 kbit/s each (DS-0s).

DS-30

A 10-bit 32-channel 2.048-Mbit/s speech-signaling and message-signaling link as used in the DMS-100 Family switches.

Acronyms, abbreviations, and terms (continued)

DTMF

dual-tone multifrequency

ESF

Extended superframe format. A T-1 format that uses the 193rd bit as a framing bit. ESF provides frame synchronization, cyclic redundancy checking, and data link bits. Frames consist of 24 bits instead of 12 bits as in the D4 format. The standard allows error information to be stored and retrieved easily, facilitating network performance monitoring and maintenance. *See also* D4 framing.

gain/loss

Transmission loss or gain usually expressed in decibels (dB) or power amplification or dissipation

HMI

human-machine interface

IPE

intelligent peripheral equipment

LGC

See line group controller.

line group controller (LGC)

a peripheral module that connects DS30 links from the network to line concentrating modules

Line Side T-1 Interface card

A line card that interfaces with a T-1 line

loopback

The reflection of data signals of known characteristics to their point of origin so that the reflected bit stream can be compared with the transmitted bit stream.

LTI

See line-side T-1 interface card.

m/A

milliamps

main distribution frame (MDF)

A frame containing terminal blocks where cables from outside plant and office equipment are terminated. Outside plant equipment is terminated on vertical columns of blocks and office equipment on horizontal rows. Cross-connection flexibility and organization is provided by jumper pairs between horizontal and vertical terminal blocks.

master/slave

A relationship between devices in which one device typically gives instructions that the other device attempts to follow. The slave station is selected and controlled by the master station.

MDF

main distribution frame

MHz

megahertz

micro-controller

A small scale hardware unit of a computing system that contains the circuits that control and perform the execution of instructions.

MRR

maximum ringing resource

Mux/Sequencer

A device that divides a message into smaller frames, blocks, or packets for transmission.

PBX

See private branch exchange.

PCM

See pulse code modulation.

PEC

See product engineering code.

private branch exchange (PBX)

A private telephone exchange, either automatic or attendant operated, serving extensions in an organization and providing access to the public network.

product engineering code (PEC)

An eight-character unique identifier for each marketable hardware item manufactured by Nortel.

pulse code modulation (PCM)

- The process used to convert an analog (voice waveform) signal to a digital code.
- A form of modulation in which the modulating signal is sampled, and the sample is quantified, coded, and sent as a bit stream.
- The representation of an analog waveform by coding and quantifying periodic samples of the signal such that each element of information consists of a binary number representing the value of the sample.

RCC

See remote cluster controller

remote cluster controller (RCC)

A dual-shelf peripheral module that provides a master controller for all units at the remote switching center and is, in turn, controlled by the host line trunk controller.

ring

The second of two speech line wires inside the telephone office. *See also* tip.

robbed-bit signaling

In T-1, refers to the use of the least significant bit of every word of frames 6 and 12 (D4), or 6, 12, 18, and 24 (ESF) for signaling purposes.

T-1

The standard 24-channel 1.544-Mb/s pulse code modulation system used in North America. This digital carrier carries a signal whose designation is a DS-1 link.

tip

One of the speech wires of a pair in a central office. *See also* ring.

Meridian SL-100

Meridian SL-100

Meridian SL-100 Line Side T-1 Interface (LTI) for IPE Services Guide

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