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SL-1

Software conversion procedures

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Introduction

This document explains how to upgrade X 11 release 8 or 9 to X11 release 10, and XI 1 release 10 or above to a higher release. It also explains software conversions within a single release. Additionally, parallel reloads for NT, RT, XT, and system options 61, 61C, 71, and 81 are shown.

THIS DOCUMENT IS FOR CONVERSION AND UPGRADES ONLY.
The procedures in this document are not for any other purpose.

Specific machine types, as they are supported by XI 1 software releases, are shown in Table 2.

CAUTION

Do not upgrade or convert a system unless you are thoroughly familiar with it and with conversion procedures. You must read through the procedure before starting.

Note: Upgrading software on single CPU systems disrupts call processing and allows service only to those telephones connected to Power Failure Transfer Units (PFTUs). Established calls may not be affected.

To upgrade software on dual CPU systems with minimum disruption to call processing, use the parallel reload method in “Procedure 6: Performing a parallel reload” on page 47. If upgrading to X 11 release 18, use “Procedure 7: Converting XI 1 release 15 through 17 to XI 1 release 18 or 19” on page 73.

The following procedures describe the various conversions. Follow Pre-conversion and Post-conversion procedures for every system conversion.

- Procedure 1: Pre-conversion procedure on page 23
- Procedure 2: Converting from X11 release 8 or 9 to X11 release 10 on page 31
- **Procedure 3:** Convert from one X11 release to a later release on page 33
- Procedure 4: Convert to later issue of the same release on page 39
- Procedure 5: Using a 3-disk configuration on page 43
- Procedure 6: Performing a parallel reload on page 47
- Procedure 7: Converting X11 release 15 through 17 to X11 release 18 or 19 on page 73
- Procedure 8: Install a new data cartridge on page 111
- Procedure 9: Install a new Read Only Memory card on page 115
- Procedure 10: Increasing memory on page 121
- Procedure 12: Post-conversion procedure on page 133

Throughout this document the term **media** refers to either tape or disk, whichever applies to your system.

The term **Source** refers to the software that you are **currently** running. **Target** refers to the new software that you are converting to.

<p style="text-align: center;">CAUTION Read the Conversion notes section in this document before performing any operations. It contains information crucial to the conversion process.</p>
--

Related documentation

The following documents may be required when performing upgrades.

- **Product compatibility** (553-3001-156)
- **Upgrade system installation (553-3001-250)**
- **Disk drive upgrade procedures (553-3001-251)**
- **XI 1 features and services (553-3001-305)**
- **XI I input/output guide** (553-3001-400)
- **General Release Bulletins** provide hardware requirements and advisory notes for a given software release.

Conversion notes

Conversion procedures vary with the system type and **Source** release of software. Note that, unlike previous releases, XI 1 release 10 offers Automatic **Inline** Conversion to release 14 or 15. It is no longer necessary to step up through each release.

Table 1 shows the XI 1 releases supported by Automatic **Inline** Conversion. To convert to XI 1 release 12 or 13 from XI 1 release 10, you must go through XI 1 release 11. XI 1 release 11 is used to support Automatic **Inline** Conversion from XI 1 release 10 only. It is not a serviceable software release

Table 1
Automatic **Inline** Conversion

From (minimum) Source release/issue	Directly to Target release
10.09	14, 15
11.20	12, 13, 14, 15
12.32	13, 14, 15
13.34	14, 15
14.41	15
15.55	16, 17, 18
16.36	17, 18
17.58	18, 19
18.20	19

To convert to a release higher than X11 release 15, you must convert to X11 release 15 first. You cannot, for example, go directly from X11 release 10 to X11 release 16. You must be operating on X11 release 17 before converting to X11 release 19 or higher. For example, you cannot go directly from X11 release 16 to X11 release 19.



Conversions may require any of the following hardware changes:

- upgrade from tape drive to disk drive (X11 release 10 and higher)
- 3.5-inch, 2 MB, High Density (HD) floppy disks (X11 release 15 through X11 release 17)
- 3.5-inch, 4 MB, Extra High Density (ED) floppy disks (X11 release 18 and later)
- replacement of security data cartridge for systems equipped with disks (A different cartridge is required for each intermediate release.)
- replacement of ROM daughter board for intermediate or Target release (See the ROM chart in “Procedure 9: Install a new Read Only Memory card” on page 115.)
- installation of new memory cards

It may be more time and cost effective to simply load new software and reenter system data, rather than going through all the procedures that a conversion requires. To determine the best option and how to take advantage of Target software features and services, consult your Northern Telecom representative.

CAUTION

Always load LD43 from the **Source** (current) media. That is, the media containing the software currently running your system.

Conversion media

Northern Telecom supplies tapes or disks, depending on system requirements, for conversion to a higher software release. If required, software for intermediate releases is also included. You do not need both tape and disk, except when upgrading from tape drive to disk drive.

If Auto **Inline** is supported for your conversion, the conversion software is included in the **Target** software. Additional conversion media are not required.

The media received contains the conversion program (LD66) for converting your current data to the format required for the next release. Check the labels on the media for accuracy. The conversion label contains the following information:

X mmm Z nnn where

X = machine type number (see Table 2)

mmm = Source software release and minimum issue

Z = conversion tape vintage

nnn = Target software release and minimum issue

System tape

XI 1 release 7 and earlier use tape drives as their media. XI 1 releases 8 and 9 use both tape and disk. The system tapes contain data for all features and services requested by the customer for the new software generic. The tape (as shipped from the factory) does not contain any customer data (for example, line, trunk, or set assignments). Three identical XI1 system tapes are supplied to the conversion site.

System disks and data cartridges

For X11 release 10 and later, disk drives are required. Northern Telecom supplies three sets of floppy disks for each system, and one QMM42 data cartridge for each CPU. Option 61C and 81 systems include 2 sets of disks. The disks and data cartridge work for the system specified on the label only, and must match your system ID. These disks and data cartridges cannot be used to upgrade any other system. Each QMM42 data cartridge is installed on a QPC584 Mass Storage Interface (MSI), QPC742 Floppy Drive Interface (FDI) card, or the NT6D63 I/O processor (IOP) card 61C (see “Procedure 8: Install a new data cartridge” on page 111). System option 81 data cartridge is installed on the NT6D63 I/O Processor (IOP).

The data cartridge contains X11 release and software packaging information. If desired, a new option package on the same release may be added by installing a new data cartridge and loading floppy disks that contain the new package. However, the cartridge ID must match the disks installed in the system. A sysload is required to enable new packages.

Software packaging

Remember to check your system packages prior to conversion. Be sure **Target** software contains all the packages required to support system operation.

General conversion information

This document supports conversions for ST, STE, NT, RT, XT, 21, 21E, 51, 61, 61C, 71, and 81 systems only.

Note: STE, 21E, and 81 systems are only supported with X11 release 18 and later. Option 61C systems are supported with X11 release 19 and later only.

Conversion from X37 to X11 is not supported.

Be sure your system has enough memory to complete the conversion. If not, go to “Procedure 10: Increasing memory” on page 121 **before you begin**. Refer to *Meridian I capacity engineering* (553-3001-149) for details concerning system capacity requirements.

To monitor the CPUs during parallel reload procedures, install a temporary Serial Data Interface (SDI) card, and connect a local TTY (or modem for remote TTY access). Refer to the parallel reload procedures for more information.

In systems equipped with superloops, calls will drop during initialization when Peripheral Software Download (PSDL) occurs. The Superloop Network (NT8D04) and Controller (NT8D01) cards download peripheral software prior to initialization completion. This may extend the duration of the system initialization when completing a conversion.

When a software upgrade is done to add new feature packages, a sysload or parallel reload is required to enable the new software.

If a Force Download occurs during a parallel reload, Initialization can take up to 15 minutes. Calls in process will be interrupted.

When QPC742D FDI Cards are used, install disks in both disk drives before powering up the system. This is not required with later vintages of the FDI card.

If you have Auxiliary processors working with your system, be sure they are powered up after you complete your conversion.

CAUTION

Do not attempt backward datadumping between software versions, upissues, or releases. It will corrupt your data.

DN Expansion

X11 release 12 to X11 release 13 or higher conversion is designed to convert data blocks with the smaller DN fields on the **Source** disk to data blocks with expanded DN fields, irrespective of the DN Expansion package on the **Target** disk/system.

CDR Expansion is **not** required to enable DN expansion. However, in order for Call Detail Records to accurately reflect system activity, CDR Expansion must be enabled as well as DN Expansion. If DN Expansion is equipped and CDR Expansion is not, system operation is not affected, but CDR records will be inaccurate.

SL-1 ST systems

SL-1 ST machines requiring the Memory Expansion capability or ISDN software options must upgrade to the QPC937A or QPC717D ROM card, and QPC709D card when loading X11 release 12 or later software. X11 releases 15 through 17 use the QPC940 ROM. The ST machine is supported up to X11 release 17 only.

Note: The ST and 21 must be upgraded to STE and 21E (respectively) to support X11 release 18 and later.

Upgrading from tape to disk drives

X11 release 10 requires disk drives. Convert your system from tape drive to disk drive media prior to upgrading to X11 release 10 software.

To convert from X11 release 5 to X11 release 8, you must go through X11 release 7.12 (for MS systems only) and 7.17. From X11 release 5 convert to X11 release 7.12 (on the MS). From 7.12, convert to 7.17. You can then convert to X11 release 8. All other systems, can convert from X11 release 5 to X11 release 7.17, then to X11 release 8.

Integrated Services Digital Network (ISDN)

Any ISDN site upgrading to X11 release 15 or higher must be configured with the QPC757 vintage C, D-Channel Handler (DCHI) card.

When performing a parallel reload, ISDN Primary Rate Interface (PRI) calls are dropped during initialization of **Target** software.

X11 release 18 and later support the NT6D80 Multi-purpose Serial Data Link (MSDL) card for D-channel interfaces.

X11 release 18 and later do not support even numbered port assignments on the NT6D11 International ISDN D-Channel card. The even port assignments must be updated to odd port assignments in LD17 prior to converting. If not done, the D-channel will not be reestablished after service change. Only QPC757 D-Channel mode is supported.

System option 61C and 81 machines require clock controller QPC471 vintage H or later, or QPC775 vintage C or later.

Converting ISDN systems

New software may contain changes to the ISDN D-Channel parameters that are downloaded to the DCHI or MSDL card. The system software automatically downloads the new parameters upon SYSLOAD if a parallel reload is not performed.

When performing a parallel reload, and switching to the second CPU, software and hardware disable and reenable all DCHI cards to ensure parameter downloading with X11 release 16 and earlier.

Ensure that the Release ID in the D-channel parameters (LD17) at the far end is changed.

When a DCHI port is configured as a TTY port, IN1 messages may be truncated when printed after sysload. System performance is not affected, but you should view your history file for the entire message.

D-Channel monitor

When the D-channel monitor is software enabled and deactivated with a maintenance telephone, **datadump** and **sysload** reactivates the monitor. To avoid this situation, software disable the D-channel monitor prior to **datadump** and **sysload**.

Incremental Software Management

Incremental Software Management (ISM) defines the maximum number of Terminal Numbers, Automatic Call Distribution (ACD) Directory Numbers, ACD positions (agents and supervisors), and AST sets allowed in a system. Before upgrading to X11 release 15.55 or higher read the ISM section in *X11 features and services (553-3001-305)*.

With X11 release 17, ACD AST sets are configured individually in **LD10** and **LD11**. When you are upgrading to X11 release 17, you must reenter your AST sets manually into the database in **LD10** and **LD11** because they will be lost during conversion.

X11 release 18 and later include D-channels (DCH), Application Module Links (AML), Digital Subscriber Loops (DSL), and Logical Terminal Identifier (LTID).

X11 release 19 and later include Meridian Packet Handlers (MPH) as part of ISM tracking.

Note: DSL, LTID, and MPH are part of ISDN Basic Rate Interface (BRI). Refer to *ISDN Basic Rate Interface description (553-3901-100)* for more details.

CAUTION

System information will be lost.
With Incremental Software Management (ISM) in X11 release 15.55 and higher, if SYS message 4327, 4328, 4329, or 4330 appears at **sysload**. Reload **Source** system disks. Order ISM disks with sufficient system parameters configured.

Patches

With X11 release 16.65 and later, patches do not need to be removed prior to conversion. When performing a data dump (EDD), an **EHM500** message prints out, rather than patch numbers, indicating existing patches will not be saved on **Target** media.

If converting from 15.53, 14.41, or earlier, you must have the patches removed prior to converting. Data corruption may occur if you do not remove the patches prior to conversion.

If a patch is included in your software, a plus sign (+) will appear next to the software issue number in LD22.

Automatic Trunk Maintenance (ATM)

When converting Xl 1 release 7 (prior to issue 7.09) to Xl 1 release 8, ATM data must be removed prior to conversion, then restored after conversion.

Command Status Link (CSL)

When converting Xl 1 release 8 (prior to issue 8.25) to Xl 1 release 9, the Data Service **DN**s (DSDN) must be removed prior to conversion, then restored after conversion. Contact your Technical Support personnel to remove the DSDNs. To determine whether or not you have **DSDN**s, check in LD22.

```
LD 22
REQ      PRT
TYPE     DSDN
CUST     <cr>
DN       <cr>
```

Converting X09 to XI 1 release 2

Automatic Route Selection (ARS) on X09, is replaced by BARS or NARS in X11. Due to the differences between the ARS and BARS data structures, complete data conversion is not supported. You can either convert the ARS data to BARS data and modify the resulting BARS data structure, or not convert ARS data at all and input completely new BARS data.

To deny conversion of ARS data to BARS data, input the command CDD BLD in LD66.

An upgrade from X09 to XI 1 release 2 requires the X9662205 conversion tape.

Requirements for upgrading to XI 1 release 10

The following conversion software is required when upgrading to X11 release 10. Check your conversion media to be sure it is correct. You must have all the conversion software between your current release and X11 release 10 as well as the system software required for each release. For example, if you are running on X11 release 7, you must have conversion packages and the system media for X11 releases 8, 9, and 10.

- X11 release 2 to X11 release 3 conversion: X205B301
Must be 2.05 or later
- X11 release 3 to X11 release 4 conversion: X306A401
Must be 3.06 or later
- X11 release 4 to X11 release 5 conversion: X416C502
Must be 4.16 or later
- X11 release 5 to X11 release 7 conversion: X516CR7
Must be 5.16 or later
- X11 release 7 to X11 release 8 conversion: X709B810
Must be 7.09 or later
For system type 711, use 7.12 to 7.17 to X11 release 8.
- X11 release 8 to X11 release 9 conversion: X826A901
Must be 8.26 or later
- X11 release 9 to X11 release 10 conversion: X903B1009
Must be 9.03 or later

Conversion notes by release

X11 release 10

X11 release 10 requires disk drives. Convert your system from tape drive to disk drive media prior to upgrading to X11 release 10 software. Refer to “Requirements for upgrading to X11 release 10” on page 14 for the list of conversion packages and supported releases.

Refer to ***Disk drive upgrade procedures*** (553-3001-251) for complete instructions concerning tape to disk drive upgrades.

X11 release 11

This is not a serviceable release. The media for X11 release 11 is required for upgrading from X11 release 10 to release 12 or 13.

X11 release 12

Conversion to X11 release 12 requires the following software conversion media and site transition media:

- X11 release 10 to X11 release 11 conversion disk **X1009A1120**
- X11 release 11.20 site transition disk

SL-1 ST machines requiring the Memory Expansion or ISDN must upgrade to the new ROM card, **QPC717D** and **QPC709D**, when loading X11 release 12 through 14 software.

X11 release 13

Once a system has been converted to either X11 release 11 or 12, Automatic **Inline** Conversion takes place during conversion sysload.

X11 release 14

X11 release 14 supports Automatic **Inline** Conversion from X11 release 10, 12, and 13. Automatic **Inline** Conversion takes place during conversion sysload.

XI 1 release 15

X11 release 15 is a hardware breakpoint. It requires a new ROM card, and 3.5inch 2 Meg, High Density (HD) disks. It also introduces Meridian 1 system options 21, 51, 61, and 71. Refer to *System overview* (553-3001-100) for complete information. It is imperative that ALL software and hardware requirements are met.

XI 1 release 16

You *must* be running X11 release 15 before upgrading to X11 release 16.

XT and 71 machines require a hard disk drive and QPC584 version F4, K, or higher, for the 3-disk configuration on X11 release 16 and later.

System option 71, and XT machine types require three floppy disks to perform upgrades and conversions. QPC584 version F4, K, or higher, is required to support the procedure. See “Procedure 5: Using a 3-disk configuration” on page 43 for a complete description for upgrading your system using this method.

Be sure to check memory utilization on the XT and system option 71 machines before converting to XI 1 release 16. Note the memory stamp issued when any service change program between LD10 and LD19 is loaded. If the AVAIL field shows 100,000 or less, add a second memory board *before* conversion. Go to “Procedure 10: Increasing memory” on page 121 for steps to increase your memory.

Option 21 systems must have NT8D18 Release 11 or later to support X11 release 16 software.

X11 release 17

X11 release 17 requires the 3-disk configuration for XT and 71 systems.

System option 71, and XT machine types require three floppy disks to perform upgrades and conversions. QPC584 version F4, K, or higher, is required to support the procedure. See “Procedure 5: Using a 3-disk configuration” on page 43 for a complete description for upgrading your system using this method.

As of X11 release 17, each ACD AST set is defined individually by using **LD10** and **LD11**. As a consequence, you must reconfigure ACD AST sets manually through **LD10** and **LD11** after upgrading to X11 release 17. See *X11 input/output guide (553-3001-400)*.

XI1 release 18

X11 release 18 introduces the system option 81. Refer to system documentation for complete information and hardware requirements.

System option and 81 machines require clock controller QPC471 vintage H or later, or QPC775 vintage C or later.

X11 release 18 is a hardware breakpoint. The ST and 21 systems must be upgraded to ST Enhanced (STE) or 21 Enhanced (21E) machines to support X11 release 18. Refer to *Upgrade system installation (553-3001-250)* for the STE and 21E upgrade procedures. The following hardware is required.

- NTND01 Integrated CPU and Memory (ICM)
- NTND02 Miscellaneous SDI Peripheral Signaling (MSPS)
- NTND31 Read Only Memory card
- QPC742F Floppy Disk Interface (FDI)
- NTND15 Floppy Disk Unit (FDU)

X11 release 18 requires the following hardware changes for the NT, RT, XT, 51, 61, and 71. See “Procedure 7: Converting X11 release 15 through 17 to X11 release 18 or 19” on page 73 for hardware installation steps during the parallel reload.

- NTND08 Read Only Memory (ROM) card
- NTND09Bx 6-Mbyte memory card
NTND09Cx 12-Mbyte memory card
- NTND10 Changeover and Memory Arbitrator (CMA) card
- QPC584L Mass Storage Interface (MSI) card
- QPC742F Floppy Disk Interface (FDI) card
- NTND15 Floppy Disk Unit (FDU)
- NTND16 Multi Disk Unit (MDU)

Note 1: With X11 release 18 and later, only STE, 21E, and RT systems support optional FDI/FDU: (QPC742F FDI, NTND15 FDU). All other systems require the MSI/MDU.

Note 2: If you are replacing an NTND09Bx 6-Mbyte card with the NTND09Cx 12-Mbyte memory card, use “Procedure 6: Performing a parallel reload” on page 47 to enter parallel mode before changing the card. **You must** sysload for the changes to take affect. Refer to *Hardware replacement* (553-3001-520) for complete instructions.

The X11 release 18 feature Multiple Appearance DN Redirection Prime automatically assigns a MADN Redirection Prime (MARP) TN when you convert your system to X11 release 18. When converting to X11 release 18, MARP is not activated until done so in LD17. Refer to *X11 features and services* (553-3001-305) and *X11 input/output guide* (553-3001-400) for a complete description.

Overlay Cache Memory allocates memory buffers for quicker overlay storage and retrieval. When converting from a previous release, this feature is not enabled until you do so in LD 17. However, when converting to a higher issue of XI 1 release 18, some memory allocation changes may take place. This does affect the amount of memory used and available when converting your system. Refer to *X11 features and services* (553-3001-305) and *X11 input/output guide* (553-3001-400) for a complete description.

Existing AML (CSL) and DCH ports keep their device number and are given an equivalent logical number and a card type (CTYP) of ESDI or DCHI. For example: CSL 9 becomes AML 9 with device number of 9 and CTYP of ESDI; and DCH 13 becomes DCH 13 with device number of 13 and CTYP of DCHI.

Asynchronous ESDI TTY ports on QPC513 ESDI cards are removed from the database.

Normal SDI ports are assumed to be on an SDI2 card type. The card type will have to be updated manually for other SDI card types. This can only be done by using the ADAN prompt with the OUT and NEW commands in LD17.

Asynchronous ESDI TTY ports on QPC757 DCHI cards convert to TTY ports with CTYP of DCHI.

XI 1 release 19

X11 release 19 introduces system management changes. Refer to *X11 software management (553-3001-300)*, *XI 1 software management (553-3001-300)*, and *X11 input/output guide (553-3001-400)* for details regarding the enhancements. Below lists some of the system features available with XI 1 release 19 and later.

- Linked overlay programs (LD10, LD11, LD20,LD32)
- Program restructuring
- Fault management
- Feature improvements
 - CPND, LAPW, and BARS
 - Speed Call, and Steering Codes
 - History file, Log file, and session file
 - I/O port lockout recovery
- System message lookup tool (option 81)
- Multi-user **login**
- Single Terminal Access
- Voice Mailbox Administration

With Voice Mailbox Administration (**VMBA**), the Meridian 1 system administrator uses Meridian 1 telephone administration overlays 10 and 11 to administer and maintain voice mailboxes (**VMBs**).

X11 release 19 introduces the system option 61C. Refer to system documentation for complete information and hardware requirements.

X11 release 19 requires the 3-disk configuration for XT and 71 systems.

If any patches reside in XI 1 release 19 software, the following information will be printed at sysload.

```

PAT000    Inserted
PAT001    Inserted
PAT003    Inserted
    
```

Use LD22 (TYPE = ISSP) to view the following printout of system patch information.

Num	Name	PRS	ID	OVL Packages
+PAT00D	JACTEST1	BV01 234	MTV2345	
+PAT001	AATEST	BV01 345	MTV2346	
-PAT002	MTVPKG68	BV01456	MTV2567	2
+PAT003	TIMEPCH	BV02678	MTV2890	22

The plus (+) sign indicates that the patch will be installed. The minus (-) sign indicates that the patch will not be installed. Patches will not be installed when the code that is being patched is not propagated on the system. Refer to *X11 input/output guide* (553-3001-400) should any other messages appear.

XI 1 release supported by machine type

Table 2 shows the X11 release associated with each system and its available release levels. The last two digits in the number column indicate the software generic (X11); the first one or two digits indicate the system type. For example, the system type for system option 71 is 12.

Table 2
Software generic by machine type

System type	x11 system number	Lowest supported X11 release	Highest supported XI 1 release
ST	1011	9	17
STE	1511	18	19
NT	1111	8	19
XT	1211	8	19
RT	1311	12	19
21	1011	15	17
21E	1511	18	19
51	1111	15	19
61	1111	15	19
61C	1811	19	19
71	1211	15	19
81	1611	18	19

Note: X11 release 15 and X11 release 18 require new hardware. Read the conversion notes for more information.

Procedure 1: Pre-conversion procedure

Read the Conversion notes section in this document before beginning your conversion procedures. The conversion procedure used depends on the release of the **Source** and **Target** software. Make sure you have all the necessary hardware and software. Save a copy of your data dumped **Source** software until you are sure that all site data converted successfully.

Use this procedure to begin all software conversions. After you have completed your conversion, as described in Procedures 2 through 10, perform the Post-conversion steps in “Procedure 12: Post-conversion procedure” on page 133.

The following items should be available before proceeding.

- the Controlled Release Bulletin for the new software
- the appropriate software and conversion media
- the disk or tape drive (as required)
- a 2 MB MDU is required for system option 71 and XT machines with X11 releases 16 and 17
- 3.5-inch 2 MB High Density (HD) floppy disks for X11 release 15 through 17
- 3.5-inch 4 MB Extra High Density (ED) floppy disks for X11 release 18
- a 4 MB MDU is required for NT, XT, 51, 61, 71 with X11 release 18
- QPC584 F4, K, or higher, for the 3-disk configuration with X11 release 16 and 17
- QPC584L is required for NT, XT, 51, 61, and 71 systems with X11 release 18 and later
- the security data cartridges required for each release if the system is equipped with disks (see “Procedure 8: Install a new data cartridge” on page 111)
- a new ROM daughterboard if required for an intermediate release or the **Target** release (see “Procedure 9: Install a new Read Only Memory card” on page 115)
- a temporary SDI card, and a local TTY or remote TTY modem are required to perform parallel reload in dual CPU systems
- new memory cards and CMAs, if required

Pre-conversion steps

- 1 Perform an overall system check. Make sure the system is performing normal call processing.

- 2 Get software information from LD22.

LD 22

REQ ISS

****** to exit overlay**

With X11 release 16.65 and later, patches do not need to be removed prior to conversion. When datadumping (EDD), an **EHM500** message is printed, rather than a list of patch numbers.

If converting from 15.53, 14.41, or earlier, you must have the patches removed prior to converting. Data corruption may occur if you do not remove the patches prior to conversion.

If a patch is included in your software, a plus sign (+) will appear next to the software issue number in LD22.

- 3 Load configuration record (LD17) to find the storage currently available in the Protected and Unprotected Data Store (PDATA and UDATA). Check the General Release Bulletin to see if additional memory cards are required for the new software or any option packages being added.
- 4 Print system data listed in Table 3. Verify all information is correct. Make corrections if necessary.
- 5 If additional memory is required for the conversion, change the MSPT, MEM, or MTYP prompts in the configuration record (LD17). See “Procedure 10: Increasing memory” on page 121.

- 6 With X11 release 14 and later, perform a template audit. The template audit reviews the templates in your system and cleans up any duplicate or corrupted templates. The following is an example of the information generated by the system during the audit. **THIS MAY TAKE AN EXTENDED PERIOD OF TIME ON LARGE SYSTEMS.** It is recommended that this be run during a low traffic period.

WARNING

DO NOT ABORT THIS OVERLAY UNTIL THE AUDIT IS COMPLETE. IF THE OVERLAY IS INTERRUPTED, DATA WILL BE CORRUPTED.

LD 01 The audit begins as soon as **LD01** is entered.

TEMPLATE AUDIT

STARTING PBX TEMPLATE SCAN

TEMPLATE 0001 USER COUNT LOW CHECKSUM OK

TEMPLATE 0002 USER COUNT HIGH CHECKSUM OK

TEMPLATE 0003 NO USERS FOUND

STARTING SL1 TEMPLATE SCAN

TEMPLATE 0001 USER COUNT OK CHECKSUM OK

.

.

TEMPLATE 0120 USER COUNT OK CHECKSUM OK

TEMPLATE AUDIT COMPLETE

- 7 To ensure backup, data dump to the **Source** system media currently in the drive. If the data dump is not successful, do not proceed with the conversion. The data dump problem must be corrected. Contact your NT technical support. If an MDU is equipped, disable and remove the QPC584 MSI card. Turn switch 3 position 4 (SW 3-4) ON. Reinsert and enable the card.

LD 43

EDD DATADUMP COMPLETE (or DATABASE BACKUP COMPLETE) is printed when the data dump has been successfully completed. Investigate any EDD messages. Refer to XII *input/output guide* (553-3001-400).

- 8 If parallel reload is to be used during the conversion, go to “Procedure 6: Performing a parallel reload” on page 47. If you are converting to X11 release 18, go to “Procedure 7: Converting X11 release 15 through 17 to X11 release 18 or 19” on page 73. Be sure to perform the correct parallel reload procedure for your system.

Note: To monitor the **CPUs** during parallel reload procedures, install a temporary Serial Data Interface (SDI) card, and connect a local TTY (or modem for remote TTY access). Refer to the parallel reload procedures for more information.

- 9 When parallel reloading option 61C/81 systems, be sure the hard disks are synchronized.

LD 137

SYNC Synchronize both hard disks
This may take as long as 40 minutes. This must be done prior to beginning the parallel reload.

If parallel reload is not required (single CPU system) then perform one or more of the following conversion procedures. Remember to perform the Post-conversion steps (“Procedure 12: Post-conversion procedure” on page 133) to complete the conversion.

- Procedure 2: Converting from X11 release 8 or 9 to X11 release 10 on page 31
- Procedure 3: Convert from one X11 release to a later release on page 33
- Procedure 4: Convert to later issue of the same release on page 39
- Procedure 5: Using a 3-disk configuration on page 43
- Procedure 8: Install a new data cartridge on page 111
- Procedure 9: Install a new Read Only Memory card on page 115
- Procedure 10: Increasing memory on page 121

Items marked with asterisks (*) are required printout for conversion. Other items are recommended for a total system status.

Table 3
Print site data (Part 1 of 2)

Site data	Print command
Terminal blocks for all TNs	LD 20 REQ PRT TYPE TNB CUST <cr>
Directory Numbers	LD 20 (LD22 prior to Release 16) REQ PRT TYPE DNB CUST <cr>
Attendant Console data block for all customers	LD 20 LD 20 REQ PRT TYPE ATT, 2250 CUST <cr>
*Customer data block for all customers	LD 21 LD 21 REQ PRT TYPE CDB CUST <cr>
Route data block for all customers	LD 21 REQ PRT TYPE RDB CUST Customer number ROUT <cr> ACOD <cr>
*Configuration Record	LD 22 REQ PRT TYPE CFN

Table 3
Print site data (Part 2 of 2)

Site data	Print command
*Software Packages	LD 22 REQ TYPE PRT PKG
*Software Issue, ROM and tape ID	LD 22 REQ ISS REQ ROM REQ TID
* Peripheral software versions	LD 22 REQ PRT TYPE PSWV
ACD data block for all customers	LD 23 REQ PRT TYPE ACD CUST Customer Number ACDN ACD DN (or <CR>)
Superloop card IDs and software version (peripheral controller, superloop network and controller cards)	LD 32 IDC loop
Multi-purpose ISDN Signaling Processor (MISP) card	LD 27 REQ PRT TYPE MISP LOOP loop number (0-i 58) APPL <cr> PH <cr>
DTI/PRI data block for all customers	LD 73 REQ PRT TYPE DDB
Note: Items marked with asterisks (*) are required printout for conversion. Other items are recommended for a total system status.	

Procedure 2: Converting from XII release 8 or 9 to XII release 10

This procedure assumes that the **Source** software is XI 1 release 8 or 9, and you are currently using disk drives. For systems with earlier software releases, use the appropriate Controlled Release Bulletin.

Refer to *Upgrade system installation* (553-3001-250) to determine if the following hardware is required.

- ROM cards for intermediate and Target releases
- data cartridges for intermediate and Target releases when equipped with disk drives
- additional memory cards
- Floppy and/or hard disk drive assemblies required for XI 1 release 10.

CAUTION

If the sysload is not successful, do not proceed with the conversion.

Reinstall your **Source** media, replace any changed hardware, and reload the system. Contact your technical support.

Convert to XI 1 release 10

- 1 Perform the steps in the Pre-conversion procedure (“Procedure 1: Pre-conversion procedure” on page 23) if not already done.
- 2 If an MDU is equipped, disable and remove the **QPC584 MSI** card. Set switch 3 position 4 (**SW3-4**) **OFF** (if not already done).
- 3 Reinsert the card, and set the **ENB/DIS** faceplate switch to **ENB**.
- 4 Insert the conversion disk into drive “A,” and load the conversion program (**LD66**).
LD 66
- 5 When the “**CDD000**” prompt is given, be sure the messages output to the **TTY** indicate the desired release, and remove the conversion disk.
- 6 Insert the **Target** disks. Be sure the **Target** disk labels match the Conversion disk labels. System disks goes into drives “A,” and “B.”
Both Target disks must be inserted.
- 7 Set the **QPC584/QPC742** card **ENB/DIS** faceplate switch to **DIS**.
- 8 Remove the **QPC584/QPC742** card and install the new data cartridge.
- 9 Reinsert the **QPC584/QPC742** and set the **ENB/DIS** switch to **ENB**.
- 10 Start conversion data dump with the command **CDD**.
- 11 When the conversion is complete, **DONE** is printed on your **TTY**. Replace the ROM card if necessary. See “Procedure 9: Install a new Read Only Memory card” on page 115.
- 12 Do a sysload by pressing the CPU **RLD** button. When performing a parallel reload, sysload in CPU 1 only (see “Procedure 6: Performing a parallel reload” on page 47).
- 13 When the sysload and initialization are complete, data dump to the disks inserted in step 6.
- 14 Repeat steps 4 through 13 for each intermediate software release, if necessary.

After you have converted to **X11** release 10, use “Procedure 3: Convert from one **X11** release to a later release” on page 33 to convert to **X11** release 12 or later

Procedure 3: Convert from one XI 1 release to a later release

This procedure applies for software conversions between individual releases. Your **Source** software must be XI 1 release 10 or later. Refer to Table 2 for the highest XI 1 release available for each system type.

There are two different procedures in this section: converting with Automatic **Inline** Conversion, and converting without Automatic **Inline** Conversion. Automatic **Inline** Conversion from XI 1 release 10 is supported to XI 1 release 14 or 1.5 only. To go to X 11 release 12 or 13, you must go through X 11 release 11 first, using the second procedure in this section. You can use Automatic **Inline** from XI 1 release 11 to 12 or later.

Table 4 shows the XI 1 releases supported.

Table 4
Automatic Inline Conversion

From (minimum) Source release/issue	Directly to Target release
10.09	14, 15
11.20	12, 13, 14, 15
12.32	13, 14, 15
13.34	14, 15
14.41	15
15.55	16, 17, 18
16.36	17, 18
17.58	18, 19
18.20	19

Convert with Automatic Mine Conversion (X11 release 14 and later)

- 1 Perform the steps in the Pre-conversion procedure (“Procedure 1: Pre-conversion procedure” on page 23) if not already done.
- 2 Manually load overlay 43 from the **Source** disk. When you see **EDD000**, disable the faceplate switch on the **QPC584/QPC742**.
- 3 Remove the **QPC584/QPC742** card. If an MDU is equipped, turn switch 3 position 4 (**SW3-4**) on the **QPC584** card to **OFF**.
- 4 Install the new data cartridge on the **QPC584/QPC742** card in the active CPU, and reinsert the card.
- 5 Set the **QPC584/QPC742** card **ENB/DIS** faceplate switch to **ENB**.
- 6 Remove both **Source** disks and insert **both Target** disks. Dump to the **Target** disks.

DATADUMP COMPLETE output when data dump is successful.

BACKING UP DISK B1 output when hard drive is equipped

EDD034

BACKUP FAILED This appears when the **QPC584** card has **SW3-4 OFF**. This is not an error. signifies completion of data dump

If the data dump is not successful, do not proceed with the conversion. Contact your technical support.

- 7 Replace the ROM card if necessary. See “Procedure 9: Install a new Read Only Memory card” on page 115.
- 8 Perform a sysload by pressing the **RLD** button. The data is automatically converted.

- 9 The following sysload and initialization messages are output on the **TTY**:
If the sysload or initialization is not successful, do not proceed with the conversion. Contact your technical support personnel. If you need to return to the original software, reinstall your source disks.

SYS000
SYS092
SYS093
SYS511
SYS091
SYS090

DONE

IN1000

CAUTION

System information will be lost.

With Incremental Software Management (ISM) in X11 release 15.55 and higher, if SYS message 4327, 4328, 4329, or 4330 appears at sysload, reload **Source** system disks and restore any changed hardware. Order ISM disks with sufficient system parameters configured.

- 10 Data dump to two backup disk sets. **Login** and load the Data dump program (LD43). Insert the backup disks and dump to the disks.
- EDD **DATADUMP COMPLETE** is output when the data dump has been successfully completed

If you are doing parallel reload, go to “Completing the parallel reload on the NT/RT/61” on page 53 for your system in **Procedure 6: Performing a parallel reload** on page 47.

If you are on a single CPU system, go to **Procedure 12: Post-conversion procedure on** page 133.

Convert without Automatic Mine Conversion (XI 1 releases 12 and 13)

- 1 Perform the steps in the Pre-conversion procedure (“Procedure 1: Pre-conversion procedure” on page 23) if not already done.
- 2 If an MDU is equipped, remove the QPC584 card and turn switch 3 position 4 (SW3-4) to OFF (if not already done).
- 3 Reinsert the card, and set the QPC584 card ENB/DIS faceplate switch to ENB.
- 4 Insert the conversion disk in drive “A.”
- 5 Load the Conversion program (LD66).
LD 66
- 6 When the “CDD000” prompt is given, be sure the messages output to the TTY indicate the desired release, and remove the conversion disk.
- 7 Insert the **Target** disks. Be sure the **Target** disk labels match the Conversion disk labels. System disks goes into drives “A,” and “B.”
Both Target disks must be inserted.
- 8 Set the QPC584/QPC742 ENB/DIS faceplate switch to DIS.
- 9 Remove the QPC584/QPC742 card and install the new data cartridge.
- 10 Reinsert the card and set the ENB/DIS faceplate switch to ENB.
- 11 Start conversion data dump with the command **CDD**.
- 12 When the conversion data dump is complete, **DONE** is printed on the TTY. Replace the ROM card if necessary. See “Procedure 9: Install a new Read Only Memory card” on page 115.
- 13 Perform a sysload by pressing the CPU RLD button. When performing a parallel reload, sysload in CPU 1 only (see “Procedure 6: Performing a parallel reload” on page 47).

- 14 When the sysload and initialization are complete, data dump to the **Target** disks inserted in step 7.

CAUTION

If the sysload is not successful, do not proceed with the conversion.

Reinstall your **Source** media, replace any changed hardware, and reload the system. Contact your technical support.

If you are doing parallel reload, go to “Completing the parallel reload on the NT/RT/61” on page **53** for your system in **Procedure 6: Performing a parallel reload** on page 47.

If you are on a single CPU system, go to **Procedure 12: Post-conversion procedure** on page 133.

Procedure 4: Convert to later issue of the same release

When upgrading from one issue to another within the same release, no additional conversion media is needed.

With X11 release 16.65 and later, patches do not need to be removed prior to conversion. When datadumping (EDD), an EHM500 message is printed, rather than a list of patch numbers.

If converting from 15.53, 14.4.1, or earlier: you must have the patches removed prior to converting. Data corruption may occur if you do not remove the patches prior to conversion.

If a patch is included in your software, a plus sign (+) will appear next to the software issue number in LD22.

Be sure you insert the A disk into drive A, and the B disk in drive B.

- 1 Perform the steps in the Pre-conversion procedure (“Procedure 1: Pre-conversion procedure” on page 23) if operating a single CPU system. Perform the parallel reload procedure (“Procedure 6: Performing a parallel reload” on page 47) if operating a dual CPU system.
- 2 Load overlay 43 from the **Source** disk.

LD 43

EDDOOO indicates overlay 43 is loaded

- 3 When you see EDDOOO, disable the QPC584/QPC742 card in CPU 1 by setting the ENB/DIS faceplate switch to DIS.

- 4 If an MDU is equipped, remove the QPC584 card and set switch 3 position 4 (SW 3-4) OFF (if not already done).
If a QPC742 is equipped, remove it.
- 5 Remove the **Source** data cartridge from the QPC584/QPC742 card. Replace it with the **Target** data cartridge.
- 6 Reinsert the QPC584/QPC742 card and set the ENB/DIS faceplate switch to ENB.
- 7 Remove both **Source** disks, and insert **both Target** disks (A1 and B1). Dump to the **Target** disks.

EDD

DATADUMP COMPLETE output when data dump is successful.

BACKING UP DISK B1 output when hard drive is equipped

EDD034

BACKUP FAILED This appears when the QPC584 card has SW3-4 OFF. This is not an error.

[.] signifies completion of data dump

If the data dump is not successful, do not proceed with the conversion. Contact your technical support personnel.

- 8 On a single CPU system, perform a sysload by pressing the RLD button. The data is automatically converted. Conversion is complete when you see the DONE message.

On a dual CPU system, sysload CPU 1 by pressing the RLD button on CMA 1 only.

- 9 The following sysload and initialization messages are output on the TTY connected to CPU 1.

SYS000
SYS092
SYS093
SYS511
SYS091
SYS090

DONE

IN1000

CAUTION

System information will be lost.

With Incremental Software Management (ISM) in X11 release 15.55 and higher, if SYS message 4327, 4328, 4329, or 4330 appears at sysload, sysload **Source** system disks. Order ISM disks with sufficient system parameters configured. Contact your Northern Telecom representative.

If you are doing parallel reload, go to “Completing the parallel reload on the NT/RT/61” on page 53 for your system in **Procedure 6: Performing a parallel reload** on page 47.

If you are on a single CPU system, go to **Procedure 12: Post-conversion procedure** on page 133 for post-conversion procedures.



Procedure 5: Using a 3-disk configuration

X 11 releases 17 and 19 require a 3-disk configuration for XT and 7 1 systems. This method takes place with three floppy disks labeled A 1, A2, and B 1. A2 is a continuation of A1.

To support this procedure, QPC584 vintage F4, K or later is required. Other vintages cause the system to Initialize when attempting to load an overlay not located on the A1 disk.

The following overlays can be accessed from the A1 disk. In the event of hard drive failure, these overlays can be accessed from the floppy. Other LDs may also be available, depending on the disk space available, but only these listed are guaranteed to be accessible.

LDs 17, 22, 32, 34, 37, 43, 44, 45, 47, 48, 60, 96 with X1 1 release 17

LDs 17, 22, 32, 34, 37, 43, 44, 60, 96 with X11 release 19 and later

- 1 Load LD43 from the **Source** release disk.
- 2 Remove the QPC584 card and set switch 3 position 4 (SW 3-4) OFF (if not already done).
- 3 Replace the data cartridge. Remove the **Source** data cartridge from the QPC584 card. Replace it with the **Target** data cartridge.
- 4 Reinsert the QPC584 card and set the ENB/DIS faceplate switch to ENB.
- 5 Put **Target** disks A 1 and B 1 into the floppy disk drives.

- 6 Enter EDD to initiate a data dump to disks A1 and B1.
DATADUMP COMPLETE output when data dump is successful.
BACKING UP DISK B1 output when hard drive is equipped
EDD034
BACKUP FAILED This appears when the QPC584 card has SW3-4 OFF. This is not an error.
[.] signifies completion of data dump

If the data dump is not successful, do not proceed with the conversion.
Contact your technical support personnel.
- 7 Replace the ROM card if necessary. See “Procedure 9: Install a new Read Only Memory card” on page 11.5.
- 8 Sysload from the **Target** disks. The system does not prompt you to insert the A2 disk, because it is not needed for sysload.

- 9 This step is required for new hard drives only. If you are reconfiguring an existing hard drive, go on to step 11. Refer to XI *Input/output guide* (553-3001-400) for complete details concerning these prompts.

X11 release 17 and earlier

LD 17

REQ CHG

TYPE CFN

IOTB YES

ADAN CHG HDK 0

NUMD 1, (2)

FTYP (3), 3S

X11 release 18 later

LD 17

REQ CHG

TYPE CFN

ADAN CHG HDK 0

NUMD 1, (2)

F T Y P 3S

You can now restore the hard disk from the floppies with the following steps. Data dump to 2 sets of the backup disks only. Leave one set of the **Target** disks unconverted, with no database, until you are sure the system converted successfully.

- 10 If you are performing a parallel reload, go to “Completing the parallel reload on the NT/RT/61” on page 53 for your system in “Procedure 6: Performing a parallel reload” on page 47.
- 11 Load LD43 from the **Source** disk.
- 12 Type RES to initiate the floppy to hard disk restore.
- 13 After completing the A1 restore, the system prompts you to insert A2. The B1 disk restore is performed automatically after the A2 restore is complete. After completing the restore, reinsert A1 into the A disk drive.
- 14 If an MDU is equipped, set the QPC584 ENB/DIS faceplate switch to DIS, and remove the card.

15 Turn switch 3-4 to ON, reinsert the card, and set the **ENB/DIS** switch to ENB.

16 Enter EDD to **datadump** for backups.

The upgrade is now complete. From this point on, further data dumps will affect both hard drive and floppies.

Now go to Procedure 12: Post-conversion procedure on page 133.

Procedure 6: Performing a parallel reload

These parallel reload procedures are for software conversions only. Do not use this procedure for any other purpose.

This section shows parallel reload procedures for specific machine types. Be sure to use the correct procedure for your machine type.

These procedures must only be performed by someone with knowledge of the system and these procedures. Follow these procedures exactly.

Parallel reloads can be done from either CPU. For the purposes of this document, we begin with CPU 0.

To better understand the process, read through the entire procedure before you begin.

CAUTION

Check your CPU labels

Be sure you are working with CPU 0, or CPU 1 as designated throughout the parallel reload procedures.

Parallel reload the NT/RT/61

- 1 Perform the Pre-conversion steps as shown in “Procedure -1: Pre-conversion procedure” on page 23.
- 2 Load overlay 35 and get the status of the CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

LD 35

STAT CPU	Get the status of the CPUs
STAT CMA	Get CMA status
STAT EXT	Get the extender status
STAT MEM	Get the memory status

- 3 Test and switch CPUs.

TCPU	Test the CPUs
SCPU	Switch the CPUs
- 4 Get the status of the other CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

STAT CPU	Get the status of the CPUs
STAT CMA	Get CMA status
STAT EXT	Get the extender status
STAT MEM	Get the memory status

- 5 Ensure CPU 0 is enabled (CPU 1 is idle).
- 6 If equipped, set the QPC84 Power Monitor card ENL/DIS faceplate switch to DIS. Do not remove the card.
- 7 Place CPU 0 into Maintenance by setting the MAINT/NORM faceplate switch to MAINT.
- 8 List the enabled memory. Disable the memory and CMA in CPU 1.

LENL	List enabled memory
DIS 10	Disable CPU 1 memory
DIS CMA 1	Disable CMA 1

- 9 Type **** to exit overlay.
- 10 Type **DIST**. This software disables the QPC584/QPC742 in CPU 0.
- 11 Set the QPC584/QPC742 ENB/DIS faceplate switch to DIS in CPU 0.

- 12 Get a temporary Serial Data Interface card. For option 61 systems, a Serial Data Interface paddle board may be used. Use a spare. Verify the baud rate. If it does not match the **TTY**, output characters may be garbled. Be sure the card is configured exactly as the existing maintenance TTY device.
- 13 Place the temporary **SDI** card in a vacant slot in CPU 1. If using the **SDI** paddle board, place it in slot 12 in the rear of CPU 1.
- 14 Set the temporary **SDI** card **ENB/DIS** faceplate switch to **ENB**. Connect a local TTY, or a modem for a remote TTY, to the temporary **SDI** card.
- 15 If an MDU is equipped, set the QPC584 card **ENB/DIS** faceplate switch to **DIS** in CPU 1. Remove the card and set switch 3 position 4 (**SW3-4**) **OFF**. Reinsert the card and reenable the **ENB/DIS** faceplate switch.
- 16 Place CPU 1 into Maintenance by setting the **MAINT/NORM** switch to **MAINT**. This will cause a sysload. If the sysload does not begin, press the **RLD** button on **CMA 1** **only**.

The following messages will print out on your **TTY**. The **CMA** and **SDI** lights will go out, and the disk drives will run. The following **SYS** messages will appear (may differ slightly depending on the XI 1 release). Check for dial tone following the **DONE** and **IN1000** messages.

```
SYS000  
SYS092  
SYS093  
SYS511  
SYS091  
SYS090  
SYSLOAD RLS: xx  
ISSUE: x
```

```
DONE
```

```
IN1000
```

Note: When sysload is complete, midnight (daily) routines will begin. Logging in to the system temporarily interrupts the midnight routines.

At this time you can begin your software conversion. See “Procedure 2: Converting from X11 release 8 or 9 to X11 release 10” on page 31 through “Procedure 5: Using a 3-disk configuration” on page 43.

To complete the parallel reload process, **go to [Completing the parallel reload on the NT/RT/61](#)** on page 53.

If the system fails to load, or **SYSxxxx** messages indicate data corruption, back out of the parallel reload process by performing the following steps.

Backing out of the parallel reload on the NT/RT/61

- 1 Place CPU 1 into Normal by setting the **MAINT/NORM** faceplate switch to **NORM**.
- 2 Reconnect the CRT or TTY cable to the original port. Disable and unseat the temporary **SDI** card from CPU 1.

If an MDU is equipped, return the QPC584 in CPU 1 to its original state: disable, remove, and set **SW3-4** to **ON**. Reinsert the card.

- 3 Set the **QPC584/QPC742** card **ENB/DIS** faceplate switch to **ENB** in CPU 0.
- 4 Log in and type **ENLT**. This software enables the **QPC584/QPC742** card.
- 5 List disabled memories. Enable the **CMA**, and memory in CPU 1. Enabling the memories may take several minutes.

LD 35

LENL	List the enabled memories
ENL CMA 1	Enable the CMA in CPU 1
ENL 10	Enable the memory in CPU 1

- 6 Get the status of the CPU, CMA, extenders, and memory. Ensure all common equipment is enabled. Clear the displays and minor alarm.

STAT CPU	Get the status of the CPUs
STAT CMA	Get CMA status
STAT EXT	Get the extender status
STAT MEM	Get the memory status
CDSP	Clear the displays
CMIN ALL	Clear all minor alarm

- 7 Place CPU 0 into Normal by setting the **MAINT/NORM** switch to **NORM**.
- 8 Test twice and switch CPUs.

TCPU	Test the CPUs
TCPU	Test the CPU again
SCPU	Switch the CPUs
CDSP	Clear display in CPU 1
****	Get out of overlay

9 Type **ENLT**. This software enables the QPC584/QPC742 card.

10 Load overlay 35. Test and switch CPUs.

LD 35

TCPU

Test the CPUs

SCPU

Switch the CPUs

11 Type ******** to exit overlay.

12 Set the QPC84 Power Monitor card **ENB/DIS** faceplate switch to ENB (if equipped).

You are now out of the parallel reload process. Verify system operation. Refer to **Procedure 12: Post-conversion procedure** on page 133.

Completing the parallel reload on the NT/RT/61

When you have finished converting the software according to Procedures 2 through 5, use these steps to complete the parallel reload process.

- 1 Log in to the system on CPU 1.
- 2 Set the time and date in LD02. Note that if Call Detail Recording (CDR) is used system message ERR225 will appear. This is normal.

Note: The system stops time when coming out of parallel reload. Up to 90 seconds may be lost. Verify the time when this procedure is complete.

LD 02

STAD dd mm yyyy hh mm ss Set Time and Date

dd = day (for example, 05 for the fifth)

mm= month (for example, 09 for September)

yyy = year (last 2 digits or all four, for example 92 or 1992)

hh hour (in 24-hour time, for example, 13:00 for 1:00 pm)

mm= minute (for example, 25)

ss seconds (for example, 00)

- 3 Load overlay 22 and print **Target** peripheral software version. The **Source** peripheral software version was printed in the Pre-conversion procedure. If there is a difference between the **Source** and **Target** peripheral software version, a forced download will occur during initialization when coming out of parallel reload. The system initialization will take longer and established calls on IPE will be dropped.

LD 22

REQ	PRT
TYPE	PSWV

- 4 Disable and unseat the temporary SDI card from CPU 1. Reconnect the CRT or TTY cable to the original port.

CAUTION

Call processing will be interrupted

Perform these next steps carefully. This is the point at which your service is interrupted. Calls in process will be interrupted, especially if Peripheral Software Download takes place.

Perform the next 2 steps in succession.

This is when call processing is interrupted; some calls may be dropped.

5 Place CPU 0 into Normal by setting the **MAINT/NORM** faceplate switch to **NORM**.

6 Initialize CPU 1 by pressing the **MAN INT** button.

If the system does not initialize within 20 seconds, press the **MAN INT** button one more time.

Some cards require peripheral software download after initialization. When these cards are present and the peripheral software versions have changed, wait for **PSDL** completion messages before continuing.

7 Test call processing. This includes, but is not limited to, the following.

Make internal, external, and network calls.
Check attendant console activity.
Check **DID** trunks.

8 Log back in and verify time and date. Update the time and date if necessary.

LD 02

TTAD	Verify time and date
STAD dd mm yyyy hh mm ss	Set Time and Date
TTAD	Verify time and date

9 List disabled memory. Enable **CMA**, and memory in CPU 0. Enabling the memory may take several minutes.

LD 35

LDIS	List disabled memory
ENL CMA 0	Enable CMA 0
ENL 00	Enable the memory in CPU 0

10 Clear the display, and minor alarm.

CDSP	Clear the displays on CPU 1
CMAJ	Clear major alarm
CMIN ALL	Clear minor alarm

11 Place CPU 1 into Normal by setting the **MAINT/NORM** faceplate switch to **NORM**.

- 12 Get the status of the CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

STAT CPU	Get the status of the CPUs
STAT CMA	Get CMA status
STAT EXT	Get the extender status
STAT MEM	Get the memory status

- 13 Test and switch CPUs. Clear the display and test again.

TCPU	Test the CPUs
SCPU	Switch the CPUs
CDSP	Clear the displays
TCPU	Test the CPUs
SCPU	Switch the CPUs

- 14 Get the status of the CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

STAT CPU	Get the status of the CPUs
STAT CMA	Get CMA status
STAT EXT	Get the extender status
STAT MEM	Get the memory status

- 15 Type ******** to exit overlay.
- 16 Remove the QPC584/QPC742 card. Replace the **Source** data cartridge with the **Target** cartridge. Reinsert the card.
- 17 Set the QPC584/QPC742 card ENB/DIS faceplate switch to ENB in CPU 0.
- 18 Type **ENLT**. This software enables the QPC584/QPC742 card.
- 19 Load an overlay to verify data cartridge operation.
- 20 Set the QPC84 Power Monitor card ENB/DIS faceplate switch to ENB, if equipped.

You are now done with your parallel reload.

Now go to Procedure 12: Post-conversion procedure on page 133.

Parallel reload the XT/71

- 1 Perform the Pre-conversion steps as shown in “Procedure 1: Pre-conversion procedure” on page 23.
- 2 Load overlay 35 and get the status of the CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

LD 35

STAT CPU	Get the status of the CPUs
STAT CMA	Get CMA status
STAT EXT	Get the extender status
STAT MEM	Get the memory status
- 3 Test and switch CPUs.

TCPU	Test the CPUs
SCPU	Switch the CPUs
- 4 Get the status of the other CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

STAT CPU	Get the status of the CPUs
STAT CMA	Get CMA status
STAT EXT	Get the extender status
STAT MEM	Get the memory status
- 5 Ensure CPU 0 is enabled (CPU 1 is idle).
- 6 If equipped, set the QPC84/QPC173 Power Monitor card (in the CPU cabinet) ENL/DIS faceplate switch to DIS. Do not remove the card.
- 7 Place CPU 0 into Maintenance by setting the MAINT/NORM faceplate switch to MAINT.
- 8 List the enabled memories. Then disable the memories and CMA in CPU 1.

LENL	List enabled memories
DIS 10	Disable CPU 1 memory (10, 11, 12 if equipped)
DIS CMA 1	Disable CMA 1
- 9 Set the QPC215 Segmented Bus Extenders (SBE) ENB/DIS faceplate switch to DIS in CPU 1.

- 10 If using the QPC775 Clock Controller card, load overlay 60 and software disable clock 1. Then hardware disable clock controller 1.

LD 60

SSCK 0	Get the status of clock 0.
SSCK 1	Get the status of clock 1.
SWCK	Switch system clock to make clock 0 active (if necessary).
DIS CC 1	Disable clock controller 1.

Set the QPC775 ENB/DIS faceplate switch to DIS in CPU 1.

- 11 Type ******** to exit overlay.
- 12 Type **DIST**. This software disables the QPC584/QPC742 in CPU 0.
- 13 Set the QPC584/QPC742 ENB/DIS faceplate switch to DIS in CPU 0.
- 14 Get a temporary Serial Data Interface card. Use a spare. Verify the baud rate. If it does not match the **TTY**, output characters may be garbled. Be sure the card is configured exactly as the existing maintenance TN device.
- 15 Place the temporary SDI card in any vacant **non-memory** slot in CPU 1.
- 16 Set the temporary SDI card ENB/DIS faceplate switch to ENB. Connect a local **TTY**, or a modem for a remote TTY, to the temporary SDI card.
- 17 If an MDU is equipped, set the QPC584 card ENB/DIS faceplate switch to DIS in CPU 1. Remove the card and set switch 3 position 4 (**SW3-4**) OFF. Reinsert the card and reenale the ENB/DIS faceplate switch.

- 18 Set the **MAINT/NORM** switch to **MAINT** in CPU 1. This will cause a sysload. If the sysload does not begin, press the **RLD** button on **CMA 1 only**.

The following messages will print out on your TTY. The **CMA** and **SDI** lights will go out, and the disk drives will run. The following **SYS** messages will appear (may differ slightly depending on the **X1 1** release). Check for dial tone following the **DONE** and **INI000** messages.

```
SYS000  
SYS092  
SY so93  
SYS511  
SY so91  
SYS090  
SYSLOAD RLS: xx  
ISSUE: x
```

```
DONE
```

```
INI000
```

Note: When sysload is complete, midnight (daily) routines will begin. Logging in to the system temporarily interrupts the midnight routines.

At this time you can begin your software conversion. See Procedures 2 through 5 in this document.

To complete the parallel reload process, go to **Completing the parallel reload on the XT/71** on page 61.

If the system fails to load, or **SYSxxxx** messages indicate data corruption, back out of the parallel reload process by performing the following steps.

Backing out of the parallel reload on the XT/71

- 1 Place CPU 1 into normal with the **MAINT/NORM** faceplate switch.
- 2 Reconnect the CRT or TTY cable to the original port. Disable and unseat the temporary **SDI** card from CPU 1.

If an MDU is equipped, return the **QPC584** in CPU 1 to its original state: disable, remove, and set **SW3-4** to **ON**. Reinsert and enable the card.
- 3 Set the **QPC584/QPC742** card **ENB/DIS** faceplate switch to **ENB** in CPU 0.
- 4 Log in and type **ENLT**. This software enables the **QPC584/QPC742** card.
- 5 List disabled memories. Enable the **CMA**, and memories in CPU 1. Enabling the memories may take several minutes.

LD 35

LENL	List the enabled memories
ENL CMA 1	Enable the CMA in CPU 1
ENL 10	Enable the memory in CPU 1 (10, 11, 12 if equipped)

- 6 Get the status of the CPU, CMA, extenders; and memory. Ensure all common equipment is enabled. Clear the displays and minor alarm.

STAT CPU	Get the status of the CPUs
STAT CMA	Get CMA status
STAT EXT	Get the extender status
STAT MEM	Get the memory status
CDSP	Clear the displays
CMIN ALL	Clear all minor alarm

- 7 Set the **QPC215 SBE ENB/DIS** faceplate switch to **ENB** in CPU 1.
- 8 Place CPU 0 into Normal by setting the **MAINT/NORM** faceplate switch to **NORM**.
- 9 Test twice and switch CPUs.

TCPU	Test the CPUs
TCPU	Test the CPU again
SCPU	Switch the CPUs
CDSP	Clear display in CPU 1
****	Get out of overlay

10 Type **ENLT**. This software enables the QPC584/QPC742 card.

11 Load overlay 35. Test and switch CPUs.

LD 35

TCPU	Test the CPUs
SCPU	Switch the CPUs

12 Type ******** to exit overlay.

13 If using the QPC775 Clock Controller card, hardware enable clock controller 1. Load overlay 60 and enable clock 1 in the software.

Set the QPC775 ENB/DIS faceplate switch to ENB in CPU 1.

LD 60

ENL CC 1	Enable clock controller 1.
SSCK 0	Get the status of clock 0.
SSCK 1	Get the status of clock 1.

If using the QPC471, Clock Controller card, and PRI/DTI is equipped, load overlay 60. Check clock tracking status. If necessary, force the clock to track on primary reference.

LD 60

SSCK 0	Get the system clock status for clock 0.
SSCK 1	Get the system clock status for clock 1.
	If the clock is not tracking, DTI061 is printed.
TRCK PCK	Force the clock to track on primary reference.

14 If equipped, set the QPC84/QPC173 Power Monitor card (in the CPU cabinet) ENB/DIS faceplate switch to ENB.

You are now out of the parallel reload process. Verify system operation. Refer to **Procedure 12: Post-conversion procedure** on page 133.

Completing the parallel reload on the XT/71

When you have finished converting the software according to Procedures 2 through 5, use these steps to complete the parallel reload process.

- 1 Log in to the system on CPU 1.
- 2 Set the time and date in LD02. Note that if Call Detail Recording (CDR) is used system message ERR225 will appear. This is normal.

Note: The system stops time when coming out of parallel reload. Up to 90 seconds may be lost. Verify the time when this procedure is complete.

LD 02

STAD dd mm yyyy hh mm ss Set Time and Date

dd = day (for example, 05 for the fifth)

mm = month (for example, 09 for September)

yyyy = year (complete, for example, 1991)

hh = hour (in 24-hour time, for example, 13:00 for 1:00 pm)

mm = minute (for example, 25)

ss = seconds (for example, 00)

- 3 Load overlay 22 and print **Target** peripheral software version. The **Source** peripheral software version was printed in the Pre-conversion procedure. If there is a difference between the **Source** and **Target** peripheral software version, a forced download will occur during initialization when coming out of parallel reload. The system initialization will take longer and established calls on IPE will be dropped.

LD 22

REQ PRT
TYPE PSWV

- 4 If using the QPC775 Clock Controller card, hardware enable clock controller 1. Load overlay 60 and enable clock 1 in the software.

Set the QPC775 ENB/DIS faceplate switch to ENB in CPU 1.

LD 60

ENL CC 1 Enable clock controller 1.
SSCK 0 Get the status of clock 0.
SSCK 1 Get the status of clock 1.

- 5 Disable and unseat the temporary SDI card from CPU 1. Reconnect the CRT or TTY cable to the original port.
- 6 Set the QPC215 SBEs ENB/DIS faceplate switches to ENB in CPU 1.

CAUTION
Call processing will be interrupted

Perform the next steps carefully. This is the point at which your service is interrupted. Calls in process will be interrupted, especially if Peripheral Software Download takes place.

Perform the next 2 steps in succession.
This is when call processing is interrupted; some calls may be dropped.

- 7 Set the QPC215 SBE ENB/DIS faceplate switch to DIS in CPU 0.
- 8 Initialize CPU 1 by pressing the MAN INT button.

If the system does not initialize within 20 seconds, press the MAN INT button again.

Some cards require peripheral software download after initialization. When these cards are present and the peripheral software versions have changed, wait for PSDL completion messages before continuing.
- 9 Test call processing. This includes, but is not limited to, the following.
 - Make internal, external, and network calls.
 - Check attendant console activity.
 - Check DID trunks.
- 10 Set the QPC215 SBE ENB/DIS faceplate switch to ENB in CPU 0.
- 11 Place CPU 0 into Normal by setting the MAINT/NORM faceplate switch to NORM.
- 12 Log back in and verify time and date. Update the time and date if necessary.

LD 02

TTAD	Verify time and date
STAD dd mm yyyy hh mm ss	Set Time and Date
TTAD	Verify time and date

- 13 List disabled memories. Enable CMA, and memories in CPU 0. Enabling the memories may take several minutes.

LD 35

LDIS	List disabled memories
ENL CMA 0	Enable CMA 0
ENL 00	Enable the memory in CPU 0 (00, 01, 02 if equipped)

- 14 Clear the display, and minor alarm.

CDSP	Clear the displays on CPU 1
CMAJ	Clear major alarm
CMIN ALL	Clear minor alarms for all customer

- 15 Place CPU 1 into Normal by setting the MAINT/NORM faceplate switch to NORM.

- 16 Get the status of the CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

STAT CPU	Get the status of the CPUs
STAT CMA	Get CMA status
STAT EXT	Get the extender status
STAT MEM	Get the memory status

- 17 Test and switch CPUs. Clear the display and test again.

TCPU	Test the CPUs
SCPU	Switch the CPUs
CDSP	Clear the displays
TCPU	Test the CPUs
SCPU	Switch the CPUs

- 18 Get the status of the CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

STAT CPU	Get the status of the CPUs
STAT CMA	Get CMA status
STAT EXT	Get the extender status
STAT MEM	Get the memory status

- 19 Type **** to exit overlay.

- 20 Remove the **QPC584/QPC742** card. Replace the **Source** data cartridge with the **Target** cartridge. Reinsert the card.
- 21 Set the **QPC584/QPC742** card **ENB/DIS** faceplate switch to **ENB** in CPU 0.
- 22 Type **ENLT**. This software enables the **QPC584/QPC742** card.
- 23 If using the **QPC471** Clock Controller card and **PRI/DTI** is equipped, load overlay 60. Check clock tracking status. If necessary, force the clock to track on primary reference.

LD 60

SSCK 0

Get the system clock status for clock 0.

SSCK 1

Get the system clock status for clock 1.

If the clock is not tracking, DT1061 is printed.

TRCK PCK

Force the clock to track on primary reference.

- 24 Set the **QPC84/QPC173** Power Monitor card (in CPU cabinet) **ENB/DIS** faceplate switch to **ENB**, if equipped.

You are now done with your parallel reload.

Go to Procedure 12: Post-conversion procedure on page 133.

Parallel reload the 61C/81

The option 81 is available with X11 release 18 and later. The option 61C is available with X11 release 19 and later.

This procedure is for software conversions and **upissues** only. It is not an installation, upgrade, or maintenance procedure. Refer to system documentation for complete details regarding the option 61C/81.

Before beginning this procedure, the **CMDUs** must be synchronized. Refer to *X11 input/output guide (553-3001-400)* for synchronization information.

- 1 Perform the Pre-conversion steps as shown in “Procedure 1: Pre-conversion procedure” on page 23.
- 2 Load overlay 137 and get the status of the hard disks to be sure they are synchronized. If not, synchronize them before proceeding.

LD 137

STAT	Get the status of the hard disks
SYNC	Synchronize the hard disks (if necessary) Synchronization may take up to 40 minutes

- 3 Load overlay 135 and get the status of the **CPs**, **CNIs**, and memories.

LD 135

STAT CPU	Get the status of both CPs and memories
STAT CNI	Get the status of all configured CNIs

- 4 Test the standby (inactive) **CP**. Then switch **CPs**, and test again.

TEST CPU	Test the standby (inactive) CP
SCPU	Switch CPs
TEST CPU	Test the standby (inactive) CP

Note: Testing the **CPs** can take up to 90 seconds for each test. When the test is complete, the memories are automatically synchronized.

- 5 Be sure **CP 0** is active and **CP1** is standby. You may need to switch **CPs** again.

STAT CPU

- 6 Verify that CMDU 0 is active. You may need to switch CMDU.
LD 137
STAT Get the status of CMDU and IOP
SWAP Switch CMDU (if necessary)
- 7 Connect a terminal to the CPIO port in Core 1 to J25 of the I/O panel at the back of the core. Be sure it is configured as follows. The recommended baud rate is 9600, to be the same as the CPIO port.
 - 7 bit even parity
 - 1 stop bit
 - full duplex
 - XON
- 8 Place CP 0 in Maintenance by setting the **Maint/Norm** switch to **Maint**.
- 9 In Core 1, disable the **NT6D65** Core to Network Interface (CNI) cards by setting the **Enb/Dis** faceplate switches to **Dis**.
- 10 In Core 1, disable the **NT6D63** I/O Processor (IOP) card by setting the **Enb/Dis** faceplate switch to **Dis**. Remove the IOP card in core 1 and replace the QMM42 data cartridge with the **Target** cartridge.
- 11 In Core 1, reseal the IOP card, and set the faceplate switch to **Enb**.
- 12 Install **Target** installation disk 1 (labeled A1) into CMDU 1 (**NT6D64**).
- 13 In Core 1, hold the **Man Rst** button in. Place Core 1 in Maintenance by setting the **Maint/Norm** switch to **Maint**. Let go of the **Man Rst** button. A sysload will begin (cold start).

At this time the Installation tool begins operating. The Installation screens guide you through the process. Choose option A from the Main Menu to upgrade software and CP and IOP ROMs.

Note: If you need more complete information, refer to “Procedure 11: Option 61C/81 installation tool” on page 125.

If the system fails to load, or system messages indicate data corruption, back out of the parallel reload process by performing the steps in “Backing out of the parallel reload on the 81.”

Backing out of the parallel reload on the 61C/81

- 1 Place the original **Source** installation disk 1 in CMDU 1 (NT6D64).
- 2 In Core 1, set the NT6D63 IOP card **Enb/Dis** faceplate switch to **Dis**. Remove the card and replace the data cartridge with the **Source** cartridge.
- 3 In Core 1, reseal the IOP card and set the faceplate switch to **ENB**.
- 4 In Core 1, press the Man **Rst** button.
- 5 Using the Installation tool, restore the CP and IOP ROMs to the **Source** ROM version. From the Main Menu select the following.

For CP ROM:

<e> to install CP ROM only

<yes> to start installation

 to install CP ROM from floppy disk

Follow screen directions until main menu returns.

For IOP ROM

<f> to install IOP ROM only

<yes> to start installation

< b> to install IOP ROM from floppy

Follow screen directions until main menu returns.

Note: Refer to “Procedure 11: Option 61C/81 installation tool” on page 125 if necessary.

- 6 Remove disk 4 from CMDU 1 (NT6D64).
- 7 Quit and reload the system. From the main menu, select:
 - <Q> to quit
 - <yes> to confirm quit
 - <a> to reboot the system
- 8 In Core 1, enable the NT6D65 CNI cards by setting the **Enb/Dis** faceplate switches to **Enb**.

- 9 On CP 1, press and release the **Man Rst** button. When **SYS700** messages appear on the CP 1 LCD display, set CP 1 **Maint/Norm** switch to **Norm**. Within 60 seconds, the LCD will display the following messages, confirming the process.

RUNNING ROM OS
ENTERING CP VOTE

An HW1533 message on Core0 CPIO or **SDI TTY** indicates the memory synchronization is complete.

- 10 In Core 0, enable the **NT6D65** CNi cards by setting the **Enb/Dis** faceplate switch to **Enb**.
- 11 Place CP 1 into Normal by setting the **Maint/Norm** switch to **Norm**, and perform a redundancy sanity test.

LD 135

TEST CPU	Test the CP
SCPU	Switch the CPs
CDSP	Clear display
TEST CPU	Test the CP
SCPU	Switch the CPs

Note: Testing the **CPs** can take up to 90 seconds for each test. When the test is complete, the memories are automatically synchronized.

- 12 Load overlay 137 and synchronize hard disks. Synchronization may take up to 40 minutes. To be sure the contents of **CMDU 0** are copied to **CMDU 1**, use the **STAT** command to verify that **CMDU 1** is disabled

LD 137

STAT CMDU	Get the status of both CMDUs
SYNC	Synchronize disks

You are now out of the parallel reload process, and have returned to the **Source** software. Go to **Procedure 12: Post-conversion procedure** on page 133.

Completing the parallel reload on the 61C/81

- 1 If necessary, replace system patches. Contact your technical support.
- 2 Load overlay 22 and print **Target** peripheral software version. The **Source** peripheral software version was printed in the Pre-conversion procedure. If there is a difference between the **Source** and **Target** peripheral software version, a forced download will occur during initialization when coming out of parallel reload. The system initialization will take longer and established calls on IPE will be dropped.

LD 22

REQ	PRT
TYPE	PSWV

- 3 In Core 1, enable the NT6D65 CNI cards by setting the **Enb/Dis** faceplate to **Enb**.

Perform the next 2 steps in succession. Call processing will be switched from Core 0 to Core 1.

CAUTION

Call processing will be interrupted

Perform the next steps carefully. This is the point at which your service is interrupted. Calls in process will be interrupted, especially if Peripheral Software Download takes place.

- 4 In Core 0, disable the NT6D65 CNI cards by setting the **Enb/Dis** faceplate switches to **Dis**.
- 5 In Core 1, press the **Man Int** button.
- 6 Test call processing. This includes, but is not limited to, the following.
 - Check for dial tone
 - Make internal, external, and network calls.
 - Check attendant console activity.
 - Check DID trunks.
 - Check any auxiliary processors

Note: From this point forward you will be updating Core 0 with **Target** software.

- 7 Move the CPIO port cable from J25 on Core 1 to J25 on Core 0.
- 8 In Core 0, disable the NT6D63 IOP card by setting the **Enb/Dis** faceplate switch to **Dis**. Remove the card and replace the **Source** data cartridge with the **Target** cartridge.
- 9 Reseat the IOP card and set the faceplate switch to **Enb**.

Note: This initiates a Warmstart on Core 0.

- 10 Insert **Target** installation disk 1 (labeled A1) into CMDU 0 (NT6D64).
- 11 On CP 0, press and release the **Man Rst** button.
- 12 Using the Installation tool, restore the CP and IOP ROMs to the **Target** ROM version. From the Main Menu select the following.

For CP ROM:

- <e> to install CP ROM only.
- <yes> to start installation.
- to install CP ROM from floppy disk.

Following screen directions until main menu returns.

For IOP ROM

- <f> to install IOP ROM only.
- <yes> to start installation.
- to install IOP ROM from floppy.

Follow screen directions until main menu returns.

Note: Refer to “Procedure 11: Option 61C/81 installation tool” on page 125 if necessary.

- 13 Remove disk 4 from CMDU0 (NT6D64).
- 14 Quit and reload the system. From the main menu, select:
 - <Q> to quit.
 - <yes> to confirm quit.
 - <a> to reboot the system.
- 15 In Core 0, enable the NT6D65 CNI cards by setting the **Enb/Dis** faceplate switches to **Enb**.

- 16 In Core 0, press and release the **Man Rst** button on CP 0. When **SYS700** messages appear on CP 0 LCD display, set CP **0 Maint/Norm** switch to **Norm**. Within 60 seconds, the LCD will display the following messages, confirming the process.

RUNNING ROM OS
ENTERING CP VOTE

An HW1533 message on Core1 CPSI or SDI TTY indicates the memory synchronization is complete

- 17 Place CP 1 into normal with the **Maint/Norm** switch and perform a redundancy sanity test.

LD 135

STAT CNI	Get status of CNI cards
STAT CPU	Get status of CPU and memories
TEST CPU	Test the CP
TEST CNI c s	Test each CNI card

Note: Testing the CPs and CNI cards can take up to 90 seconds for each test. When the CP test is complete, the memories are automatically synchronized.

- 18 Test the standby (inactive) Core. Then switch Cores, and test the other side.

TEST CPU	Test the standby (inactive) Core
SCPU	Switch Cores
TEST CPU	Test the standby (inactive) Core

Note: Testing the Cores can take up to 90 seconds for each test. When the test is complete, the memories are automatically synchronized.

- 19 Clear the display, and minor alarms on both Cores.

CDSP	Clear the displays on the Cores
CMAJ	Clear major alarm
CMIN ALL	Clear minor alarm

- 20 Get the status of the Cores, CNIs, and memories

STAT CPU	Get the status of both Cores
STAT CNI	Get the status of all configured CNIs and memories

- 21 Load overlay 137 and synchronize hard disks. Synchronization may take up to 40 minutes. To be sure the contents of CMDU 1 are copied to CMDU 0, verify that CMDU 0 is disabled.

LD 137

STAT Get the status of both CMDUs, IOPs, and redundancy
SYNC Synchronize disks

- 22 Get the status of the CMDUs and be sure CMDU 0 is active. Switch if necessary.

LD 137

STAT Get the status of CMDU and IOP
SWAP Switch CMDU (if necessary)
STAT CMDU Get the status of the CMDUs. Be sure the same CMDU and CPU are active.

- 23 Insert the **B1** disk into the active CMDU for backup. Load overlay 43 and **datadump** to the backup disks. This command creates backups for both CMDUs when redundancy is in effect, and both CMDUs have disks inserted.

LD 43

EDD DATA DUMP COMPLETE (or DATABASE BACKUP COMPLETE)

is printed when the data dump has been successfully completed. Investigate any EDD messages. Refer to *XII input/output guide* (553-3001-400).

You are now done with your parallel reload. **Go to Procedure 12: Post-conversion procedure** on page 133.

Procedure 7: Converting XI 1 release 15 through 17 to XI 1 release 18 or 19

These conversion procedures require hardware upgrades as well as software conversion. Be sure to follow the procedure for your system carefully to ensure complete system conversion.

X 11 release 15, 16, or 17 must be the Source software release before converting to XI 1 release 18. To convert to XI 1 release 19 your **Source** software must be X 11 release 17. For conversion from X 11 release 18 to 19, refer to “Procedure 6: Performing a parallel reload” on page 47.

This procedure *does not* include upgrade procedures to the option 8 1 (X 11 release 18) or the option 61C (XI 1 release 19). Refer to *Upgrade system installation* (553-3001-250) for complete upgrade information.

These conversions require upgraded memory for the NT, RT, XT, 61, and 7 1. The following hardware changes are required.

- NTND08 R O M
- QPC584L Mass Storage Interface (MSI)
- QPC742F Floppy Disk Interface (FDI)
- NTND09Bx 6-Mbyte memory card
NTND09Cx 12-Mbyte memory card
- NTND10 C M A
NTND16 Multi Disk Unit (MDU)
- NTND15 Floppy Disk Unit (FDU)

Note 1: Two NTND80 cables are required for the NTND16 MDU. Be sure this cable is available before beginning your conversion.

Note 2: With X11 release 18 and later, only STE, 21E, and RT systems support optional FDI/FDU (QPC742F FDI, NTND15 FDU). All others require the MSI/MDU.

When performing these procedures you will install the **Source** software to verify system data, then convert to the **Target** X11 release 18 hardware and software.

CAUTION

Hardware changes must be performed

To return to the previous release, you must reseat the original hardware.

Note: The option 61C is available with X11 release 19 and later only. Refer to system documentation for information regarding the option 61C and 81.

Convert the NT/61 to XI 1 release 18

- 1 Perform the Pre-conversion steps as shown in “Procedure 1: Pre-conversion procedure” on page 23.
- 2 Load overlay 3.5 and get the status of the CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

LD 35

STAT CPU	Get the status of the CPUs
STAT CMA	Get CMA status
STAT EXT	Get the extender status
STAT MEM	Get the memory status

- 3 Test and switch CPUs.

TCPU	Test the CPUs
SCPU	Switch the CPUs

- 4 Get the status of the other CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

STAT CPU	Get the status of the CPUs
STAT CMA	Get CMA status
STAT EXT	Get the extender status

- 5 Ensure CPU 0 is enabled (CPU 1 is idle).
- 6 If equipped, set the QPC84 Power Monitor card (in CPU cabinet) ENL/DIS faceplate switch to DIS. Do not remove the card.
- 7 Place CPU 0 into Maintenance by setting the MAINT/NORM faceplate switch to MAINT.
- 8 List the enabled memories. Then disable the memory and CMA in CPU 1.

LENL	List enabled memory
DIS 10	Disable CPU 1 memory
DIS CMA 1	Disable CMA 1

- 9 Type **** to exit overlay.
- 10 Type **DIST**. This software disables the QPC584/QPC742 in CPU 0.
- 11 On CPU 0, set the QPC584/QPC742 ENB/DIS faceplate switch to DIS.

- 12 Get a temporary Serial Data Interface card. For option 61 systems, a Serial Data Interface paddle board may be used. Use a spare. Verify the baud rate. If it does not match the **TTY**, output characters may be garbled. Be sure the card is configured exactly as the existing maintenance **TTY** device.
7. 13 Place the temporary **SDI** card in vacant slot in CPU 1. If using the **SDI** paddle board, place it in slot 12 in the rear of CPU 1.
- 14 Set the temporary **SDI** card **ENB/DIS** faceplate switch to **ENB**. Connect a local **TTY**, or a modem for a remote **TTY**, to the temporary **SDI** card.
- 15 If an MDU is equipped, remove the QPC584 card from CPU 1 and set switch 3 position 4 (**SW3-4**) **OFF**.
- 16 Set the **MAINT/NORM** switch to **MAINT** in CPU 1. This will cause a sysload. If the sysload does not begin, press the **RLD** button on **CMA 1** only.

The following messages will print out on your **TTY**. The **CMA** and **SDI** lights will go out, and the disk drives will run. The following **SYS** messages will appear (may differ slightly depending on the X11 release). Check for dial tone following the **DONE** and **INI000** messages.

SYS000
SYS092
SYS093
SYS511
SYS091
SYS090
SYSLOAD RLS: xx
ISSUE: x

DONE
INI000

Note: When sysload is complete, midnight (daily) routines will begin. Logging in to the system temporarily interrupts the midnight routines.

- 17 Load overlay 43 from the **Source** disk.
LD 43
EDD000 indicates overlay 43 is loaded

- 18 When EDD000 appears, remove the QPC584/QPC742 card from CPU 1.
- 19 Install the Release 18 data cartridge on the QPC584L.
SET SWITCHES 1, 5, AND 7 ON. Insert the QPC584L MSI in the same slot on CPU 1.
- 20 Remove the original MDU/FDU.
- 21 Insert the NTND16 MDU.
DO NOT place the MDU next to a power converter.

Note: The MDU requires power and 3 adjacent card slots. Refer to *Disk drive upgrade procedures* (553-3001-251).
- 22 Attach the cables between the MDU and the MSI on CPU 1. Set the QPC584L ENB/DIS faceplate switch to ENB.
- 23 Insert **Target A1** and **B1** disks. Enter EDD to initiate datadump.
EDD <CR> Be sure the datadump is successful before moving on.
- 24 Set the CMA 1 ENB/DIS faceplate switch to DIS. Disconnect the CMA cables from the faceplate. **Disconnect the top cable first.**
Remove CMA from CPU 1.
- 25 Set the NTNDIO CMA card ENB/DIS faceplate switch to DIS.
Verify that pins 1 and 2 are set on jumper J3 on the NTNDIO CMA.
- 26 Insert the NTNDIO CMA card into CPU 1
Connect the cables to the CMA card. **Connect the bottom cable first.**
- 27 Remove the Memory card from CPU 1.
- 28 Insert NTND09 Memory card in the same slot.
- 29 Replace the original ROM on CPU 1 with the NTND08 ROM. Refer to “Procedure 9: Install a new Read Only Memory card” on page 115 for ROM replacement instructions.
- 30 Set the NTNDIO CMA 1 ENB/DIS faceplate switch to ENB.

- 31 An automatic reload may occur at this point. If it does not, press the Reload button on CPU 1. The following messages print out on your TTY. Verify any other messages.

```
SYS000  
SYSO092  
SYSO093 INHIBITS 000012A  
SYS0511  
SYS0091  
SYS0090  
CONV RLS x ISSUE xx TO RLS x ISSUE xx  
  
CONVERSION PROCESS COMPLETED  
DONE  
IN1000
```

Note: When sysload is complete, midnight routines will begin. Log in to the system to stop the procedures. You cannot interrupt LD43.

- 32 Set the time and date in LD02. Note that if Call Detail Recording (CDR) is used system message ERR225 will appear. This is normal.

LD 02

STAD dd mm yyyy hh mm ss Set Time and Date
dd = day (for example, 05 for the fifth)
mm = month (for example, 09 for September)
yyyy = year (last 2 digits or all four, for example 92 or 1992)
hh = hour (in 24-hour time, for example, 13:00 for 1:00 pm)
mm = minute (for example, 25)
ss = seconds (for example, 00)

- 33 Update the database to reflect the release 18 features. Refer to *X11 input/output guide* (553-3001-400), and *X11 features and services* (553-3001-305) for complete explanations. Be sure to update your memory and floppy disk types, and hard disk.

in LD17

LD 17

REQ	CHG
TYPE	CFN
ADAN	CHG HDK 0
NUMD	1, (2)
FTYP	3s

- 34 Print system data listed in Table 3. Verify all information is correct. Make corrections if necessary.

To complete the parallel reload process, go to **Complete the NT/61 conversion** on page 82.

If the system fails to load, or **SYSxxxx** messages indicate data corruption, back out of the parallel reload process by performing the following steps.

Back out of the NT/61 conversion

- 1 Place CPU 1 into normal with the **MAINT/NORM** switch.
- 2 Disable and unseat the temporary **SDI** card from CPU 1. Reconnect the CRT or TTY cable to the original port.
- 3 Disable and remove the **QPC584L MSI** card from CPU 1. Remove the Release 18 data cartridge from the card.
- 4 Insert the **Source QPC742/QPC584** card and data cartridge. Be sure the **Source** data cartridge is installed. Set the **ENB/DIS** faceplate switch to **ENB**.
- 5 Remove the **NTND16 MDU**.
- 6 Insert the **Source MDU/FDU**. Connect the original cable between the **MSI/FDI** and the **MDU/FDU**.
- 7 Insert the **Source A1 and B1** disks in the **MDU/FDU**.
- 8 Set the **NTND10 CMA ENB/DIS** faceplate switch to **DIS**. Disconnect the CMA cables. **Disconnect the top cable first.** Remove the **NTND10 CMA**.
- 9 Insert the **Source CMA** card. Be sure it is faceplate disabled. Connect the original CMA cables. **Connect the bottom cable first.**
- 10 Remove the **NTND09 Memory** card.
- 11 Insert the **Source memory** card.
- 12 Replace the **NTND08 ROM** card with the **Source ROM** card. Refer to "Procedure 9: Install a new Read Only Memory card" on page 115 for instructions.
- 13 Set the **CMA 1 ENB/DIS** faceplate switch to **ENB**.
- 14 Set the **QPC584/QPC742** card **ENB/DIS** faceplate switch to **ENB**.
- 15 Log in and type **ENLT**. This software enables the **QPC584/QPC742** card.

- 16 Load overlay 35. Enable the CMA, and memory in CPU 1. Enabling memory may take a few minutes.

LD 35

ENL CMA 1 Enable the CMA in CPU 1
ENL 10 Enable the memory in CPU 1

- 17 Get the status of the CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

STAT CPU Get the status of the CPUs
STAT CMA Get CMA status
STAT EXT Get the extender status
STAT MEM Get the memory status

- 18 Clear the display, major, and minor alarm in CPU 0.

CDSP Clear the displays
CMAJ Clear major alarms
CMIN ALL Clear all minor alarm

- 19 Place CPU 0 into Normal by setting the **MAINT/NORM** faceplate switch to **NORM**.

- 20 Test twice and switch CPUs.

TCPU Test the CPUs
TCPU Test the CPU again
SCPU Switch the CPUs
CDSP Clear display in CPU 1
******** Get out of overlay

- 21 Type **ENLT**. This software enables the QPC584/QPC742 card.

- 22 Load overlay 35. Test and switch CPUs.

LD 35

TCPU Test the CPUs
SCPU Switch the CPUs

- 23 Type ******** to exit overlay.

- 24 Set the QPC84 Power Monitor card **ENL/DIS** faceplate switch to **ENB** (if equipped).

You are now out of the parallel reload process. Verify system operation. Go to **Procedure 12: Post-conversion procedure** on page 133.

Complete the NT/61 conversion

- 1 Log in to the system on CPU 1.
- 2 Set the time and date in LD02. Note that if Call Detail Recording (CDR) is used system message ERR225 will appear. This is normal.

Note: The system stops time when coming out of parallel reload. Up to 90 seconds may be lost. Verify the time when this procedure is complete.

LD 02

STAD dd mm yyyy hh mm ss Set Time and Date

dd = day (for example, 05 for the fifth)

mm = month (for example, 09 for September)

yyyy = year (last 2 digits or all four, for example 92 or 1992)

hh = hour (in 24-hour time, for example, 13:00 for 1:00 pm)

mm = minute (for example, 25)

ss = seconds (for example, 00)

- 3 Load overlay 22 and print **Target** peripheral software version. The **Source** peripheral software version was printed in the Pre-conversion procedure. If there is a difference between the **Source** and **Target** peripheral software version, a forced download will occur during initialization when coming out of parallel reload. The system initialization will take longer and established calls on IPE will be dropped.

LD 22

REQ PRT
TYPE PSWV

- 4 Disable and unseat the temporary **SDI** card from CPU 1. Reconnect the CRT or TTY cable to the original port.

CAUTION

Call processing will be interrupted

Perform these next steps carefully. This is the point at which your service is interrupted. Calls in process will be interrupted, especially if Peripheral Software Download takes place.

Perform the next 2 steps in succession.

This is when call processing is interrupted; some calls may be dropped.

- 5 Place CPU 0 into normal by setting the MAINT/NORM faceplate switch to NORM.
- 6 Initialize CPU 1 by pressing the MAN INT button.
If the system does not initialize within 20 seconds, press the MAN INT button again.
The MSDL and MISP cards available with X11 release 18 and later download peripheral software after initialization. When these cards are present and the peripheral software versions have changed, wait for PSDL completion messages before continuing.
- 7 Test call processing. This includes, but is not limited to, the following.
Make internal, external and network calls.
Check attendant console activity.
Check DID trunks.
- 8 Set the QPC584/QPC742 card ENB/DIS faceplate switch to DIS in CPU 0. Remove the MSI/FDI from CPU 0.
- 9 Install the Release 18 data cartridge on the QPC584L. SET SWITCHES 1, 5, AND 7 ON. Insert the QPC584L MSI in the same slot in CPU 0.
- 10 Attach the NTND80 cable between the NTND16 MDU and the QPC584L MSI on CPU 0.
- 11 Set the QPC584L MSI ENB/DIS faceplate switch to ENB on CPU 0.
- 12 Set the CMA 0 ENB/DIS faceplate switch to DIS. Disconnect the CMA cables from the faceplate. **Disconnect the top cable first.** Remove the CMA from CPU 0.
- 13 Set the ENB/DIS switch to DIS on the NTNDIO CMA card. Verify pins 1 and 2 are set on jumper at J3 on the NTNDIO CMA card.
- 14 Insert the NTNDIO CMA card in CPU 0
Connect the cables to the CMA card. **Connect the bottom cable first.**
- 15 Remove the Memory card from CPU 0.
- 16 Insert NTND09 Memory card in the same slot on CPU 0.

- 17 Replace the ROM in CPU 0 with the **NTND08** ROM. Refer to “Procedure 9: Install a new Read Only Memory card” on page 115 for ROM replacement instructions.
- 18 Set the **NTND10 CMA 0 ENB/DIS** faceplate switch to **ENB**.
- 19 Log back in and verify time and date. Update the time and date, if necessary.

```
LD 02
TTAD                               Verify time and date
STAD dd mm yyyy hh mm ss Set Time and Date
TTAD                               Verify time and date
```

- 20 Enable the CMA, and memory in CPU 0. Enabling memory may take a few minutes.

```
LD 35
ENL CMA 0      Enable CMA 0
ENL 00         Enable the memory in CPU 0
```

- 21 Clear the display, major and minor alarms on CPU 1.

```
CDSP          Clear the displays on CPU 1
CMAJ        Clear major alarm
CMIN ALL      Clear minor alarm
```

- 22 Place CPU 1 into normal by setting the **MAINT/NORM** faceplate switch to **NORM**

- 23 Get the status of the CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

```
STAT CPU      Get the status of the CPUs
STAT CMA      Get CMA status
STAT EXT      Get the extender status
STAT MEM      Get the memory status
```

- 24 Test twice and switch CPUs. Clear the display and test CPUs again.

```
TCPU          Test the CPUs
TCPU          Test CPUs again
SCPU        Switch the CPUs
CDSP          Clear display
TCPU          Test the CPUs again
****         Exit overlay
```

- 25 Type **ENLT**. This software enables the **QPC584/QPC742** card.
- 26 Load overlay 35 and switch CPU.

LD 35
SCPU

- 27 Get the status of the CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

STAT CPU	Get the status of the CPUs
STAT CMA	Get CMA status
STAT EXT	Get the extender status
STAT MEM	Get the memory status

- 28 Load an overlay to verify data cartridge operation.
- 29 Set the **QPC84** Power Monitor card **ENB/DIS** faceplate switch to **ENB** (if equipped).

You have now completed the conversion to X11 release **18**. Go to **Procedure 12: Post-conversion procedure** on page 133.

Convert the RT to X11 release 18

- 1 Perform the Pre-conversion steps as shown in “Procedure 1: Pre-conversion procedure” on page 23.
- 2 Load overlay 35 and get the status of the CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.
LD 35
STAT CPU Get the status of the CPUs
STAT CMA Get CMA status
STAT EXT Get the extender status
STAT MEM Get the memory status
- 3 Test and switch CPUs.
TCPU Test the CPUs
SCPU Switch the CPUs
- 4 Get the status of the other CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.
STAT CPU Get the status of the CPUs
STAT CMA Get CMA status
STAT EXT Get the extender status
STAT MEM Get the memory status
- 5 Ensure CPU 0 is enabled (CPU 1 is idle).
- 6 If equipped, set the QPC84 Power Monitor card (in CPU cabinet) ENL/DIS faceplate switch to DIS. Do not remove the card.
- 7 Place CPU 0 into Maintenance by setting the MAINT/NORM faceplate switch to MAINT.
- 8 List the enabled memory. Disable the memory and CMA in CPU 1.
LENL List enabled memory
DIS 10 Disable CPU 1 memory
DIS CMA 1 Disable CMA 1
- 9 Type **** to exit overlay.
- 10 Type **DIST**. This software disables the QPC584/QPC742 in CPU 0.
- 11 On CPU 0, set the QPC584/QPC742 ENB/DIS faceplate switch to DIS.

- 12 Get a temporary Serial Data Interface card. Use a spare. Verify the baud rate. If it does not match the TTY, output characters may be garbled. Be sure the card is configured exactly as the existing maintenance TTY device.
- 13 Place the temporary **SDI** card in vacant slot in CPU 1. If using the **SDI** paddle board, place it in slot 12 in the rear of CPU 1.
- 14 Set the temporary **SDI** card **ENB/DIS** faceplate switch to **ENB**. Connect a local **TTY**, or a modem for a remote **TTY**, to the temporary **SDI** card.
- 15 If an MDU is equipped, remove the **QPC584** card from CPU 1 and set switch 3 position 4 (**SW3-4**) **OFF**.
- 16 Set the **MAINT/NORM** switch to **MAINT** in CPU 1. This will cause a sysload. If the sysload does not begin, press the **RLD** button on **CMA 1 only**.

The following messages will print out on your TTY. The **CMA** and **SDI** lights will go out, and the disk drives will run. The following **SYS** messages will appear (may differ slightly depending on the X11 release). Check for dial tone following the **DONE** and **IN1000** messages.

```
SYS000  
SYS092  
SYS093  
SYS511  
SYS091  
SYS090  
SYSLOAD RLS: xx  
ISSUE: x
```

```
DONE
```

```
IN1000
```

Note: When sysload is complete, midnight (daily) routines will begin. Logging in to the system temporarily interrupts the midnight routines.

- 17 Load overlay 43 from the **Source** disk.

```
LD 43  
EDD000 indicates overlay 43 is loaded
```

- 18 When **EDD000** appears, remove the **QPC584/QPC742** card from CPU 1.

- 19 Install the Release 18 data cartridge on the QPC584L MSI or QPC742F FDI. If using the QPC584L, SET SWITCHES 1, 5, AND 7 ON. Insert the card in the same slot on CPU 1.
- 20 Remove the original MDU/FDU.
- 21 Insert the NTND16 MDU or NTND15 FDU. DO NOT place the MDU next to a power converter.
Note: The MDU requires power and 3 adjacent card slots. Refer to *Disk drive upgrade procedures (553-3001-251)*.
- 22 If using MDU/MSI, attach the NTND80 cable between the MDU and MSI on CPU 1. If using FDU/FDI, attach the cable between the FDU and FDI on CPU1. Set the ENB/DIS faceplate switch to ENB.
- 23 Insert **Target A1 and B1** disks. Enter EDD to initiate datadump. **EDD <CR>Be** sure the datadump is successful before moving on.
- 24 Set the CMA 1 ENB/DIS faceplate switch to DIS. Disconnect the CMA cables from the faceplate. **Disconnect the top cable first.** Remove CMA from CPU 1.
- 25 Set the NTNDIO CMA ENB/DIS switch to DIS. Verify that pins 1 and 2 are set on jumper J3 on the NTNDIO CMA.
- 26 Insert the NTNDIO CMA card into CPU 1. Connect the cables to the CMA card. **Connect the bottom cable first.**
- 27 Remove the Memory card from CPU 1.
- 28 Insert NTND09 Memory card in the same slot.
- 29 Replace the original ROM on CPU 1 with the NTND08 ROM. Refer to "Procedure 9: Install a new Read Only Memory card" on page 115 for ROM replacement instructions.
- 30 Set the NTNDIO CMA 1 ENB/DIS faceplate switch to ENB.

- 31 An automatic reload may occur at this point. If it does not, press the Reload button on CPU 1. The following messages print out on your TTY. Verify any other messages.

```

SYS000
SYS0092
SYSO093 INHIBITS 000012A
SYS0511
SYS0091
SYS0090
CONV RLS x ISSUE xx TO RLS x ISSUE xx

CONVERSION PROCESS COMPLETED

DONE

IN1000

```

Note: When sysload is complete, midnight routines will begin. Log in to the system to stop the procedures. You cannot interrupt LD43.

- 32 Set the time and date in LD02. Note that if Call Detail Recording (CDR) is used system message ERR225 will appear. This is normal.

LD 02

```

STAD dd mm yyyy hh mm ss           Set Time and Date
dd = day (for example, 05 for the fifth)
mm = month (for example, 09 for September)
yyyy = year (last 2 digits or all four, for example 92 or 1992)
hh = hour (in 24-hour time, for example, 13:00 for 1:00 pm)
mm = minute (for example, 25)
ss = seconds (for example, 00)

```

- 33 Update the database to reflect the release 18 features. Refer to *XII input/output guide (553-3001-400)*, and *XI 1 features and services (553-3001-305)* for complete explanations. Be sure to update your memory and floppy disk types, and hard disk.

in LD17

LD 17

REQ	CHG
TYPE	CFN
ADAN	CHG HDK 0
NUMD	1, (2)
FTYP	3s

- 34 Print system data listed in Table 3. Verify all information is correct. Make corrections if necessary.

To complete the parallel reload process, go to **Complete the RT conversion** on page 93.

If the system fails to load, or **SYSxxxx** messages indicate data corruption, back out of the parallel reload process by performing the following steps.

Back out of the RT conversion

- 1 Place CPU 1 into normal with the MAINT/NORM switch.
- 2 Disable and unseat the temporary SDI card from CPU 1. Reconnect the CRT or TTY cable to the original port.
- 3 Disable and remove the QPC584L MSI or QPC742F FDI card from CPU 1. Remove the Release 18 data cartridge from the card.
- 4 Insert the **Source** QPC742/QPC584 card and data cartridge. Be sure the **Source** data cartridge is installed. Set the ENB/DIS faceplate switch to ENB.
- 5 Remove the NTND16 MDU or NTND15 FDU.
- 6 Insert the **Source** MDU/FDU. Connect the original cable between the MSI/FDI and the MDU/FDU.
- 7 Insert the **Source** A1 and B1 disks in the MDU/FDU.
- 8 Set the NTNDIO CMA ENB/DIS faceplate switch to DIS. Disconnect the CMA cables. **Disconnect the top cable first.** Remove the NTND10 CMA.
- 9 Insert the **Source** CMA card. Be sure it is faceplate disabled. Connect the original CMA cables. **Connect the bottom cable first.**
- 10 Remove the NTND09 Memory card.
- 11 Insert the **Source** memory card.
- 12 Replace the NTND08 ROM card with the **Source** ROM card. Refer to “Procedure 9: Install a new Read Only Memory card” on page 115 for instructions.
- 13 Set the CMA 1 ENB/DIS faceplate switch to ENB.
- 14 Set the QPC584/QPC742 card ENB/DIS faceplate switch to ENB.
- 15 Log in and type **ENLT**. This software enables the QPC584/QPC742 card.

- 16 Load overlay 35. Enable the CMA, and memory in CPU 1. Enabling memory may take a few minutes.

LD 35

ENL CMA 1 Enable the CMA in CPU 1
ENL 10 Enable the memory in CPU 1

- 17 Get the status of the CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

STAT CPU Get the status of the CPUs
STAT CMA Get CMA status
STAT EXT Get the extender status
STAT MEM Get the memory status

- 18 Clear the display, major, and minor alarm in CPU 0.

CDSP Clear the displays
CMAJ Clear major alarms
CMIN ALL Clear all minor alarm

- 19 Place CPU 0 into Normal by setting the **MAINT/NORM** faceplate switch to **NORM**.

- 20 Test twice and switch CPUs.

TCPU Test the CPUs
TCPU Test the CPU again
SCPU Switch the CPUs
CDSP Clear display in CPU 1
******** Get out of overlay

- 21 Type **ENLT**. This software enables the QPC584/QPC742 card.

- 22 Load overlay 35. Test and switch CPUs.

LD 35
TCPU Test the CPUs
SCPU Switch the CPUs

- 23 Type ******** to exit overlay.

- 24 Set the QPC84 Power Monitor card **ENL/DIS** faceplate switch to **ENB** (if equipped).

You are now out of the parallel reload process. Verify system operation. Go to **Procedure 12: Post-conversion procedure** on page 133.

Perform the next 2 steps in succession.**This is when call processing is interrupted; some calls may be dropped.**

5 Place CPU 0 into normal by setting the MAINT/NORM faceplate switch to NORM.

6 Initialize CPU 1 by pressing the MAN INT button.

If the system does not initialize within 20 seconds, press the MAN INT button again.

The MSDL and MISP cards available with X1 1 release 18 and later download peripheral software after initialization. When these cards are present and the peripheral software versions have changed, wait for PSDL completion messages before continuing.

7 Test call processing. This includes, but is not limited to, the following.

Make internal, external and network calls.

Check attendant console activity.

Check DID trunks.

8 Set the QPC584/QPC742 card ENB/DIS faceplate switch to DIS in CPU 0. Remove the MSI/FDI from CPU 0.

9 Install the Release 18 data cartridge on the QPC584L MSI or QPC742F FDI. If using the QPC584L, SET SWITCHES 1, 5, AND 7 ON. Insert the card in the same slot on CPU 1.

10 If using MDU/MSI, attach the NTND80 cable between the MDU and MSI on CPU 0.

If using FDU/FDI, attach the cable between the FDU and FDI on CPU 0. Set the ENB/DIS faceplate switch to ENB.

11 Set the CMA 0 ENB/DIS faceplate switch to DIS. Disconnect the CMA cables from the faceplate. **Disconnect the top cable first.** Remove the CMA from CPU 0.

12 Set the ENB/DIS switch to DIS on the NTNDIO CMA card. Verify pins 1 and 2 are set on jumper at J3 on the NTNDIO CMA card.

13 Insert the NTNDIO CMA card in CPU 0. Connect the cables to the CMA card. **Connect the bottom cable first.**

14 Remove the Memory card from CPU 0.

- 15 Insert NTND09 Memory card in the same slot on CPU 0.
- 16 Replace the ROM in CPU 0 with the **NTND08** ROM. Refer to “Procedure 9: Install a new Read Only Memory card” on page 115 for ROM replacement instructions.
- 17 Set the NTND10 CMA 0 **ENB/DIS** faceplate switch to ENB.
- 18 Log back in and verify time and date. Update the time and date, if necessary.

LD 02

TTAD

Verify time and date

STAD dd mm yyyy hh mm ss Set Time and Date

TTAD

Verify time and date

- 19 Enable the CMA, and memory in CPU 0. Enabling memory may take a few minutes.

LD 35

ENL CMA 0

Enable CMA 0

ENL 00

Enable the memory in CPU 0

- 20 Clear the display, major and minor alarms on CPU 1.

CDSP

Clear the displays on CPU 1

CMAJ

Clear major alarm

CMIN ALL

Clear minor alarm

- 21 Place CPU 1 into normal by setting the **MAINT/NORM** faceplate switch to NORM.

- 22 Get the status of the CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

STAT CPU

Get the status of the **CPUs**

STAT CMA

Get CMA status

STAT EXT

Get the extender status

STAT MEM

Get the memory status

23 Test twice and switch CPUs, Clear the display and test CPUs again.

TCPU	Test the CPUs
TCPU	Test CPUs again
SCPU	Switch the CPUs
CDSP	Clear display
TCPU	Test the CPUs again
****	Exit overlay

24 Type **ENLT**. This software enables the QPC584/QPC742 card.

25 Load overlay 35 and switch CPU.

LD 35
SCPU

26 Get the status of the CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

STAT CPU	Get the status of the CPUs
STAT CMA	Get CMA status
STAT EXT	Get the extender status
STAT MEM	Get the memory status

27 Load an overlay to verify data cartridge operation.

28 Set the QPC84 Power Monitor card **ENB/DIS** faceplate switch to ENB (if equipped).

You have now completed the conversion to X11 release **18**. Go to **Procedure 12: Post-conversion procedure** on page 133.

Convert the XT/71 to XI 1 release 18

- 1 Perform the Pre-conversion steps as shown in “Procedure 1: Pre-conversion procedure” on page 23.
- 2 Load overlay 35 and get the status of the CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

LD 35	
STAT CPU	Get the status of the CPUs
STAT CMA	Get CMA status
STAT EXT	Get the extender status
STAT MEM	Get the memory status
- 3 Test and switch **CPUs**.

TCPU	Test the CPUs
SCPU	Switch the CPUs
- 4 Get the status of the other CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

STAT CPU	Get the status of the CPUs
STAT CMA	Get CMA status
STAT EXT	Get the extender status
STAT MEM	Get the memory status
- 5 Ensure CPU 0 is enabled (CPU 1 is idle).
- 6 If equipped, set the **QPC84/QPC173** Power Monitor card (in CPU cabinet) **ENL/DIS** faceplate switch to **DIS**. Do not remove the card.
- 7 Place CPU 0 into Maintenance by setting the **MAINT/NORM** faceplate switch to **MAINT**.
- 8 List the enabled memories. Disable the memories and CMA in CPU 1.

LENL	List enabled memories
DIS 10	Disable CPU 1 memory (10, 11, 12 if equipped)
DIS CMA 1	Disable CMA 1
- 9 Set the **QPC215** Segmented Bus Extender **ENB/DIS** faceplate switch to **DIS** in CPU 1 only.

- 10** If using the QPC775 Clock Controller card, load overlay 60 and software disable clock 1. Then hardware disable clock controller 1.

LD 60

SSCK 0 Get the status of clock 0.

SSCK 1 Get the status of clock 1.

SWCK Switch system clock to make clock 0 active (if necessary).

DIS CC 1 Disable clock controller 1.

Set the QPC775 ENB/DIS faceplate switch to DIS in CPU 1.

- 11** Type **** to exit overlay.
- 12** Type **DIST**. This software disables the QPC584/QPC742 in CPU 0.
- 13** Set the QPC584/QPC742 ENB/DIS faceplate switch to DIS in CPU 0.
- 14** Get a temporary Serial Data Interface card. Use a spare. Verify the baud rate. If it does not match the TN, output characters may be garbled. Be sure the card is configured exactly as the existing maintenance TTY device.
- 15** Place the temporary SDI card in a vacant slot in CPU 1.
- 16** Set the temporary SDI card ENB/DIS faceplate switch to ENB. Connect a local TTY, or a modem for a remote TTY, to the temporary SDI card.
- 17** If an MDU is equipped, remove the QPC584 card from CPU 1 and set switch 3 position 4 (SW3-4) OFF.

- 18 Set the **MAINT/NORM** switch to **MAINT** in CPU 1. This will cause a sysload. If the sysload does not begin, press the RLD button on CMA 1 **only**.

The following messages will print out on your **TTY**. The CMA and **SDI** light will go out, and the disk drives will run. The following **SYS** messages will appear (may differ slightly depending on the X1 1 release). Check for dial tone following the **DONE** and **IN1000** messages.

SYS000
SYS092
SYS093
SYS511
SYS091
SYS090
SYSLOAD RLS: xx
ISSUE: x

DONE

IN1000

Note: When sysload is complete, midnight (daily) routines will begin. Logging in to the system temporarily interrupts the midnight routines.

- 19 Load overlay 43 from the **Source** disk.

LD 43
EDDOOO indicates overlay 43 is loaded

- 20 When **EDDOOO** appears, remove the **QPC584/QPC742** card from CPU 1.

- 21 Install the Release 18 data cartridge on the **QPC584L**.
SET SWITCHES 1, 5, AND 7 ON. Insert the **QPC584L MSI** in the same slot in CPU 1.

- 22 Remove the original **MDU/FDU**.

- 23 Insert the **NTND16 MDU**.
DO NOT place the MDU next to a power converter.

Note: The MDU requires power and 3 adjacent card slots. Refer to *Disk drive upgrade procedures* (553-3001-251).

- 24 Attach the cables between the MDU and the **MSI** on CPU 1. Set the **QPC584L ENB/DIS** faceplate switch to **ENB**.
- 25 Insert **Target A1** and **B1** disks. Enter **EDD** to initiate datadump.
EDD <CR>Be sure the data dump is successful before moving on.
- 26 Set the **CMA 1 ENB/DIS** faceplate switch to **DIS**. Disconnect the **CMA** cables from the faceplate. **Disconnect the top cable first.**
Remove **CMA** from CPU 1.
- 27 Set the **NTNDIO CMA ENB/DIS** switch to **DIS**.
Verify that pins 1 and 2 are set on jumper **J3** on the **NTNDIO CMA**.
- 28 Insert the **NTNDIO CMA** card into CPU 1.
Connect the cables to the **CMA** card. **Connect the bottom cable first.**
- 29 Remove **Memory** cards from CPU 1.
- 30 Insert **NTND09** **Memory** cards in the same slots in CPU 1.
- 31 Replace the original **ROM** in CPU 1 with the **NTND08** **ROM**. Refer to “Procedure 9: Install a new Read Only Memory card” on page 11.5 for **ROM** replacement instructions.
- 32 Set the **NTNDIO CMA 1 ENB/DIS** faceplate switch to **ENB**.
- 33 An automatic reload may occur at this point. If it does **not**, press the **Reload** button on CPU 1. The following messages appear.

```
SYS000  
SYS0092  
SYS0093 INHIBITS 000012A  
SYS0511  
SYS0091  
SYS0090  
CONV RLS x ISSUE xx TO RLS x ISSUE xx
```

```
CONVERSION PROCESS COMPLETED  
DONE
```

```
IN1000
```

Note: When **sysload** is complete, midnight routines will begin. Log in to the system to stop the procedures. You cannot interrupt **LD43**.

- 34 Set the time and date in LD02. Note that if Call Detail Recording (CDR) is used system message ERR225 will appear. This is normal.

LD 02

STAD dd mm yyyy hh mm ss Set Time and Date

dd = day (for example, 05 for the fifth)

mm = month (for example, 09 for September)

yyyy = year (last 2 digits or all four, for example 92 or 1992)

hh = hour (in 24-hour time, for example, 13:00 for 1:00 pm)

mm = minute (for example, 25)

ss = seconds (for example, 00)

- 35 Update the database to reflect the X11 release 18 features. Refer to *X11 input/output guide* (553-3001-400), and *X11 features and services* (553-3001-305) for complete explanations. Be sure to update your memory and floppy disk types, and hard disk.

in LD17

REQ	CHG
TYPE	CFN
ADAN	CHG HDK 0
NUMD	1, (2)
FTYP	3s

- 36 Print system data listed in Table 3. Verify all information is correct. Make corrections if necessary.

Go to Complete the XT/71 conversion on page 105 to finish this process.

If the system fails to load, or **SYSxxxx** messages indicate data corruption, back out of the parallel reload process by performing the following steps.

Back out of the XT/71 conversion

- 1 Place CPU 1 into normal with the **MAINT/NORM** switch.
- 2 Disable and unseat the temporary **SDI** card from CPU 1. Reconnect the **CRT** or **TTY** cable to the original port.
- 3 Disable and remove the **QPC584L MSI** card from CPU 1. Remove the Release 18 data cartridge from the card.
- 4 Insert the **Source QPC742/QPC584** card and data cartridge. Be sure the **Source** data cartridge is installed. Set the **ENB/DIS** faceplate switch to **ENB**.
- 5 Remove the **NTND16 MDU**.
- 6 Insert the **Source MDU/FDU**. Connect the original cable between the **MSI/FDI** and the **MDU/FDU**.
- 7 Insert the **Source A1** and **B1** disks in the **MDU/FDU**.
- 8 Set the **NTND10 CMA ENB/DIS** faceplate switch to **DIS**. Disconnect the **CMA** cables. **Disconnect the top cable first.** Remove the **NTND10 CMA**.
- 9 Insert the **Source CMA** card. Be sure it is faceplate disabled. Connect the original **CMA** cables. **Connect the bottom cable first.**
- 10 Remove the **NTND09 Memory** cards.
- 11 Insert the **Source** memory cards.
- 12 Replace the **NTND08 ROM** card with the **Source ROM** card. Refer to “Procedure 9: Install a new Read Only Memory card” on page 115 for instructions.
- 13 Set the **CMA 1 ENB/DIS** faceplate switch to **ENB**.
- 14 Set the **QPC584/QPC742** card **ENB/DIS** faceplate switch to **ENB**.
- 15 Log in and type **ENLT**. This software enables the **QPC584/QPC742** card.

- 16 Load overlay 35. Enable the CMA, and memories in CPU 1. Enabling memory may take a few minutes.

LD 35

ENL CMA 1 Enable the CMA in CPU 1
ENL 10 Enable the memory in CPU 1 (10, 11, 12 if equipped)

- 17 Set the QPC215 **SBEs** faceplate switch to ENB.

- 18 Get the status of the CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

STAT CPU Get the status of the CPUs
STAT CMA Get CMA status
STAT EXT Get the extender status
STAT MEM Get the memory status

- 19 Clear the display, major, and minor alarm in CPU 0.

CDSP Clear the displays
CMAJ Clear major alarms
CMIN ALL Clear all minor alarm

- 20 Place CPU 0 into Normal by setting the **MAINT/NORM** faceplate switch to NORM.

- 21 Test twice and switch CPUs.

TCPU Test the CPUs
TCPU Test the CPU again
SCPU Switch the CPUs
CDSP Clear display in CPU 1
******** Get out of overlay

- 22 Type **ENLT**. This software enables the QPC584/QPC742 card.

- 23 Load overlay 35. Test and switch CPUs.

LD 35

TCPU Test the CPUs
SCPU Switch the CPUs

- 24 Type ******** to exit overlay.

- 25 If using the QPC775 Clock Controller card, hardware enable clock controller 1. Load overlay 60 and enable clock 1 in the software.
Set the QPC775 ENB/DIS faceplate switch to ENB in CPU 1.
- LD 60**
ENL CC 1 Enable clock controller 1.
SSCK 0 Get the status of clock 0.
SSCK 1 Get the status of clock 1.
- 26 If using the QPC471 Clock Controller card, and PRI/DTI is equipped, load overlay 60. Check clock tracking status. If necessary, force the clock to track on primary reference.
- LD 60**
SSCK 0 Get the system clock status for clock 0.
SSCK 1 Get the system clock status for clock 1.
If the clock is not tracking, DT1061 is printed.
TRCK PCK Force the clock to track on primary reference.
- 27 Set the QPC84/QPC173 Power Monitor card (in the CPU cabinet) ENB/DIS faceplate switch to ENB (if equipped).

You are now out of the parallel reload process. Verify system operation. Go to **Procedure 12: Post-conversion procedure** on page 133.

Complete the XT/71 conversion

- 1 **Log** in to the system on CPU 1.
- 2 Set the time and date in LD02. Note that if Call Detail Recording (CDR) is used system message ERR225 will appear. This is normal.

Note: The system stops time when coming out of parallel reload. Up to 90 seconds may be lost. Check the time again when this procedure is complete.

**LD
02**

STAD dd mm yyyy hh mm ss Set Time and Date

dd = day (for example, 05 for the fifth)

mm = month (for example, 09 for September)

yyyy = year (complete, for example, 1991)

hh = hour (in 24-hour time, for example, 13:00 for 1:00 pm)

mm = minute (for example, 25)

ss = seconds (for example, 00)

- 3 Load overlay 22 and print **Target** peripheral software version. The **Source** peripheral software version was printed in the Pre-conversion procedure. If there is a difference between the **Source** and **Target** peripheral software version, a forced download will occur during initialization when coming out of parallel reload. The system initialization will take longer and established calls on IPE will be dropped.

LD 22

REQ PRT
TYPE PSWV

- 4 If using the QPC775 Clock Controller card, hardware enable clock controller 1. Load overlay 60 and enable clock 1 in the software.

Set the QPC775 ENB/DIS faceplate switch to ENB in CPU 1.

LD 60

ENL CC 1 Enable clock controller 1.

SSCK 0 Get the status of clock 0.

SSCK 1 Get the status of clock 1.

- 5 Disable and unseat the temporary **SDI** card from CPU 1. Reconnect the CRT or TTY cable to the original port.

- 6 Set the **QPC215 SBE ENB/DIS** faceplate switch to ENB in CPU 1.

CAUTION

Call processing will be interrupted

Perform the next steps carefully. This is the point at which your service is interrupted. Calls in process will be interrupted, especially if Peripheral Software Download takes place.

Perform the next 2 steps in succession.

This is when call processing is interrupted; some calls may be dropped.

- 7 Set the **QPC215 SBE ENB/DIS** faceplate switch to DIS in CPU 0.
- 8 Initialize CPU 1 by pressing the MAN INT button.

If the system does not initialize within 20 seconds, press the MAN INT button again.

The MSDL and MISP cards available with X11 release 18 and later download peripheral software after initialization. When these cards are present and the peripheral software versions have changed, wait for PSDL completion messages before continuing.
- 9 Test call processing. This includes, but is not limited to, the following.
 - Make internal, external, and network calls.
 - Check attendant console activity.
 - Check DID trunks.
- 10 Place CPU 0 into normal by setting the **MAINT/NORM** faceplate switch to NORM
- 11 Set the **QPC584/QPC742** card **ENB/DIS** faceplate switch to DIS in CPU 0. Remove the **MSI/FDI** from CPU 0.
- 12 Install the Release 18 data cartridge on the **QPC584L**.
SET SWITCHES 1, 5, AND 7 ON. Insert the **QPC584L MSI** in the same slot in CPU 0.
- 13 Attach the NTND80 cable between the NTND16 MDU and the **QPC584L MSI** on CPU 0.
- 14 Set the **QPC584L MSI ENB/DIS** faceplate switch to ENB on CPU 0.

- 15 Set the CMA 0 **ENB/DIS** faceplate switch to DIS. Disconnect the CMA cables from the faceplate. **Disconnect the top cable first.**
Remove the CMA from CPU 0.
- 16 Set the **ENB/DIS** switch to DIS on the NTNDIO CMA card.
Verify pins 1 and 2 are set on jumper at **J3** on the NTNDIO **CMA** card.
- 17 Insert the NTNDIO CMA card in CPU 0.
Connect the cables to the CMA card. **Connect the bottom cable first.**
- 18 Remove the Memory cards from CPU 0.
- 19 Insert NTND09 Memory cards in memory slots beginning with 0 (immediately to the left of the CMA card).
- 20 Replace the ROM in CPU 0 with the **NTND08** ROM. Refer to “Procedure 9: Install a new Read Only Memory card” on page 11.5 for ROM replacement instructions.
- 21 Set the NTNDIO CMA 0 **ENB/DIS** faceplate switch to ENB.
- 22 Set the QPC215 SBE **ENB/DIS** faceplate switch to ENB in CPU 0.
- 23 Log back in and verify time and date. Update the time and date, if necessary.

LD 02

TTAD	Verify time and date
STAD dd mm yyyy hh mm ss	Set Time and Date
TTAD	Verify time and date

- 24 Enable the CMA, and memories in CPU 0. Enabling memory may take a few minutes.

LD 35

ENL CMA 0	Enable CMA 0
ENL 00	Enable the memory in CPU 0 (00, 01, 02 if equipped)

- 25 Clear the display, major and minor alarms on CPU 1.

CDSP	Clear the displays on CPU 1
CMAJ	Clear major alarm
CMIN ALL	Clear minor alarm

26 Place CPU 1 into normal by setting the **MAINT/NORM** faceplate switch to **NORM**.

27 Get the status of the CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

STAT CPU	Get the status of the CPUs
STAT CMA	Get CMA status
STAT EXT	Get the extender status
STAT MEM	Get the memory status

28 Test twice and switch CPUs. Clear the display and test CPUs again.

TCPU	Test the CPUs
TCPU	Test CPUs again
SCPU	Switch the CPUs
CDSP	Clear display
TCPU	Test the CPUs again
****	Exit overlay

29 Type **ENLT**. This software enables the QPC584/QPC742 card.

30 Load overlay 35 and switch CPU.

LD 35
SCPU

31 Get the status of the CPU, CMA, extenders, and memory. Ensure all common equipment is enabled.

STAT CPU	Get the status of the CPUs
STAT CMA	Get CMA status
STAT EXT	Get the extender status
STAT MEM	Get the memory status

-
- 32 If using the QPC471 Clock Controller card and PRI/DTI is equipped, load overlay 60. Check clock tracking status. If necessary, force the clock to track on primary reference.

LD 60**SSCK 0** Get the system clock status for clock 0.**SSCK 1** Get the system clock status for clock 1.

If the clock is not tracking, DT1061 is printed.

TRCK PCK Force the clock to track on primary reference.

- 33 Set the QPC84/QPC173 Power Monitor card (in the CPU cabinet) ENB/DIS faceplate switch to ENB (if equipped).

You have now completed the conversion to X11 release 18.

Go to Procedure 12: Post-conversion procedure on page 133.

Procedure 8: Install a new data cartridge

The QMM42 Data Cartridge contains the system ID number and equipped software options. The software will not load without the correct data cartridge. The data cartridge is installed on the QPC584 Mass Storage Interface (MSI) card or QPC742 Floppy Disk Interface (FDI) card. The system option 6 IC/8 I data cartridge is installed on the NT6D63 I/O Processor (IOP) card.

Be sure to observe anti-static precautions.

Before you begin, check Tables 5 and 6 to ensure switch settings are correct. Also check that your label matches your **Target** release.

QPC584 and QPC742 cards

- 1 Set the QPC584/QPC742 card ENB/DIS faceplate switch to DIS.
- 2 Disconnect the cable to the card you are removing.
- 3 Unhook the locking devices on the card; pull it out of the card cage.
- 4 Remove the data cartridge anchor screw and unplug from the connectors on the component side of the QPC584/QPC742 card.
- 5 Plug the replacement data cartridge into the connectors on the component side of the QPC584/QPC742 card. Slightly tighten the anchor screw.
- 6 Reinsert the card and hook the locking devices.
- 7 Reconnect the cable to the card.
- 8 Set the QPC584/QPC742 card ENB/DIS faceplate switch to ENB

QMM42 on the NT6D63 IOP card

- 1 Set the QPC584/QPC742 card ENB/DIS faceplate switch to DIS.
- 2 Unhook the locking devices on the card; pull it out of the card cage.
- 3 Remove the data cartridge anchor screw and unplug from the connectors on the component side of the QPC584/QPC742 card.
- 4 Plug the replacement data cartridge into the connectors on the component side of the QPC584/QPC742 card. Slightly tighten the anchor screw.
- 5 Reinsert the card and hook the locking devices.
- 6 Set the QPC584/QPC742 card ENB/DIS faceplate switch to ENB.

Table 5
QPC584 Mass Storage Interface (MSI)

Options	Switch S3							
	1	2	3	4	5	6	7	8
5.25in. floppy drives only	on	off	off	off	off	off	off	off
5.25-in. floppy drives and 5.25in. hard drive	on	off	off	on	off	off*	off	off
3.5-in. floppy drives only	on	off	off	off	on	off	**	***
3.5-in. floppy drives and 3.5in. hard drive	on	off	off	on	on	off	**	***

Note: Vintage E or later is required for 3.5-in. drives. Vintage F4, K, or later is required for the 3-disk configuration. Vintage L or later is required for XI 1 release 18.

* When a QMM38 MSU is replaced, set switch 6 to on before the faulty QMM38 is powered down, so the disk head will retract (shipping mode). After the replacement MSU is installed, set switch 6 to off.

** For 4 Mbyte (ED) disks set to on.
 For 2 Mbyte (HD) disks set to off.

*** For STE, or 21 E, set to on when the NTND01 Integrated CPU/Memory (ICM) Card is installed
 For all other systems, set to off.

Table 6
QPC742 Floppy Disk Interface (FDI)

Options	SW3							
	1	2	3	4	5	6	7	8
5.25in. floppy drives	on	off						
3.5-in. floppy drives	on	off	off	off	on	off	*	**
Note: Vintage D or later is required for 3.5-in. drives. Vintage F or later is required for X11 release 18. * For 4 Mbyte (ED) disks set to on. For 2 Mbyte (HD) disks set to off. ** For STE, or 21 E, set to on when the NTND01 Integrated CPU/Memory (ICM) Card is installed. For all other systems, set to off.								

Procedure 9: Install a new Read Only Memory card

The Read Only Memory (ROM) card is attached to the component side of the CPU, CPU Function, or ICM card. In option 81 systems, ROM capability is provided by the CP card. See the list below for the cards pertaining to your system.

- XI 1 release 17 and earlier
 - ST/21 QPC687 CPU card
 - NT/RT/XT QPC579 CPU Function (FN) card
51/61/71

- XI 1 release 18 and later
 - STE/21E NTND01 ICM card
 - NT/RT/XT QPC579 CPU Function (FN) card
51/61/71
 - 61C/81 NT6D66 Call Processor (CP) card

Note: The option 6 1 C is available with XI 1 release 19 and later. The option 8 1 is available with XI 1 release 18 and later.

Tables 7 and 8, on the following pages, lists the ROM cards required for each system, for each XI 1 release.

Be sure to observe antistatic precautions.

Table 7
ROM requirements by system type and X11 release
for ST, STE, NT, RT, and XT systems

x11 release	System type			
	ST	STE	NT	XT
7	QPC717B	N/A	QPC602	QPC602
8	QPC717B	N/A	QPC602	QPC602
9	QPC717B	N/A	QPC602	QPC602
10	QPC717B	N/A	QPC602	QPC602
12	QPC717D	N/A	QPC602	QPC602
13	QPC717D	N/A	QPC602	QPC602
14	QPC717D or QPC937	N/A	QPC602	QPC602
15	QPC940	NIA	QPC939	QPC939
16	QPC940	N/A	QPC939	QPC939
17	QPC940	NIA	QPC939	QPC939
18	N/A	NTND31	NTND08	NTND08
19	N/A	NTND31	NTND08	NTND08

Note: ST systems are not supported with X11 release 18 and later. You must upgrade to the ST Enhanced (STE).

Table 8
ROM requirements by system type and XII release
for 21, 21E, 51, 61, 61C, 71, and 81 systems

XII release	System type						
	21	21E	51	61	61C	71	81
7	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
13	N/A	N/A	N/A	N/A	N/A	N/A	N/A
14	N/A	N/A	N/A	N/A	N/A	N/A	N/A
15	QPC940	N/A	QPC939	QPC939	N/A	QPC939	N/A
16	QPC940	N/A	QPC939	QPC939	N/A	QPC939	N/A
17	QPC940	N/A	QPC939	QPC939	N/A	QPC939	N/A
18	N/A	NTND31	NTND08	NTND08	N/A	NTND08	NTND66
19	N/A	NTND31	NTND08	NTND08	NTND66	NTND08	NTND66

Note 1: System options 21, 51, 61, and 71 are available for XI1 release 15 and later only.

Note 2: System option 81 is available with XI 1 release 18 and later only.

Note 3: System option 21 is not supported with XI 1 release 18 and later. You must upgrade to 21 Enhanced (21 E).

Note 4: System option 61 E is available with XI 1 release 19 and later only.

Note 5: ROM and memory requirements for option 61C/81 fulfilled by the NT6D66 Call Processor (CP) card.

Replace ROM card on single CPU systems

CAUTION

Call processing will stop when you remove the ICM, CPU, or CPU FN card.

- 1 To replace the ROM card, you must remove the card.
 - If the **SDI** port is configured on the QPC687 card, software disable it, and disconnect the cable to the **SDI** port.
- 2 Unhook the locking devices on the card. Pull it out of the card cage.
- 3 Gently unplug the ROM card from the connectors on the component side of the card.

CAUTION

When you remove the ROM card, do not touch other components on the card.

- 4 Plug the replacement ROM card into the connectors on the component side of the card.
 - For the NTND31 ROM, install the screw and washer at each corner.
- 5 Reinsert the card and hook the locking devices.
- 6 Set the **ENB/DIS** switch to **ENB** on the card.
- 7 A system reload is required. Press the **RLD** button.

Replace ROM card on dual CPU systems

CAUTION

This procedure must take place on the inactive CPU.

- 1 Disable the Function card by setting the associated QPC580 CPU Interface (IF) card **ENB/DIS** faceplate switch. Disconnect the cable between the Function and Interface cards in the inactive CPU.
- 2 Unhook the locking devices on the QPC579 Function card; pull it out of the card cage.
- 3 Gently unplug the ROM card from the connectors on the component side of the Function card.

CAUTION

When you remove the ROM card, do not touch other components on the Function card.

- 4 Plug the replacement ROM card into the connectors on the component side of the QPC579 Function card.
- 5 Reinsert the QPC579 Function card and hook the locking devices. Enable the Function card by setting the QPC580 Interface card **ENB/DIS** faceplate switch to **ENB**.
- 6 Connect the cable between the Function and Interface cards.

Procedure 10: Increasing memory

XI 1 release 17 and earlier

With XI 1 release 17 and earlier, if you find that you need to increase the memory in your system, perform the following procedure.

With XI 1 release 12 through 14, an ST memory upgrade is supported. The only other systems supporting memory upgrades with X 11 release 17 or earlier are XT and 7 1 systems.

<p>CAUTION</p>

<p>Perform this procedure from your Source media, prior to conversion.</p>
--

- 1 Load LD 17 to perform a change

LD 17

REQ	CHG	Change system data
CEQU	YES	Change Common Equipment parameters
MTYP	xxx	Enter the new memory type

See XI1 input/output guide (553-3001-400) for a complete explanation of these prompts and allowed responses.

- 2 Perform a datadump to your **Source** media.
Install required memory boards and invoke system reload. Additional system memory is now provisioned and active.
- 3 You are now ready to perform your conversion, or parallel reload.

X11 release 18 and later

X11 release 18 requires significant hardware changes for all systems. These hardware changes must be made during the conversion process. Refer to “Procedure 7: Converting X11 release 15 through 17 to X11 release 18 or 19” on page 73 for the conversion and upgrade details. The hardware requirements for NT, RT, XT, 61, and 71 for X11 release 18 and later are listed below.

- NTND08 R O M
- NTND09Bx 6-Mbyte Memory Card
NTND09Cx 12-Mbyte memory Card
- NTND10 C M A
- QPC584L Mass Storage Interface (MSI)
- NTND16 Multi Disk Unit (MDU)
- QPC742F Floppy Disk Interface (FDI)
- NTND15 Floppy Disk Unit (FDU)

Note 1: The FDI and FDU or the MSI and MDU are optional for RT systems. NT, XT, 51, 61, and 71 systems require the MSI and MDU.

Note 2: If you are replacing an NTND09Bx 6-Mbyte card with the NTND09Cx 12-Mbyte memory card, use “Procedure 6: Performing a parallel reload” on page 47 to enter parallel mode *before* changing the card. You **must** sysload for the changes to take affect. Refer to *Hardware replacement* (553-3001-520) for complete instructions.

The ST and 21 must be upgraded to ST Enhanced (STE) or 21 Enhanced (21E) machines to support X11 release 18. Refer to *Upgrade system installation* (553-3001-250) for the STE and 21E upgrade procedures. The following hardware is required.

- NTND01 Integrated CPU and Memory (ICM)
- NTND02 Miscellaneous **SDI** Peripheral Signaling (MSPS)
- NTND31 ROM
- QPC742F Floppy Disk Interface (FDI)
- NTND15 Floppy Disk Unit (FDU)

Note I: Do not mix NTND09 memory cards with QPC583 memory cards.

Note 2: NTND10 CMA cards are backward compatible with QPC583 memory cards and **QPC581** CMA cards. Set pins 2 and 3 on jumper J3 to support backward compatibility.

Procedure 11: Option 61 C/81 installation tool

Use this procedure to install only the specific items listed here. These are simple steps intended as a guide through the procedure. General reference information can be found in “Option 61 C/81 Installation tool reference” on page 141.

The Option 61 C/81 Installation tool is used to convert software and system components to a later release, or to **upissue** within the same release (X11 release 18 and later, option 61C is available with X11 release 19 and later).

The Installation tool is comprised of eight 3.5-inch 4 MB Extra High Density (ED) disks. Disks 1 through 7 are labeled A1 through A7. Disk 8 is labeled B1. Be sure the correct disk is installed in the drive when performing this procedure.

There are several options to choose when using the Installation tool, as listed below. In addition, a tools menu is used to update the system time and date. Follow the steps in this procedure to install the specific items listed.

- upgrade the X11 software, system database, and CP and IOP ROMs
- upgrade the X11 software, and CP and IOP ROMs
- upgrade the X11 software only
- upgrade the system database only
- upgrade the CP and/or IOP ROMs only

Main menu

Before the Installation tool is activated, verify that the system is in split mode and a terminal is connected to the CPIO port in the inactive Core.

If the Installation tool is not already activated, insert disk A1 from the software package into the inactive CMDU. Press the Man Rst button on the NT6D66 CP Card in the same Core.

Throughout the installation, the option to stop and return to the main menu is always available. The main menu refers to all the options.

NT Meridian - 1 Software/Database/PEROM INSTALL Tool (Version)

MAIN MENU

This tool will install or upgrade your Meridian 1 System Software, Database and PE-ROM (both CP-ROM and IOP-ROM). You will be prompted throughout the installation and given the opportunity to Quit at any time.

Please enter:

- <CR>-> <a> - To install Software, CP-ROM, IOP-ROM.
- -To install Software, Database, CP-ROM, IOP-ROM.
- <c> • To install Software only.
- <d> • To install Database only.
- <e> • To install CP-ROM only.
- < f>• To install IOP-ROM only.
- <g> -To go to the Tools Menu.
- <q> • Quit.

Enter choice >

Installation steps

These are the exact steps used to perform the conversion required. All the steps begin with the main menu. If more information is needed refer to “Option 61C/81 Installation tool reference” on page 141.

Software, database, and ROMs

Enter the following commands to install the software, database and ROM requirements for your system.

From the main menu, select the following.

- 1 to install all components
<yes> to confirm that you want to install all the components
<a> to start the upgrade

Follow the screen directions requiring disk insertion. Seven disks will be requested. When everything except the database has been installed, the database installation menu appears. The system database can be installed from the default disk (disk 8, labeled B1), or from an existing backup disk. Remove disk 7 and insert the database disk now.

From the menu select the following.

- 2 <a> to install the database from disk 8 (B1)
OR
 to install the database from an existing backup disk
<yes> to begin the installation

Following the database installation, install the CP and IOP ROMs. From the menu select the following.

- 3 For CP ROM:
 <e> to install CP ROM only
 <yes> to start installation
 to install CP ROM from floppy disk
Follow screen directions until main menu returns.

For IOP ROM:

- <f> to install IOP ROM only
 <yes> to start installation
 < b> to install IOP ROM from floppy
Follow screen directions until main menu returns.

- 4 Remove the disk from the CMDU.
- 5 Quit and reload the system. From the main menu, select:
 - <q> to quit
 - <yes> to confirm quit
 - <a> to reboot the system

Software, and ROMs

Enter the following commands to install the software, and ROM requirements for your system.

From the main menu, select the following.

- 1 <a> to install software, CP and IOP ROMs
 - <yes> to confirm that you want to install all the components
 - <a> to start the upgrade

Follow the screen directions requiring disk insertion. Seven disks will be requested. Following the software installation, install the CP and IOP ROMs. From the menu select the following.

- 2 For CP ROM:
 - <e> to install CP ROM only
 - <yes> to start installation
 - to install CP ROM from floppy disk

Follow screen directions until main menu returns.

For IOP ROM:

- <f> to install IOP ROM only
- <yes> to start installation
- < b> to install IOP ROM from floppy

Follow screen directions until main menu returns.

- 3 Remove the disk from the CMDU.
- 4 Quit and reload the system. From the main menu, select:
 - <q> to quit
 - <yes> to confirm quit
 - <a> to reboot the system

Software only

Enter the following commands to install the software, and ROM requirements for your system.

Beginning with the main menu, select the following.

- 1 <a> to install software, CP and IOP ROMs
<yes> to confirm that you want to install all the components
<a> to start the upgrade

Follow the screen directions requiring disk insertion. Seven disks will be requested. Following the software installation quit and reboot the system.

- 2 Remove the disk from the CMDU.
- 3 Quit and reload the system. From the main menu, select:
 <q> to quit
 <yes> to confirm quit
 <a> to reboot the system

Database only

The system database can be installed from the default disk (disk 8, labeled B1), or from an existing backup disk. Remove disk 7 and insert the database disk now.

Note: This is database installation only. Database conversion is discussed later in this chapter.

Enter the following commands to install the software, database and ROM requirements for your system.

From the main menu, select the following.

- 1 <d> to install the database
<a> to install the database from disk 8 (B1)
OR
 to install the database from an existing backup disk
<yes> to begin the installation

Follow the screen directions requiring disk insertion. Seven disks will be requested. Following the database installation, quit and reboot the system.

- 2 Remove the disk from the CMDU.
- 3 Quit and reload the system. From the main menu, select:
 - <q> to quit
 - <yes> to confirm quit
 - <a> to reboot the system

ROMs only

The CP and IOP ROMs are installed individually. To be sure you install the required ROM version, install it from the floppy disk.

From the main menu select the following.

- 1 For CP ROM:
 - <e> to install CP ROM only
 - <yes> to start installation
 - to install CP ROM from floppy disk

Follow screen directions until main menu returns.

For IOP ROM:

- <f> to install IOP ROM only
- <yes> to start installation
- < b> to install IOP ROM from floppy

Follow screen directions until main menu returns

- 2 Remove the disk from CMDU 1 (NT6D64).
- 3 Quit and reload the system. From the main menu, select:
 - <Q> to quit
 - <yes> to confirm quit
 - <a> to reboot the system

Converting to option 61 E/81 media

Whenever a database is installed, the option to convert a pre-option 61E/81 database is available. This conversion supports databases operating with X11 release 15 and later software. Disk B1 (disk 8) must be in the CMDU at this time.

From the main menu, select the following.

- 1 <d> to install the database
 <c> to convert to option 81 media
 <a> to transfer the database from the floppy to the hard drive
 <a> to convert from a 2 Megabyte floppy disk
 OR
 to convert from a 4 Megabyte floppy disk
 <y> to begin the installation
 <a> to confirm the database conversion
- 2 Remove the disk from CMDU 1 (NT6D64).
- 3 Quit and reload the system. From the main menu, select:
 - <Q> to quit
 - <yes> to confirm quit
 - <a> to reboot the system

Quitting

Throughout the installation process, the option to quit is always available. When you choose to quit, the system will reload. Be sure there are no disks in the floppy disk drive when quitting.

- 1 Remove the disk from CMDU 1 (NT6D64).
- 2 Quit and reload the system. From the main menu, select:
 - <Q> to quit
 - <yes> to confirm quit
 - <a> to reboot the system

Procedure 12: Post-conversion procedure

This procedure verifies that the conversion process was successful, and system data converted completely. This is the last part of the total conversion procedure. Perform these steps **AFTER** you have completed all other procedures for your system.

The site data should be printed before and after conversion (see Table 9). If the data has changed, make the necessary updates on the **Target** release, **and** **datadump** to the new system media. You must print out the items marked with an asterisk (*) to be sure everything converted properly. All other items on Table 9 are provided if you want to print them.

Check the General Release Bulletin (GRB), and the Conversion notes (earlier in this document) to verify any database updates that need to be made as a result of conversion. Be sure to verify all **SYSxxx** messages that may appear during the conversion process. These message may indicate some database updates are required.

CAUTION

Test call processing thoroughly. This may include more testing than is described in this procedure, depending on system configuration. This procedure is intended to show some of the basic tests performed to complete the conversion process.

Note: When parallel reload is complete, the attendant consoles will be in Night mode. If you are performing these procedures during the day, contact the attendant. If these procedures are taking place during the evening, you may not want to perform these call processing steps.

Post-conversion steps

- 1 Print system data listed in Table 9. Verify that all information matches the printouts created before conversions. Make changes if necessary.
- 2 From any unrestricted telephone, dial the access code for an outside line (usually 9), and dial the listed Directory Number (DN) for the customer. Verify that the correct Incoming Call Indicator (ICI) lights at the attendant console.
- 3 If the customer is equipped with more than one console, transfer the call to another console.
- 4 Extend the call to a telephone, and release the call from the console.
- 5 From the called telephone, transfer the call back to the attendant.
- 6 Answer and release the call.
- 7 From any telephone dial the DN for the attendant. Verify that the correct ICI lights at the console, then release the call.
- 8 Busy out one trunk group using a trunk group busy key on the console.
- 9 From any telephone with TGAR O-7, dial the access code of the busied-out trunk group, to verify that the call is intercepted to the console, receives either overflow tone, or a recorded announcement.
- 10 Restore the trunk group to the in-service state using the trunk group busy key on the console.
- 11 During the conversion procedure the Central Office may have busied out the DID trunks. If DID trunks are equipped, from any unrestricted telephone, dial the access code for an outside line, and dial a DID number into the system.
- 12 If a private network is used, from any unrestricted telephone, dial the network access code and place a CDP, ESN, BARS/NARS, or ISDN call as applicable to your system.

- 13 If an MDU is present, the **Target** software and converted data must be restored to the hard drive. If you are using the 3-disk configuration, you will be prompted to insert the A2 disk. Refer to “Procedure 5: Using a 3-disk configuration” on page 43 for additional detail.

LD 43

RES

Restore software and system data to hard drive

Output reads as follows:

RESTORING DISK A1

DISK A1 RESTORED INSERT DISK A2

You must insert disk A2 before the A1 countdown is complete

RESTORING DISK B1

RESTORE COMPLETE TOTAL DISKS = 2 (or 3)

- 14 If Restore is successful, disable and remove the QPC584 **MSI** card from CPU 1. Set switch 3 position 4 (SW 3-4) ON. Reinsert and enable the card. Repeat for CPU 0.
- 15 Enter ******** to exit the overlay.

- 16 Type **ENLT**. This software enables the QPC584/QPC742 card.

For system option 61C/81, go to step 23. System options 21, 51, 61, 71, ST, NT, RT, and XT, use steps 17 through 22.

- 17 Load LD35 to test and switch CPUs.

LD 35

TCPU

Test CPUs

SCPU

Switch CPUs

To abort overlay

- 18 Type **ENLT**. This software enables the QPC584/QPC742 card.

- 19 **Datadump** to two additional copies of the **Target** system media. Put copy 2 of the A1 and B1 disks into the drives, and load LD43. If an MDU is equipped, use the Backup command. If an MDU is not equipped, use the **datadump** command. Repeat for copy 3 of A1 and B1.

LD43

BKO Backup with an MDU

OR

EDD Backup with an FDU

- 20 If not done previously, set the time and date. Note that if Call Detail Recording (CDR) is used system message ERR225 will appear. This is normal.

LD 02

STAD dd mm yyyy hh mm ss

dd = day (for example, 05 for the fifth)

mm = month (for example, 09 for September)

yyyy = year (last 2 or all four digits, for example, 92 or 1992)

hh = hour (in 24-hour time, for example, 13:00 for 1:00 pm)

mm = minute (for example, 25)

ss = seconds (for example, 00)

- 21 If you have auxiliary processors working with your system, be sure they are powered up. Be sure the Application Module Links (AML) are up. DCH and AML messages may indicate problems during the conversion. Investigate any of these messages.
- 22 Keep one copy of the **Source** software, as it was backed up in the Pre-conversion procedure, in case it becomes necessary to reconvert. After the **Target** software has been running well for a few weeks, return your original software to Northern Telecom through your distribution channel.

For option 61 C/81 systems only.

- 23 Load LD135 to test and switch CPUs.

LD 135

TEST CPU

Test CPU

SCPU

Switch CPUs

To abort overlay

- 24 Load LD137 to get the status of the CMDUs and IOPs.

LD 137

STAT

Get the status of both CMDUs and IOPs

To abort overlay

- 25 Type **ENLT**. This software enables the QPC584/QPC742 card.

- 26 Load LD43 to backup the other set of B1 disks. Insert the B1 disk in the active CMDU.

LD43

BKO Backup to the backup disks and teh active CMDU.

- 27 If not done previously, set the time and date. Note that if Call Detail Recording (CDR) is used system message ERR225 will appear. This is normal.

LD 02

STAD dd mm yyyy hh mm ss

dd = day (for example, 05 for the fifth)

mm = month (for example, 09 for September)

yyyy = year (last 2 or all four digits, for example, 92 or 1992)

hh = hour (in 24-hour time, for example, 13:00 for 1:00 pm)

mm = minute (for example, 25)

ss = seconds (for example, 00)

- 28 If you have auxiliary processors working with your system, be sure they are powered up. Be sure the Application Module Links (AML) are up. DCH and AML messages may indicate problems during the conversion. Investigate any of these messages.
- 29 Keep one copy of the **Source** software, as it was backed up in the Pre-conversion procedure, in case it becomes necessary to reconvert. After the **Target** software has been running well for a few weeks, return your original software to Northern Telecom through your distribution channel.

Items marked with asterisks (*) are required printout for conversion. Other items are recommended for a total system status.

Table 9
Print site data (Part 1 of 2)

Site data	Print command
Terminal blocks for all TNs	LD 20 REQ PRT TYPE TNB CUST <cr>
Directory Numbers	LD 20 (LD22 prior to Release 16) REQ PRT TYPE DNB CUST <cr>
Attendant Console data block for all customers	LD 20 REQ PRT TYPE ATT, 2250 CUST <cr>
*Customer data block for all customers Route data block for all customers	LD 21 REQ PRT TYPE CDB CUST <cr> LD 21 REQ PRT TYPE RDB CUST Customer number ROUT <cr> ACOD <cr>
*Configuration Record	LD 22 REQ PRT TYPE CFN
*Software Packages	LD 22 REQ PRT TYPE PKG

Table 9
Print site data (Part 2 of 2)

Site data	Print command
* Software Issue, ROM and tape ID	LD 22 REQ ISS REQ ROM REQ TID
* Peripheral software versions	LD 22 REQ PRT TYPE PSWV
ACD data block for all customers Superloop card IDs and software version (peripheral controller, superloop network and controller cards)	LD 23 REQ PRT TYPE ACD CUST Customer Number ACDN ACD DN (or <CR>) LD 32 IDC loop
Multi-purpose ISDN Signaling Processor (MISP) card	LD 27 REQ PRT TYPE MISP LOOP loop number (0-1 58) APPL <cr> PH <cr>
DTI/PRI data block for all customers	LD 73 REQ PRT TYPE DDB
Note: Items marked with asterisks (*) are required printout for conversion. Other items are recommended for a total system status.	

Option 61 C/81 Installation tool reference

The Option 61C/81 Installation tool is used to convert software and system components to a greater release, or to upissue within the same release (X11 release 18 and later).

Note: Option 61C is available with X11 release 19 and later.

Follow the instruction given throughout the menus. They direct you concerning the proper disks to insert, and when to insert them.

Do not turn the system off during the installation process. If you need to quit the installation process, do so from within the tool.

After installing any component, quit and reboot the system. This will reload the system with the newly installed information.

General information

The Installation tool is comprised of eight 3.5-inch 4 MB Extra High Density (ED) disks. Disks 1 through 7 are labeled A1 through A7. Disk 8 is labeled B 1. Be sure the correct disk is installed in the drive when performing this procedure.

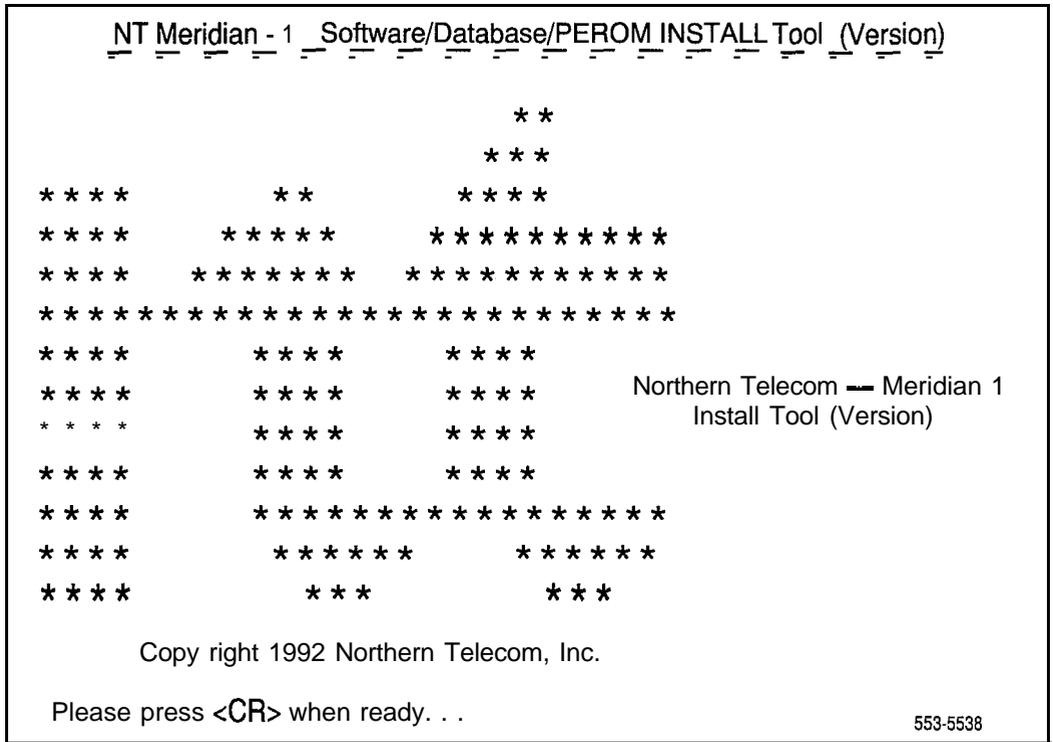
CAUTION

The screens shown in this procedure are examples. They are not intended to exactly represent the displays that will appear for your system. Be sure to watch the terminal display, and follow the instructions.

The options available with the Installation tool are listed below. Additionally, a tools menu is used to update the system time and date.

- upgrade the X1 1 software, system database, and CP and IOP ROMs
- upgrade the X11 software, and CP and IOP ROMs
- upgrade the X1 1 software only
- upgrade the system database only
- upgrade the CP and/or IOP ROMs only

Figure 1



When you press <CR>, the Installation tool performs system and disk checks to be sure the conversion can take place. If there is a problem, the Installation tool stops the process and prints a system message. The message indicates the problem found and any necessary action.

Throughout the process, status messages appear on the **TTY** display. Shown below is the status messages received after pressing **<CR>**.

```
> OBTAIN and CHECK SYSTEM CONFIGURATION.  
> Validate hard disk partitions.  
> Obtain database file names.  
> Process the Install Control file.  
> Installing for release [X11 release number].  
> System Information obtained successfully.
```

```
System Date and Time now is:  
Saturday 04-01-l 993, 15:37:04
```

If the system time and date is not set, a time and date shown is **00-00-0000, 00:00:00**. The Installation tool prompts for an update, and it can be entered at this time. Be sure the correct time and date is set before proceeding with the installation. This can be changed at any time with the Tools Menu.

Main menu

Throughout the installation, the option to stop and return to the main menu is always available. The main menu offers all the options.

NT Meridian - 1 Software/Database/PEROM INSTALL Tool (Version)

MAIN MENU

This tool will install or upgrade your Meridian - 1 System Software, Database and PE-ROM (both CP-ROM and IOP-ROM). You will be prompted throughout the installation and given the opportunity to Quit at any time.

Please enter:

- <CR>--> <a> - To install Software, CP-ROM, IOP-ROM.
- - To install Software, Database, CP-ROM, IOP-ROM.
- <c> - To install Software only.
- <d> - To install Database only.
- <e> - To install CP-ROM only.
- <f> - To install IOP-ROM only.
- <g> - To go to the Tools Menu.
- <q> - Quit.

Enter choice >

The following are the recommended options to choose for certain situations.

- For a software **update**, or going to a later X11 release, choose the default option A.
- When upgrading to an option **61C/81** system, or for a new option **61C/81** installation, choose option B.
- When a specific component is required, choose options C, D, E, or F.

Note: When installing new software, it is recommended to always upgrade the ROMs as well.

When the procedure is complete, the Installation tool does not automatically restart. You will be prompted that the process is complete and you may choose another option if necessary. Quitting the process automatically restarts the system. Do not press the RST button on either side.

When updating software (choosing option A), install the software and ROMs on one side only. The second side requires ROM installation only. Synchronizing the disks places the new software on both sides. Refer to “Procedure 6: Performing a parallel reload” on page 47 for complete details.

Status summary chart

The summary chart appears for all the installation options. This example is shown when option B (all components) is chosen. The possible values and meanings for each column are defined below.

– Selection

- **yes** indicates the item will be installed.
- **no** indicates the item was not selected, and will not be updated.

– Status

- **quit** indicates the quit option was used, and the process was exited.
- **ok** indicates the selection was installed successfully.
- **error** indicates the installation was not successful. A system message is given when the Installation tool encounters a problem. Follow the actions required by the message.
- **ignore** applies to the CP ROM and IOP ROM upgrade only. This appears when the process was exited when asked to replace a release and issue with the same release and issue.
- **blank** indicates the status is not yet determined if Selection = Yes. If Selection = No, the field remains blank.

– Comment

- **from rel <number> to rel <number>** gives the Source and Target release and issue numbers.

INSTALLATION STATUS SUMMARY

Number of disks: 8

Site Identification: <customer ID number>

Option	Selection	Status	Comment
Software	yes	ok	from rel <number> to <number>
Database	yes	ok	
CP-ROM	yes	ok	
IO-ROM	ves	ok	

553-5538

Please enter:

<CR> --> <y> • Yes, start Installation now.
 <n> - No, stop Installation. Go back to Main Menu

Enter choice >

Warning and non-warning messages

When the Installation tool encounters a problem, a system message appears on the terminal display. These messages fall into two categories: warning and non-warning.

Warning messages are not critical errors. The Installation tool proceeds with the conversion following the appearance of this message. Refer to *X11 input/output guide (553-3001-400)* for details regarding these messages.

Non-warning messages appear when a critical problem is encountered. The Installation tool stops the process, and an action is recommended. When the action is complete, the Installation tool can be restarted. In some cases, the tool allows you to restart by pressing the Carriage Return <CR>.

Installation messages (INST) are defined fully in *X11 input/output guide (553-3001-400)*. Refer to that document for more details.

Installing all components

When option A or B is chosen, the Installation tool verifies system capacity to be sure there is enough room for the conversion to take place. When the installation begins, status messages appear to keep track of the installation progress.

The components are installed in the order they appear on the status summary chart: software, database, CP ROM, IOP ROM. After choosing to install all the components, the tool asks for a confirmation (twice). Pay close attention to the menus when they appear; they display the options available at any given stage.

When you have confirmed the installation, the following screen appears.

NT Meridian - 1 Software/Database/PEROM INSTALL Tool (Version)

You have chosen to UPGRADE your system from

Release: <number> to Release <number>.

This will erase all old system files. Database files will NOT be erased. You may Continue with Software installation or Quit now and leave your system unchanged.

Note: ERASED FILES CANNOT BE RECOVERED.

Please enter:

<CR> --> <a> - Continue with Upgrade.

 - Quit.

Enter choice >

When option A is chosen, the Installation tool begins the upgrade. While the upgrade is taking place, the Installation tool presents progress messages to keep track of the tool's progress. When required, the tool prompts for the next required disk. For a sample, see the following figure.

```
Enter choice > a
> Starting Software Install
> Upgrading from release <number> to release <number>
> Initialize volume "/p"
> Create Directories
> Create directory "/p/etc"
> Create directory "/p/hidir"
> Copy from "f0/p/os/diskos" to "/p/os/diskos"
> Copy from "f0/p/disk.sys" to "/p/disk.sys"

NT Meridian - 1 Software/Database/PEROM INSTALL Tool (Version)
A

Please insert disk [2] into the floppy drive.
Please enter:
<CR> --> <a> - Disk [2] is now in the floppy drive.
          Continue with installation.
          <q> - Quit.

Enter Choice >
```

The tool responds in the same manner throughout the procedure. If the incorrect disk is inserted, or the disk is not inserted completely, a system message appears. Insert (or reinsert) the correct disk and press <CR>. The upgrade continues.

Disks 6 and 7 contain system patch information. When these disks are finished, all system patches will be erased. Contact your technical support for information regarding any patches that need to be reinserted. Patch reinsertion must be done manually.

When you have successfully installed the components, the following message appears.

NT Meridian - 1 Software/Database/PEROM INSTALL Tool (Version)

Success, the Meridian 1 Software release: <number> was installed successfully on side <number>.

Diskette 1 to 7 were read and All files were copied from floppy disk to the hard disk. If you chose to install Database, Install will ask you to insert disk8 later on.

Please press <CR> when ready. . .

Disk 8 contains the system database. If option A was chosen, disk 8 is not necessary. Returning to the Main menu will allow you to choose to install the new database.

Quitting automatically restarts the system and upgrades all the installed components.

Installing the database

Before upgrading the system database, be sure a backup of the Source database is on hand. Should any problems arise, it may be necessary to return to the previous database.

When option B is selected, the database is installed at the end of the procedure. When option D is chosen, only the database is installed. In either case, the following applies.

Database installation offers several choices. All these options are offered through a display screen

- The customer database can be installed from a backup floppy.
- The new database can be installed from Installation tool disk 8.
- A pre-option 61C/81 database can be converted to option 61C/81 database. This can be a transfer from a 4 MB or 2 MB 3.5-inch disk.
- Check on the existing system database.

As always, the option to quit the process is available.

NT Meridian - 1 Software/Database/PEROM INSTALL Tool (Version)

You have chosen to do a Database Installation. You may:

- Install the CUSTOMER Database from a previous backup floppy.
- Install the DEFAULT Database from the installation floppy (diskette number 8).
- Transfer previous system Database from floppy to the hard disk.
- Check the Database that currently exists on hard disk prior to the start of this installation.

Note: If installing the Database from a floppy disk, please insert the correct disk now.

Please enter:

```
<CR> -->      <a> - Install CUSTOMER Database.
                Customer Database backup floppy is now in the drive.

                <b> - Install DEFAULT Database.
                Installation floppy disk [8] is now in the drive.

                <c> - Transfer the previous system Database (DBMT).

                <d> - Check the Database that exists on the hard disk.

                <q> - Quit
```

Enter choice >

All these options, except option D, will erase the **Source** database files and replace them with the **Target** contents of the disk.

Option D checks the system for existing database file. If a file is missing, a system message appears indicating the missing file. Refer to *X11 input/output guide* (553-3001-400) for message details.

Installing the Target database from backup or install disk

Choosing option A or B begins the database upgrade process. This will update the system database from either a backup or installation floppy. The following screen appears. Be sure to have the required floppy disk in the drive. Option A requires the backup floppy disk; option B requires the last installation disk.

NT Meridian - 1 Software/Database/PEROM INSTALL Tool (Version)

You have chosen to install Database from the floppy drive onto the hard disk from Release: <number> to Release: <number>.

This will overwrite existing database files with new content. If the correct Database disk is not in the drive, please insert it now.

You may Continue with the Database install or Quit and leave your Database unchanged.

Note: ERASED DATABASE FILES CANNOT BE RECOVERED.

Please enter:

<CR> --> <a> • Continue with the Database Install.

 • Quit.

Enter Choice >

Again the system prompts for confirmation. This process overwrites the existing database files. There is no way to recover the old files once this process is complete. When the installation is confirmed, the upgrade begins. Status messages appear to keep track of the upgrade progress. If no system messages appear, the installation is successful.

Upgrading to an option 61C/81 database

Option C is the Database Media Transfer (DBMT). This converts a previous database to an option 61C/81 database. The database must be X11 release 15 or later to be converted to option 61C/81. This does not change the content of the database, only the file format.

There are two options within the DBMT menu: verify the version and issue of the database on the disk, and convert the database on the disk. Choosing option B displays information concerning the disk in the floppy drive as shown below.

NT Meridian - 1 Software/Database/PEROM INSTALL Tool (Version)

You have chosen to display the version and issue of the Database on the floppy disk. please insert the source floppy disk (A1) in the floppy drive now. After you insert the disk in drive, please choose one of the following types:

WARNING: If you choose 2M floppy type, then do NOT insert a 4M floppy and vice versa. This may cause a problem in initializing the floppy driver. If this problem occurs you will have to reboot the system and re-invoke the Install tool.

Please enter:

<CR> --> <a> - The source floppy is a 2-Mbyte capacity type.
 - The source floppy is a 4-Mbyte capacity type.
 <q> - Quit.

Enter Choice > a

> Display Database's version and issue

* MERIDIAN - 1 DATABASE *

Version	1211
issue	1819

Press <CR> when ready. .

Choosing option A allows you to convert a previous database to an option 61C/81 database. Pre-option 61C/81 databases must be X11 release 15 or later, on a 3.5-inch disk. The disk can be either 2 MB or 4 MB capacity. When option A is chosen, the system prompts for disk type. Refer to the figure below for display examples.

CAUTION

CNI cards, and Network groups must be defined in LD17 prior to converting a pre-option 61C/81 database. If not, system information will be affected.

NT Meridian - 1 Software/Database/PEROM INSTALL Tool (Version)

You have chosen to transfer the Database from floppy to hard disk. Please insert the source floppy disk (61) in the floppy drive now. After you insert the disk in the drive, please choose one of the following floppy types.

Please enter:

- <CR> --> <a> • The source floppy is a P-Mbyte capacity type.
- • The source floppy is a 4-Mbyte capacity type.
- <q> • Quit.

Enter Choice >

When the choice is made, the status summary window appears with information detailing the conversion process. Following the status summary, a window appears to confirm the conversion choice.

NT Meridian - 1 Software/Database/PEROM INSTALL Tool (Version)

You have chosen to transfer the Database from floppy onto the hard disk of side 0. This will erase the database on the hard disk. If you quit now, the database will be left unchanged. Please confirm before Install does the transferring.

If you would like to transfer the database, but the floppy disk B1 is not in the drive, please insert it now.

WARNING: If you choose 2M floppy type, then do NOT insert a 4M floppy and vice versa. This may cause a problem in initializing the floppy driver. If this problem occurs you will have to reboot the system and re-invoke the Install tool.

Please enter:

<CR> --> <a> - Yes, transfer the database.

 <q> - Quit.

Enter Choice >

Installing CP and IOP ROMs

It is possible to upgrade CP and IOP ROM information only. It is recommended that the ROM information be upgraded whenever the software is upgraded. ROM information must also be installed whenever new ROMs are installed.

ROM information must be installed on both sides. When the system disks are synchronized, the upgraded software will be installed on both sides. Refer to "Procedure 6: Performing a parallel reload" on page 47 for more information.

The menus and status summaries are similar to all the other menus. The CP ROM menu is shown here. It applies to both the CP and IOP installation process.

NT Meridian - 1 Software/Database/PEROM INSTALL Tool (Version)

You have chosen to install CP-ROM. However, there are 2 sources the CP-ROM can be installed from:

- Hard disk. Rom image file from the hard disk will be installed
- Floppy disk. Rom image file from the floppy disk will be installed

Please make a selection of which source of the ROM image file you would like to install.

Please enter:

<1> - Install CP-ROM from the hard disk (Current rel. iss: xx.xx).

<2> - Install CP-ROM from the floppy disk.

<Q> - Quit.

Enter Choice >

Install the ROM information from the hard disk if you have installed the Software portion previously. The software installation includes the necessary ROM information.

Install the ROM information from the floppy if the software was not upgraded, or the ROM upgrade is being done on the second side following a parallel reload.

If this installation fails for any reason, retry. If it fails a second time, contact your technical support personnel.

Quitting the installation tool

Throughout the installation process, the option to quit is always available. When you quit, you can return to the main menu, load the installation tool from the beginning again, or end the installation process entirely.

When you quit the installation process entirely, the system reboots automatically. Be sure any floppy disks are removed from the floppy disk drive **before** you quit the tool and reboot the system.

When you enter Quit from a menu, the following menus appear.

```

NT Meridian - 1 Software/Database/PEROM INSTALL Tool (Version)

```

```

You have chosen to Quit. Please confirm.

```

```

Please enter:

```

```

<CR> ->      <Y> - Yes, Quit.

```

```

                <N> - No, DO NOT Quit.

```

```

Enter Choice >

```

Choosing to quit at this point prompts you to decide whether you want to quit the process entirely or return to the main menu.

NT Meridian - 1 Software/Database/PEROM INSTALL Tool (Version)

You have chosen to Quit from Install. Now, you have the option of:

- Reboot the system. If you have any floppy disk in the drive, it will reboot from this floppy. If you take out the floppy disk, it will reboot from the hard disk.
- Continue loading from where you left off prior to install. If disk 1 is not in the drive now, please put disk 1 in the drive now.
- Go back to Install's Main Menu.

Please enter:

<CR> -> <a> • Reboot the system.
 • Continue loading.
 <C> • Go back to Main Menu.

Enter Choice >

The tools menu

The tools menu is available to set the time and date. This time and date is for your system. It will reset the time and date, if already configured.

```

NT Meridian - 1 Software/Database/PEROM INSTALL Tool (Version)
                                     TOOLS MENU

This is the Tools Menu for Install. You can select the tool that is appropriate. Please select one of
the options below.

Please enter:

<CR> ->      <a> - To set the system date and time.
              <b> - To partition the hard disk.
              <C> - To go back to Main Menu.

Enter Choice >

```

The disk partition is available to support personnel. A password is required to go further with that choice. Setting the time and date is done with the following menu.

When asked to enter the time and date, enter it in the following format. A space or dash can be used to separate the items.

dd mm *YYY*
hh mm ss
or
dd-mm-yyyy
hh-mm-ss

NT Meridian - 1 Software/Database/PEROM INSTALL Tool (Version)

You have selected the option to set the system date and time. This will change the internal clock of your system to a new date and time.

The system date and time are also used by Install to time-stamp the new files created.

pressing the carriage-return at the prompt below will leave the system date and time unchanged.

Please enter the **new** date or time.

Current date is: Thursday 04 - 01 - 1993

Enter new date (dd mm yyyy)? 2 4 1993

Date is set to: Friday 04 - 02 - 1993

Current time is: 12:05:05

Enter new time (hh mm ss)? 13 05 05

Time is set to: 13:05:05

System date and Time now is:

Friday 04 - 02 - 1993, 13:05:05

SL-1

Software conversion procedures

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SL-1

Traffic measurement

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Introduction

The Meridian 1 automatically collects data about peg counts, usages, failures to match, and other activities that occur during operation. These measurements are stored in the system and are output on the hour or half-hour. By examining traffic data from different times of the day and year, system administrators can monitor system performance, identify potential congestion problems, and plan future growth.

System measurements are available for six different categories: networks, services, dial tone delay, processor load, lines, and junctor groups. With these statistics, a system manager can balance the load across the system and can meet or exceed the grade of service.

The audience for this document includes maintenance technicians, system operators, and system managers who want detailed information on types of calls, call completion rates, call failures, waiting periods, and other vital data.

Related documents

Program loading instructions and system messages are provided in *X11 input/output guide* (553-3001-400).

If your system is equipped with the Meridian Manager Traffic Reporting option, available only with X11 release 17 and earlier, please refer to *Meridian Manager Traffic Reporting* for detailed information on programming traffic measurements.

Traffic overview

This chapter provides information on how traffic data is accumulated, processed, and output. It also provides important information on how to interpret the traffic reports.

The system accumulates traffic data during normal call processing. This data is processed to provide regularly scheduled reports. Typical traffic measurements include the following:

Peg count A peg count is a count of an event, like call completion.

Failure To Match (FTM) A failure to match is a count of the number of times an idle network path could not be found between two connection points.

Usage The usage of a resource such as a trunk or a conference is the time measurement, in 100 call seconds (CCS), of how long the resource has been busy. The usage time is normally calculated when the resource becomes idle.

Established path An established path is a path between two terminals when both are talking to each other. Outgoing calls are not considered established until the end-of-dialing timers have expired, as set in the software. Incoming calls are not established until answer supervision is returned.

Service loop A service loop is either a tone and digit switch loop, or a multifrequency (MF) sender loop.

Network loop Provides path switching and control for stations and trunks connected to it.

The traffic data is accumulated for many of the system resources, such as lines, trunks, and network loops. The data is processed on a scheduled basis and output in various reports. The Traffic Control overlay (LD02) is used to set the traffic options.

The traffic reporting system saves system-generated traffic reports in a Traffic Log File rather than in the History File.

Traffic Control program (LD02)

LD02 is used to

- set traffic report schedules and options
- set the type of reports to be generated
- set system date, time, and daily time adjustment
- set or query the system identification (ID)
- set thresholds
- reset the system clock when daylight savings time begins and ends
- print or perform threshold tests on the last reports

The Traffic Control commands are provided at the end of this document and in the XII *input/output guide (553-3001-400)*.

Report schedules

The traffic reports can be output

- on selected days of the week during a defined period of the year, specified by start day and end day
- for any defined period of the day (from 8 a.m. to 5 p.m., for example)
- every hour or half hour as follows:
 - hourly, on the hour
 - hourly, on the half-hour
 - half-hourly, on the hour and half-hour

Customer reports may have different schedules.

Time and date

The time of day and date of the system can be queried and adjusted manually. Manual adjustment is required after a sysload.

To compensate for tolerances in the system clock, the time of day can be automatically adjusted during the midnight routines.

Note: Since the traffic measurement schedule and midnight routines reference the time-of-day clock, these programs can be inadvertently triggered by time adjustment. For example, adjusting the time from **11:05** to **10:55** results in the output of traffic data when the system clock reads **11:00**, provided output is scheduled.

System identification

The system ID is required when the system is controlled from a central administration center. The system ID identifies the system from which the traffic measurements originate. Each system is identified by a unique 1 to 4 digit number that is output as part of the traffic data.

The system ID is assigned to the system when the traffic measurement schedules and options are defined. It is input the first time traffic schedules are defined. When traffic schedules or options are changed, the system ID number need not be redefined. The system ID may also be changed using the Configuration Record program (LD17).

Types of traffic reports

The following traffic reports are available:

System reports

Customer reports

- Customer network reports
- Threshold reports
- Traffic report on selected terminals

System reports

System reports are identified by the prefix TFS. The 3-digit code following the prefix identifies the type of report.

TFS001 - networks

TFS002 - service loops

TFS003 dial tone delay

TFS004 - processor load

TFS005 - selected terminals

TFS007 junctor group

TFS008 - Command Status Links and Application Module Links

TFS009 - D-Channel

TFS011 - Multi-purpose Integrated Services Digital Network (ISDN) Signaling Processor traffic

TFS012 - Multi-purpose ISDN Signaling Processor D-Channel (DCH) management

TFS013 - Multi-purpose ISDN Signaling Processor messages

TFS015 - Meridian Packet Handler (MPH)

Customer reports

Customer reports are identified by the prefix TFC. The 3-digit code following the prefix identifies the type of report.

TFC001 – networks

TFC002 – trunks

TFC003 – customer console measurements

TFC004 – individual console measurements

TFC005 – feature key usage

TFC006 – Radio Paging

TFC007 – Call Park

TFC008 – messaging and auxiliary processor links

TFC009 – Network Attendant Service

Customer network reports

Customer network measurements are identified by the prefix TFN. The 3-digit code following the measurement identifies the type of report.

TFN001 – route lists

TFN002 – Network Class Of Service

TFN003 – incoming trunk group

Threshold reports

Various traffic thresholds can be defined to monitor system performance. When a threshold is reached, a warning message is output. For example, a threshold for attendants' average speed of answer can be defined. If this value is exceeded in a report period, then a TFC103 warning message is output. In addition, the two attendant console reports (TFCO03 and TFC004) are generated, even if they are disabled. Threshold warnings may indicate the need for additional resources, such as more attendants.

The following system or customer thresholds can be defined. For each threshold there is an equivalent traffic report.

TFS101 — dial tone speed

TFS102 — loop traffic

TFS105 — junctor traffic

TFC101 — incoming matching loss

TFC102 — outgoing matching loss

TFC103 — average speed of answer

TFC104 — percent last trunk busy

TFN101 — off-hook queue overflow threshold

Traffic report on selected terminals

Selected lines and trunks can be defined for special traffic measurement. In addition to the normal traffic measurements, additional peg counts and usage measurements are made for this set of terminals. Lines and trunks to be included in this set are given the Individual Traffic Measurement (ITM) class of service in the Traffic Control program. Attendants may not be given the ITM class of service.

Traffic collection

The Meridian 1 has five traffic data collection stages: accumulate, hold, print, control, and output.

Accumulate

When the Meridian 1 takes any measured action, the associated counters are updated. Traffic information is automatically accumulated as the events take place, regardless of schedules or thresholds. When the measurements are transferred to the holding register, the accumulating register returns to zero for the next tracking period.

Note: Measurements totaling less than 50 call seconds are recorded as 0 ccs.

Hold

According to your defined schedules, traffic information is transferred from the accumulating registers to the holding registers. Each accumulating register has an associated holding register.

You can view or print data in the holding registers whenever you like. The information remains in the holding register until the next scheduled transfer.

Some measurements have thresholds. When the information is transferred into the holding register, the thresholds are checked. If the thresholds are exceeded, a message is printed.

Print

Once data is in the holding registers, you can print it whenever you desire before the next scheduled transfer. Additionally, in LD02, you can access the holding registers and print any aspect of the traffic measurement information. Traffic data can only be printed when it is in the holding register.

Note: Depending on the type and amount of information, you may require a high speed printer.

Control

Traffic measurement variables (such as options and schedules) are accessed in LD02. See *X11 input/output guide* (553-3001-400) for complete information.

Output

Traffic information is output according to your schedules defined in LD02. When data is being printed at the teletype (TTY), the output rate depends on the system time available. Information may be printed all at once, or it may be printed at intervals. Data output begins when the information enters the holding registers, and it ends before the next scheduled transfer.

Factors affecting traffic data

Any change in the system, such as a sysload or under- or over-use of facilities, can cause discrepancies in the data collected. In most cases, warning messages alert the user that the data may have been corrupt.

Sysload and initialization

A sysload or system initialization causes traffic data in the accumulating and holding registers to be lost. After sysload, any changes to traffic schedules, traffic options, or threshold levels made since the last Equipment Data Dump must be redefined using LD02. After a sysload, two traffic report periods are required to produce a real-time usage count.

After an initialization, a TFS301 message precedes traffic reports output. The message warns that the initialization has corrupted the traffic data because the data was not collected over the entire hour or half-hour. Ignore the first traffic reports after an initialization.

A TFS302 message warns that the traffic schedule was changed during the last hour or half-hour. Traffic reports following this message may be invalid if the change involved periods not previously scheduled or report types not previously enabled.

Connections with high usage

To report connections with excessive CCS, two warning messages are provided. TFS401 is printed when the CCS are greater than or equal to 36 CCS, but less than 50 CCS. TFS402 is printed for CCS greater than or equal to 50.

When a network path is held for longer than one hour (36 CCS), the accumulated usage can have a detrimental effect on hourly traffic studies. High-usage connections can result from

- data terminal connections
- loop start trunks that fail to provide suitable supervision
- long conversations
- call processing faults
 - telephone problems

Small quantities

Peg counts and usage measurements for a small number of calls should not be used to analyze traffic data. Traffic measurements are not accurate for small samples.

Traffic information is accumulated in units of 2 seconds and is converted to CCS when printed. The CCS amounts are rounded to the nearest thousandth, so usage of less than 50 CCS are printed as 0 CCS.

Matching timeslots

Meridian 1 switching is accomplished through network groups and loops. A half network group contains 16 network loops. A full network group contains 32 network loops. A network loop has 32 timeslots: 30 are used to establish a network connection, 1 is for signaling and control, and 1 is reserved for future use. A **timeslot** is considered busy if it is in actual use or is reserved by the Central Processing Unit (CPU) for future use.

In L, VL, LE, VLE, XL, A, M, MS, and S machines, timeslots are grouped into matching pairs so that each **timeslot** can be used with only one other **timeslot** on the same or different network loop. Thus, a matching pair of timeslots is idle only if both timeslots are idle. For a network connection between different groups, the matching timeslots are idle in at least one of the four junctors between the two network groups.

N, XN, ST, STE, RT, NT, XT, 21, 21E, 51, 61, 71, and 81 systems do not require matching timeslots. Any **timeslot** in the network loop may be used.

Measurement verification

A number of cross-reference checks can verify the traffic data. Sometimes a path is reserved but never actually used, or is used but is neither a tone and digit loop connection, nor a part of a completed call under the definition of TFCOO1 report, so the checks given here contain a tolerance. For example, with ring no answer, a path is reserved between the two terminals, but not used.

TFS001 and TFC001

In these cases, TFS001 usage accumulates as the timeslots involved are considered occupied; however, no usage accumulates in either TFCOO1 or TFS002 reports.

The sum of TFS001 usages on all terminal loops, minus the sum of TFS001 usages on tone and digit loops should equal twice the sum of all TFCOO1 usages for all customers $\pm 25\%$.

TFCOO1 and TFC002

For each customer the following figures should be within $\pm 2\%$:

- outgoing usage plus tandem usage in TFCOO1 should equal the outgoing trunk usages for all groups in TFC002
- outgoing peg count plus tandem peg count in TFCOO1 should equal the sum of all outgoing trunk peg counts, less Recorded Announcement Trunk peg counts, for all groups in TFC002
- Incoming usage plus tandem usage in TFCOO1 should equal the sum of all incoming trunk usages for all groups in TFC002
- incoming peg count plus tandem peg count in TFCOO1 should equal the sum of all incoming trunk peg counts for all groups in TFC002

TFS001 and TFS002

The following figures should be within 45%:

- the sum of loop failure to match over all Tone and Digit Switch (TDS) loops in TFS001 should equal the sum of failure to match over all services except **Digitone** Receiver and conference loops in TFS002
- the sum of loop usage over all TDS loops in TFS001 should equal the sum of service usage over all services except **Digitone** Receiver and conference in TFS002
- the sum of loop peg count over all TDS loops in TFS001 should equal the sum of service peg count over all services except **Digitone** receiver and conference in TFS002

The following figures should be within $\pm 2\%$:

- the sum of loop failure to match over all conference loops in TFS001 should equal the conference failure to match in TFS002
- the sum of loop usage over all conference loops in TFS001 should equal the conference service usage in TFS002
- the sum of loop peg count over all conference loops in TFS001 should equal the conference service peg count in TFS002

System traffic reports

This chapter describes the system traffic measurements and reports. Peg count and thresholds are always given as a **5-digit** number. Usage (accumulated CCS) and console measurements are given as 7-digit numbers.

TFS000 traffic print program entry

TFS000 is output to indicate the start of the reports.

TFS001 networks

The TFS001 report measures four types of network loops, which appear on the report as TERM (lines, trunks, consoles), TDS (Tone and Digit Switch), MFS (Multifrequency Sender), and CONF (conference service). Six columns of data indicate intraloop and loop measurements. The first three measurements, which show intraloop data, are valid only for terminal **loops**. TDS, MFS, and CONF loop values are always zero as they do not use intraloop measurements. The six columns:

- FTM (failure to match) increments when an intraloop connection cannot be made because all timeslots are busy.
- CCS shows the total time (in hundreds of call seconds) that two timeslots are busy in the same loop.
- PC (peg count) increments when an intraloop connection becomes idle.
- Loop FTM increments for the total loop when a connection between two terminals cannot be made.
- Loop CCS shows the total time that timeslots were busy for a loop.
- Loop PC indicates the total number of times that a connection was idled for the loop.

TFSOOI may count incomplete or unsuccessful calls as well as successful ones. TFSOOI does not count calls that use End to End Signaling (EES). The sections on “Terminal loop measurements” below, “Conference loop measurements” on page 18, and “Service loops” on page 19 describe this information in greater detail. See Figure 1 for TFSOOI report format.

Intraloop and loop FTM should be zeroes. Any failure to match indicates a load balance problem. The call seconds should not exceed 3500, and all terminal loops should have similar CCS counts (within 100 CCS of one another). Total loop blockage should be less than one percent, although blockage on an individual loop may exceed one percent.

To solve blockage and load problems, redistribute terminals and CCS over loops. Overloaded loops should not get new traffic, and it may be desirable to add a shelf or a loop (if the average loop CCS exceeds 660).

Terminal loop measurements

This section gives a detailed description of each field in each report.

Loop number

The loop number that is being measured.

Loop type

The type of network being measured (terminal loop, TDS or MFS Sender loop, or conference loop).

Intraloop Failure to Match (FTM)

When two terminals on the same loop fail to match, loop FTM increments twice (once for each terminal) and intraloop FTM increments once. Intraloop FTMs indicate whether blockage occurred on a single loop or among many loops. Lessening traffic can ease most intraloop and interloop FTMs.

For DTI loops, the FTM increments only once.

Intraloop usage

When two points on the same loop connect, call usage is added twice to loop usage (once per timeslot) and once to the intraloop usage.

Intraloop peg count

If two connection points on the same network loop are idled, the loop peg count increments twice, once for each terminal, and the intraloop peg count increments once. These measurements plus the interloop measurements show the actual system loop usage.

Loop FTM

The loop FTM increments when the following conditions occur:

- A terminal to terminal connection is blocked. In this case, the loop FTM of both network loops increments.
- A terminal or **Digitone Receiver (DTR)** to service loop path is blocked. An FTM is counted on both the service loop and the terminal loop. No call can generate more than two FTMs.
- A single-line telephone to DTR path is blocked. An FTM is counted on both the DTR loop and the terminal loop. For any one call, at most one pair of FTMs per blocked idle DTR can occur. After the first pass at all DTRs, further attempts to find an idle DTR and a path to it (the system tries again automatically) are not counted as additional loop FTMs.
- A terminal loop to conference loop connection is blocked when any party tries to form a new conference or to add a new conferee to an existing conference.

Loop usage

The loop usage gives the total time that loop timeslots were busy. This measurement reflects the switch condition. Switches with less than 200 to 300 CCS on enhanced network loops (QPC414) or 800 to 900 CCS on superloops are considered low usage switches. Average use ranges from 300 to 500 CCS for enhanced network loops (QPC414) and from 1200 to 2000 CCS for superloops. High usage switches have 500 to 600 CCS on enhanced network loops (QPC414) and 2000 to 2800 CCS on superloops.

The maximum supported loop CCS for local equipment is 660 for network loops (QPC414) and 3500 for superloops (NT8D04). For Remote Peripheral Equipment (RPE) loops, the maximum is 435 CCS.

A report whose loop CCS is greater than 1080 CCS for network loops or 4320 CCS for superloops is invalid.

Loop peg count

This measurement increments when an established path between two terminals becomes idle. Idling the paths between the terminals and TDMF or DTR loops does not increase the terminal loop peg count. Idling the paths does accumulate peg counts on the service loops.

Conference loop measurements

Other measurements apply to conference calls.

Intraloop peg count, usage, and FTM

Since all calls to a conference loop are from another loop, the intraloop measurements are always zero.

Loop FTM

The conference loop FTM increments in two cases:

- No conference loop is available for a new conference. In this case, all conference loops of the system have been checked, and the FTM counts against the last conference loop checked. Conference loops are not used in any order so the last one checked is not always the same.
- A new conferee cannot be added to an existing conference.

Loop usage

This measurement gives the total time that timeslots in this loop were marked as busy and unavailable for other use. Conference loop usage can vary greatly. Conference loops are selected randomly and are evenly distributed throughout the system.

Loop peg count

This shows the total number of people involved on a given conference loop. The loop peg count increments when an established path between the connection point and the conference loop is idle. The connection point's loop peg count is not incremented. Each person involved in the conference requires a path between the telephone and the conference loop.

When a conferee leaves a conference, a peg is made only on the conference loop. The overall effect is

- one peg per added conferee on its terminal loop
- one peg per conferee, including the controller, on the conference loop
- one peg per added conferee on the controller's terminal loop.

For example, a 6-party conference will give 5 pegs on the terminal loop peg count, 6 on the conference loop, and 5 on the controller's terminal loop.

End to End Signaling Interworking does not use the conference loop, reducing traffic measurement on this loop.

Service loops

Service loops include TDS and MF senders.

Since all calls to a service loop are from another loop, the intraloop measurements are always zero.

Loop FTM

When you cannot find a path for either a tone or an outpulsing to a terminal loop or service loop, then loop FTM counts on the last service loop checked. Further attempts to provide the service to the same terminal are not counted.

Within a given network group, service loops are checked in a fixed order. In normal operation, switches on the first TDS loop, which accumulates the peg and usage traffic, show high usage and those on a second loop that accumulates all loop FTM counts show low usage.

Loop usage

Loop usage gives the total time that timeslots of this loop are marked busy and unavailable for other use.

Loop peg count

This count increments whenever a path to the TDS loop becomes idle.

Figure 1
TFS001 networks

Format							
System ID	TFS001						
Loop number	Loop type	Intraloop FTM	Intraloop c c s	Intraloop peg count	Total loop FTM	Total loop c c s	Total loop peg count
Example							
200	TFS001						
004	TERM	00000	0000142	00161	00001	0002056	01652 S
008	TERM	00000	0000184	00180	00001	0002500	01725 S
012	TDMS	00000	0000000	00000	00013	0000031	01496
013	CONF	00000	0000000	00000	00000	0000010	00006
014	TERM	00000	0000085	00060	00006	0000544	00287
015	TERM	00003	0000064	00039	00014	0000372	00284
<p>Note 1: Superloops are identified by an "S" at the end of the line. Superloops exist in multiples of four (4, 8, 12, 16, etc.). For example, if superloop 4 exists, loops 5, 6, and 7 do not.</p> <p>Note 2: Determine the grade of service provided within the listed loop, and determine the total loop traffic by dividing the FTM by the peg count.</p>							

TFS002 service loops

The TFS002 report measures the following service loops: CONF, DTR, TDS, MFS, and tone detectors. The report output differs according to the type of service. Each type of service has its own report line. Three-digit numbers identify each service:

000	Dial Tone
001	Busy Tone
002	Overflow Tone
003	Ringback Tone
004	Tone Ringing Meridian 1 Sets
005	Miscellaneous Tone
006	Outpulsers
007	Spare
008	Digitone Receiver
009	Conference
010	MF Tone for Automatic Number Identification (ANI)
011	Meridian 1 Tone Detector
012	MFS
013	EES TDS usage (X11 release 19 and later)
014	EES conference usage (X1 1 release 19 and later)

See Figure 2 for TFS002 report format.

Service Failure To Match (FTM)

When no path can be found between a terminal and any service loop, the **FTM** for that service increments. Repeated attempts to obtain a path for a service (dial tone, overflow tone, or outpulse) count as a single service FTM.

The response to the FTM varies, depending on the type of request.

- A queue forms for requests for **Digitone** Receivers, dial tone, overflow tone, and outpulsing connections. The system periodically searches for a network path.
- The system abandons requests for tones other than dial tone and overflow tone.
- Conference connections are replaced by overflow tone; console tone and the buzzing tone are not provided by the TDS.

Service usage

Service usage indicates the total time that the path to the service loop was busy. Peg counts for dial tone, busy tone, overflow tone, **ringback** tone, ringing tone, and miscellaneous tone appear per timeslot, not per call. Outpulsers accumulate usage for the duration of time spent outpulsing. The trunk circuit card, rather than the TDS card, performs the actual outpulsing.

Service request peg count

This measurement increments whenever a path between a terminal and a service loop becomes idle. The report identifies the service with a 3-digit number. If the type of service is unknown, the miscellaneous tone peg count increments.

An **outputse** is pegged once for the duration of outpulsing. Each outpulsed digit is not counted.

Conference measurements

TFS001 service number 9 represents the sum of all conference measurements on a per conferee basis. For example, a three-party conference for 200 seconds, counts three times with usage equal to 6 CCS.

Digitone Receiver (DTR) measurements

DTR measurements reflect service failures, usage, and requests.

Service FTM

This count increments when the system cannot find a path between the originating party and an idle DTR. It does not increment in the case where idle **DTRs** cannot be used because of network blocking, and a subsequent idle DTR is successfully used for the call.

If the system cannot provide dial tone through a DTR, but the path between the originating party and the DTR is available, the DTR **FTM** increments. When the system makes repeated attempts to find a path to an idle receiver, any attempt after the first does not increment the FTM.

Service usage

This gives the time that the path between the DTR and the originating party was busy. It accumulates when that path is made idle.

Service request peg count

This count, which shows the number of DTR uses, increments when a path between a DTR and a single line telephone, or a direct inward dial (DID) or Tie trunk (receiving DTMF from the central office) is idle. The Meridian 1 does not provide dial tone to 2500 type telephones until an idle DTR and network path are available. Since requests for dial tone are queued if the TDS is not available, the count reflects the number of unavailable TDS timeslots as well as DTR use. The following formula determines grade of service:

$$\text{FTM} \div (\text{peg count} + \text{FTM})$$

Tone detector service

Tone detector statistics indicate service failures, usage, and requests.

Service FTM

This count increments when no path is available between an idle tone detector and a trunk.

Service usage

This count increments when the path between the tone detector and the originator is busy.

Service request peg count

This count increments when the path between the tone detector and the trunk is idled. The count reflects the total number of times the tone detectors are used.

Figure 2
TFS002 service loops

Format			
System ID	TFS002		
Service number	Service FTM	Service usage	Service request peg count
Example			
200	TFS002		
000	00002	0000023	01650
001	00000	0000003	00099
002	00002	0000008	00321
003	00002	0000057	00951
004	00000	0000010	00168
005	00000	0000005	00068
006	00003	0000044	00376
007	00000	0000000	00000
008	00013	0000076	01471
009	00000	0000013	00069
010	00000	0000002	00012
011	00000	0000000	00000
012	00000	0000002	00022
013	00000	0000001	00003
014	00000	0000000	00000

TFS003 dial tone delay

TFS003 measurements show the number of times users waited for dial tone for longer than one second. Three columns indicate the number of times a user waited longer than three seconds for a dial tone, the number of times a user waited longer than ten seconds for a dial tone, and the total delay time in seconds of all calls that waited longer than one second. Dial tone delay should occur in no more than 1.5% of calls. See Figure 3 for TFS003 report format.

These counts include both successful and aborted connections. A call that is delayed for longer than ten seconds increments both the three-second and the ten second counters. Dial tone delay can be caused by insufficient **DTRs**, network blockage, heavy CPU demands, or hardware faults.

Figure 3
TFS003 dial tone delay

Format		
System ID	TFS003	
Delay	Delay	Total delays
> 3 seconds	>10 seconds	< or = 1second
Example		
200	TFS003	
00003	00001	0040

TFS004 processor load

The processor load report indicates the load on the system by showing the peg count for CPU functions: idle cycle count, total CPU attempts, load peak peg, input/output buffer overflow, and call register overflow. See Figure 4 for TFS004 report format.

There are 3600 seconds in an hour, or 36 CCS. System integrity functions consume about 30% of CPU CCS, leaving approximately 25 CCS for call processing. The more real time the switch uses, the slower call processing functions operate. For this reason, it is a good idea to check this report regularly (twice a year or whenever new features are added) to make sure the system is not overloaded. The idle cycle count should be a minimum of one million cycles.

Report measurements

With X11 release 18 and later, the following parameters appear on TFS004 output:

- the rated call capacity of the system
- the percentage of real time used for the current hour
the highest percentage of real time used for the last 24 hours
- the hour of the highest real time usage
- the number of eliminated measurements

Measurements are collected over 24 hours. Although errors are inevitable, more than six invalid points per 24 hours indicate that the numbers produced are not valid. (After a sysload, zero values print for the first 24 hours because of insufficient data collection.)

Idle cycle count

The idle cycle count indicates the real time capacity used for call processing.

If none of the first five items requires attention, the item is included in the idle cycle count. The idle cycle count, plus the number of CPU attempts, plus the load peak peg define the CPU load.

As the load increases, the idle cycle count decreases. As the load decreases, the idle cycle count increases. This count increments every time the processor does not have any of the following tasks to perform:

- input messages (including timing marks)
- 128 ms timing tasks (high-priority or low-priority)
- ring/queue activity
- teletype (TTY) input

Total CPU call attempts

This increments once for each of the following:

- dial tone request
 - incoming trunk seizure
- call originating from the attendant
- attempt by the attendant to extend a call

Load peak peg

The load peak peg count is the number of times the CPU could not process a task within 128 ms. The CPU continues to perform and complete the tasks, in order of priority, until all the tasks are completed, no matter how many 128 ms periods it takes.

I/O buffer overloads

I/O buffer overload measures the number of times that signaling or output signals have been lost due to buffer overflow. Each peg count indicates a lost call. The buffers involved are the high priority input buffers (HPIB), the low priority input buffers (LPIB), and the 500/2500 and Meridian 1 output buffers (OB). If any I/O buffer overflow count is not zero, it indicates an extreme traffic load, a hardware fault, or the given buffer is not being fully used. Refer to *System engineering* (553-3001-151) for recommended buffer sizes.

Call register (CR) overflow

Call register overflow counts the number of times call processing software fails to find an idle call register. Each peg represents either a lost Call Detail Recording (CDR) record, a lost call, or an uncompleted feature. When a call or feature requires a call register and none is available, a call register transfers from the CDR queue to the call or feature. In this way, calls and features are given higher priority than CDR records. Refer to *System engineering* (553-3001-151) for call register provisioning guidelines.

Rated Call Capacity

Rated Call Capacity (RCC), determined over 24 hours, is a function of the idle cycle count and the number of call attempts, assuming a linear relationship between those factors. RCC represents the maximum level at which the CPU can operate and still maintain the required grade of service.

Slight RCC variations are normal. A change greater than 5% indicates a possible shift in the fundamental nature of the call load.

Percent of Real Time Used

Percent of Real Time Used (Percent of RTU) shows the load level of the system for the current hour or half hour using the following formula:
Percent of RTU = $100 * \text{Current number of call attempt} \& \text{CC}$.

Maximum of Real Time Used

Maximum of Real Time Used (Max RTU) shows the maximum load on the system during the previous 24 hours using the following formula:
Max RTU = $\text{Maximum number of call attempt} \& \text{CC}$.

Hour of Maximum Real Time Used

Hour of Maximum Real Time Used (Hour of Max RTU) shows the time that the maximum load occurred, which is the busiest hour of the previous 24 hours. (Hours begin only on the hour, not on the half hour.)

Exception peg count

Every measurement that contains information not related to call processing activity impairs the relationship between idle cycle counts and number of call attempts, reducing the accuracy of calculations. Exception peg count indicates the number of times the idle cycle count or CPU attempt count deviates from the expected values over 24 hours. Up to 3 exceptions in 24 hours is normal because of activities like midnight routines, service changes, and broadcast messages. If the number is greater than 6, the RCC is invalid. If the number continues to be high, a detailed traffic analysis is required.

Note: If the number of observation hours is less than 48 or the correlation coefficient is less than .95, only asterisks print.

Real time load

The real time load includes a minimum idle cycle count and a maximum idle cycle count.

- Take the minimum idle cycle count over one hour when the switch is not processing any calls. Background programs, as defined in the configuration record, should be removed from the configuration record for the duration of the measurement period, all users should be logged out, and there should be no TTY activity.

Note: In an ideal situation, the switch processes no calls during the one hour measurement period. However, you can make a fairly accurate minimum idle cycle count if the number of calls processed does not exceed 3% of calls processed during a busy hour.

- Record the maximum idle cycle count during a busy hour of each day (normal call processing, background programs running) in a moderately busy season for two weeks. The average of these daily numbers is the maximum cycle count.

The percent of Real Time Used (%RTU) can be determined with the following formula.

$$\% \text{ RTU} = [(HICC \div LICC) \div HICC] \times 100$$

Where:

HICC = minimum idle cycle count (high idle cycle count)

LICC = maximum idle cycle count (low idle cycle count)

To calculate the percent of Real Time Remaining (%RTR), use the following formula.

$$\% \text{ RTR} = [(LICC \div HICC) \cdot (1 \cdot 2500 \div 3600)] \times 100$$

The figure of 2500 is the factor representing average busy season busy hour (ABSBH, with high day grade of service: 20% of calls having tone delay greater than three seconds). This figure is derived by computing 91% of total capacity, which is 3600 seconds an hour ($3600 \cdot .91 = 3276$), and assuming that number is 1.3 times as high as the ABSBH ($3276/1.3$ is approximately 2500).

Line Load Control (LLC)

Line Load Control (LLC) is a manually activated feature associated with optional feature package 105 that denies calls from designated stations. LLC can be set to OFF (no LLC), or to F, S, or T to block the first group of calls (F), first and second groups (S), or first, second, and third groups (T). Blocked group members cannot originate internal or trunk calls.

LD02 defines blocking probability for LLC levels. The TSF004 report prints the blocking counts only when optional feature package 105 is equipped.

Refer to *X11 features and services (553-3001-305)* for more information on LLC level definition and activation.

Figure 4
TFS 004 processor load

Format			
System ID	TFS004		
Idle cycle count	CPU attempts	Load peak peg count	
HPIB overflow peg count	LPIB overflow peg count		
50012500 OB overflow peg count	SL-1OB overflow peg count		
CR overflow peg count			
Rated Call Capacity (Note)	Maximum Real Time Used (RTU) (Note)	Percent of RTU (Note)	
Number of eliminated observations (Note)	Hour of Max RTU (Note)		
LLC1 blocked calls	LLC2 blocked calls	LLC3 blocked calls	
Example			
200	TFS004		
1474233	21786	00141	
00000	00000		
00000	00000		
00000			
00000	00000	00000	
00000	00000		
00000	00000	00000	
Note: Asterisks appear in these fields when the information is insufficient to generate the report.			

TFS005 measurement on selected terminals

The TFS005 measurements evaluate groups of phone lines, trunks, or both within a terminal loop. (See Figure 5.) These measurements, available for terminals assigned the Individual Traffic Measurement (ITM) class of service by the Traffic Control program (LD02), help analyze traffic by department or group.

The TFS005 report shows loop numbers, total CCS for terminals assigned an ITM COS, and line peg count.

Line usage

This is the total usage for all calls in a loop. View individual terminals to determine their usage. Totals are related to those in TFS001, although the correlation is imprecise.

Line peg count

When an established path involving a non-trunk terminal with ITM becomes idle, the line peg count increments for the terminal's loop. If both terminals in an established path have ITM, then two line peg counts are added. In addition, when an established path between a terminal and a conference loop becomes idle and the terminal has ITM, the line peg count increments for the terminal's loop.

For all trunks, the peg count increments when the trunk becomes idle if, at any time since the trunk was seized, it was involved in an established connection.

Figure 5
TFS005 lines

Format		
System ID	TFS005	
Loop number	Line usage	Line peg count
Example		
200	TFS005	
00	0000144	00066
01	0000213	00179
02	0000232	00144
03	0000244	00130
05	0000289	00124
08	0000218	00158
10	0000229	00154

TFS007 junctor measurements

Each network group has two network shelves and 32 consecutively numbered loops. Junctors link network groups together. The TFS007 report displays measurements related to the paths that connect different network groups, involving an intergroup junctor. Measurements indicate the **FTMs** for each junctor, the junctor usage in CCS, and a peg count of network group connections.

Each network group must be connected to all the other network groups. The two-digit junctor number that appears in the first column of the report signifies which two groups are connected:

- network group 0 contains loops 0 to 31
- network group 1 contains loops 32 to 63
- network group 2 contains loops 64 to 95
- network group 3 contains loops 96 to 127
- network group 4 contains loops 128 to 159

For example, junctor 02 connects network group 0 (loops 0 to 31) and network group 2 (64 to 95).

See Figure 6 for TFS007 report format.

Figure 6
TFS007 junctors

Format				
System ID	TFS007			
Junctor group	Junctor	FTM	Junctor usage	Junctor peg count
Example				
222	TFS007			
01	00001		0001642	01554
02	00001		0001696	01852
12	00002		0001712	01518

Junctor FTM

The junctor FTM counts failures to establish a connection **between** network groups. The junctor FTM increments the peg count at the originating loop, the junctor group, and the terminating loop. Blockage in a junctor group should not exceed 1%. Determine junctor blockage with the following formula:

$$\text{Junctor FTM} \div (\text{junctor peg count} + \text{FTM}) \times 100$$

Junctor usage

This measurement gives the total time in CCS that timeslots of the junctor group were busy and unavailable for other use. Low usage is around 500 CCS per group; high usage is around 1700 CCS. Two-group network systems usually have higher usage than larger systems because fewer connections are available.

If junctor loads are unbalanced, it may be desirable to redesign network groups. Departments with a high level of intercommunication should be in the same network group, separated on different loops. Outgoing trunks on a given route should be spread across groups. **DTRs** should also be spread across groups.

Junctor peg count

The junctor peg count shows completed calls between network groups. Connections to tone and digit loops do not affect the peg count. The junctor peg count increments when the connections between network groups become idle.

TFS008 Command Status Link and Application Module Link measurements

TFS008 gives traffic statistics related to Command Status Link (CSL) and Application Module Link (AML). The CSL handler tracks every incoming and outgoing message for each CSL message type. The counts appear on the traffic report and are kept by the CSL handler whether or not a traffic report is scheduled. The traffic report can be configured via LD2 to appear every hour on the hour or half hour. See Figure 7 for the report format and the legend that follows the figure.

Figure 7
TFS008 CSL and AML measurements (Part 1 of 2)

System ID	TFS008									
SYSTEM	iqsys ovlf	oqsys ovlf	syscr unavl	avgiq sys	avgiq call	avgiq admin				
CSL										
csl#	vasid	fails	link stop	down time	avgo q size	iochr ovfl	eobf miss	eobf prem	inval prior	inval lgnth
OMSG	cas uts calans icc dta	crs tnmn calds ias disreq	pci confm usm itc disres	ans data ceq init	dis audit cab isis	dnp cts ftr iei	digit dsi mon icss	tmg timstp iqs sfn	tst query its conreq	mwi ovd iss conres
IMSG	con opr calans cdd	incl gts calds conreq	rls tnmn setftr conres	offh alarm mon dta	rdy confm iqr disreq	nrdy data itr disres	msi audit isr	msb rtsc isi	conf timstp iei	mwi query icsr
PRI	pri1	pri2	pri3	pri4						
PACKETS		output	input							

Figure 7
TFS008 CSL and AML measurements (Part 2 of 2)

Example										
0111 TFS008										
SYSTEM		00004	00000	00003	00360	00001	00456			
CSL										
CSL01	0 0 0 1 0	00021	00032	00043	00054	00001	00026	00089	0033	0022
OMSG	00001	00002	00003	00004	00005	00006	00007	00008	00009	00010
	00010	00014	00028	00040	00034	00025	00067	00016	00028	00001
	00009	00157	00021	00000	00065	00000	00000	00000	00000	00000
	00000	00000	00000	00099	00000	00000	00000	00000	00001	00000
	00005	00000	00000							
IMSG	0 0 0 0 4	00003	00005	00006	00043	00002	00006	00009	00019	00007
	00010	00014	00028	00040	00034	00025	00067	00016	00028	00001
	00009	00157	00000	00000	00000	00000	00000	00000	00000	00000
	00000	00000	00001	00005	00000	00000				
PRI		00632	00078	00400	00067					
PACKETS		00020	00012							

Legend for TFSOOS report

SYSTEM

- iqsys ovfl input queue overflow
- oqsys ovfl output queue overflow
- syscr unavl system resource not available
- avgiq sys average input queue size for system messages
- avgiq call average input queue size for call processing messages
- avgiq admin average input queue size for administration messages

CSL

csl#	Command Status Link (CSL) port number
vasid	value added server ID associated with this link
fails	number of CSL output failures
link stop	number of times the link stopped
down time	link down time in seconds
avgoq size	average output queue size
iochr ovfl	number of times IOCHAR TTY buffer overflowed
eobf miss	number of packets with End of Block flag missing
eobf prem	number of packets with End of Block flag premature
inval prior	number of packets with invalid priority
inval lgth	number of packets with invalid length

OMSG/IMSG — outgoing/incoming message types

alm	alarm indication
ans	call answered
audit	software audit
cab	call abandons queue
calans	call answer
calds	call disconnect
cas	channel assignment
ceq	call enters queue
con	call connect
conf	conference request
confm	confirmation
conreq	network layer connect request
conres	network layer connect response
crs	call connection request
cts	change terminal status
data	administration data block
digit	dialed digits
dis	call disconnect
disreq	network layer disconnect request
disres	network layer disconnect response
dnp	DN update

dsi	device state information
dta	network layer data
gts	get terminal status
ias	the number of statistics messages
icc	the number of incoming call indication messages
icsr	the number of check/change call detail recording (CDN) state requests
icss	the number of check/change call detail recording (CDN) state response messages
iei	the number of error indications sent (output messages [OMSG])
iei	the number of error indications (input messages [IMSG])
incl	incoming call accepted
init	the number of Meridian 1 initialization indication messages
iqr	the number of queue requests
iqs	the number of queue request response messages
isi	the number of start up / shut down indications
isis	the number of start up / shut down indication response messages
isr	the number of statistics requests
iss	the number of statistics response messages
itc	the number of treatment completed messages
itr	the number of treatment requests
its	the number of treatment response messages
mon	monitor
msb	make set busy
mwi	message waiting indication change
nrdy	not ready
offh	off-hook
opr	operator revert
ovd	override
pci	present call
query	query

rdy	ready
rls	call disconnect request
rtsc	request terminal status change
setfr	set feature message
timstp	timestamp
tmg	telset message
tnmn	TN maintenance mode
tst	telset status message
usm	unsolicited status message
uts	update terminal status

PRI — number of messages of priority 1 to 4 (excluding polling messages)

PACKETS-number of incoming and outgoing packets

TFS009 D-channel

TFS009 reports traffic activity for D-channels. The last six fields report activity on the Multi-purpose Serial Data Link (MSDL) card on the D-channel.

Figure 8
TFS009 D-channel report format (Part 1 of 2)

<p>DCH x VAS IS x</p> <p>number of all incoming messages received on the D-channel?</p> <p>number of all incoming call processing messages received on the D-channel</p> <p>number of all incoming management messages received on the D-channel</p> <p>number of all incoming maintenance messages received on the D-channel</p> <p>average number of incoming bytes per message</p> <p>accumulated real time a D-channel was busy transferring incoming messages</p> <p>running average of the number of requests queued in request output message buffer</p> <p>number of times when no request output message buffer was available</p>	<p>number of all outgoing messages sent on the D-channel</p> <p>number of all outgoing call processing messages sent on the D-channel</p> <p>number of all outgoing management messages sent on the D-channel</p> <p>number of all outgoing maintenance messages sent on the D-channel</p> <p>average number of outgoing bytes per message</p> <p>accumulated real time a D-channel was busy transferring outgoing messages</p> <p>number of times a message with no End of Message (EOM) mark was received</p>
---	---

Figure 8
TFS009 D-channel report format (Part 2 of 2)

number of PRA layer-3 protocol errors since the last traffic report	
number of times the D-channel was down	accumulated real time the D-channel was down since the last report in units of 2 seconds. For example, if the value is 10, the down time is 20 seconds
average incoming link usage (given as a percentage of the link capacity)*	peak incoming link usage (given as a percentage of the link capacity) over a 5-second period*
average outgoing link usage (given as a percentage of the link capacity)*	peak outgoing link usage (given as a percentage of the link capacity) over a 5-second period*
number of connected calls*	time (in seconds) since the MSDL D-channel traffic was last cleared*
Note: *These six fields will display only for D-channels on Multi-purpose Serial Data Link (MSDL) cards	

TFS01 1 Multi-purpose ISDN Signaling Processor traffic

The Multi-purpose ISDN Signaling Processor (MISP) card is used for ISDN Basic Rate Interface (BRI) activities. The MISP traffic report shows the call processing activities of all Digital Subscriber Loops (**DSLs**) associated with each MISP in the system and indicates the type of BRI traffic such as voice, data, or packet data.

Beginning with X11 release 19, this report contains Basic Rate Signaling Concentrator (BRSC) information if the MISP serves **BRSCs**. It contains the following types of information for each MISP in the system. MISP information in the four D-channel parameters shows totals for the line cards that the MISP serves directly. BRSC information shows D-channel traffic data collected at the BRSC.

As the list of definitions below indicates, some columns apply only to the MISP; others apply to the MISP and BRSC.

Attempted calls (MISP only)

Number of attempted calls, including all successfully completed calls and incomplete attempted calls

Completed calls (MISP only)

Number of successfully completed calls for the reported period

Call length (MISP only)

Average length of a successfully completed call in seconds

MISP/BRSC messages

Number of signaling messages sent by the MISP, the BRSC, or both, to the terminals on the D-channels

Terminal messages

Number of signaling messages sent by the terminals to the MISP, the BRSC, or both on the D-channels

MISP/BRSC data packets

Number of D-channel data packets sent by the MISP, the BRSC, or both to the terminals

If the MISP is configured with BRSCs, a separate report prints for each BRSC.

Terminal data packets

Number of D-channel data packets sent by the terminals to the MISP, the BRSC, or both.

In the sample report below in Figure 9, an MISP004 serves a BRSC.

Figure 9
TFS011 Multi-purpose ISDN Signaling Processor traffic

Format						
System ID TFS011						
MISP and BRSC ID						
Attempted calls	Completed calls	Call length	MISP/BRSC messages	Terminal messages for MISP/BRSC	MISP/BRSC C data packets	Terminal data packets for MISP/BRSC
Example						
0111 TFS011						
MISP002						
00020	00006	00019	00080	00040	00000	00006
MISP004						
00030	00001	00030	00125	00060	00180	00012
BRSC 24015						
			005110	001020	003600	000200

TFS012 Multi-purpose ISDN Signaling Processor D-channel

The Multi-purpose ISDN Signaling Processor (MISP) card is used for ISDN Basic Rate Interface (BRI) activities. The MISP D-channel management messages check for communication problems between the MISP and the terminals. The report contains the traffic management activity for each DSL based on the exchange of signaling messages between the MISP and the terminals over the D-channels.

Beginning with X11 release 19, this report contains MISP and BRSC information for MISP that serve BRSCs. In TFS012, the report indicates the total for line cards that the MISP serves directly. BRSC information shows D-channel data collected at the BRSC.

The following definitions apply to TFS012:

MISP/BRSC links

Number of MISP/BRSC-initiated link initializations

Terminal links

Number of terminal-initiated link initializations

MISP/BRSC messages

Number of management messages sent from the MISP, the BRSC, or both, to terminals

Terminal messages

Number of management messages sent from terminals to the MISP, the BRSC, or both.

Incomplete calls

Number of times the links associated with D-channels were not able to complete calls

Link errors

Number of management data link errors

If the MISP is configured with **BRSCs**, a separate report prints for each BRSC.

The following example shows an MISP004 serving a BRSC.

Format					
System ID TFS012					
MISP/ BRSC ID					
MISP/ BRSC links	Terminal links	MISP/ BRSC messages	Terminal messages	Incomplete calls	Link errors
Example					
0111 TFS012					
MISP002					
00010	00015	00010	00016	00011	00002
MISP004					
00001	00008	00016	00009	00017	00001
BRSC 240 15					
000004	000012	000021	000089	000061	00021

TFS013 Multi-purpose ISDN Signaling Processor messages

The Multi-purpose ISDN Signaling Processor (MISP) card is used for ISDN Basic Rate Interface (BRI) activities. The MISP messages report shows the total number of call processing, maintenance, and management messages sent through each **MISP** in the system grouped by message size. Maintenance technicians analyze these totals to determine if messages are within the specified lengths.

Beginning with X11 release 19, this report includes BRSC information for **MISPs** that serve **BRSCs**. The MISP information shows totals for the line cards that the MISP serves directly. BRSC data reflects D-channel information collected at the BRSC.

The report has three columns, as defined below:

1-10 bytes

Total number of messages from 1 to 10 bytes long

1 1-20 bytes

Total number of messages from 11 to 20 bytes long

Greater than 20

Total number of messages more than 20 bytes long

A sample report appears below. If the MISP is configured with BRSCs, a separate report prints for each BRSC.

Format		
System ID TFS013		
MISP/BRSC ID		
I-1 0 bytes	11-20 bytes	Greater than 20
Example		
0111 TFS013		
MISP002		
00060	00000	00000
MISP004		
00012	00004	00000
BRSC 24 0 15		
00004	00002	00000

TFS015 Meridian Packet Handler traffic report

Beginning with X11 release 19, the Meridian Packet Handler (MPH) report provides specific information about incoming and outgoing calls and data packets. This report is particularly useful for analyzing the flow of data over network links.

The report has ten columns as described below:

aa: The loop number of the Meridian Packet Handler

bb: The link interface type (MCU, PRI, BCH, BRIL, BRSC); up to four characters (to determine which link interface type is listed in bb, STAT the interface using STIF in LD32: the interface and **timeslot** appear).

cc: The **timeslot** number of the link on the MPH loop; four digits

dd: Number of initializations of layer 2 link(s); up to five digits

ee: Number of attempted incoming calls; up to five digits

ff: Number of completed incoming calls; up to five digits

gg: Number of attempted outgoing calls; up to five digits

hh: Average length in seconds of a data call; up to five digits

ii: Number of incoming data packets; up to ten digits

jj: Number of outgoing data packets; up to ten digits

TFS102 loop traffic threshold

This threshold, which applies to all loops, shows loop usage in CCS per measurement period. Also output when a threshold violation occurs in TFS001 are network FTMs.

Format		
System ID	TFS1 02	
Loop number	Loop usage	Threshold
Example		
220	TFS102	
01	0000550	00450

TFS105 junctor traffic threshold

This threshold, expressed in CCS, highlights junctor usage per measurement period. When the junctor traffic threshold is exceeded, TFS007 junctor traffic prints. The threshold is the same for all junctor groups and cannot be set individually.

Format		
System ID	TFS1 05	
Junctor group	Junctor usage	Threshold
Example		
222	TFS105	
13	0002341	0002000

TFS301 initialization

A TFS301 message precedes traffic data output after an initialization. This message warns that some traffic data has been lost due to the initialization, and that the report is incomplete.

TFS302 traffic schedule changed

A TFS302 message warns that the traffic schedule was changed during the interval covered by the traffic report. Traffic report data may be invalid if the change covered dates or hours not previously scheduled or options not previously set.

TFS303 traffic measured over one hour

A TFS303 message indicates that traffic report data accumulated for more than one hour and is therefore inaccurate. For example, if reporting is scheduled to stop at 18:00 and restart at 08:00, the 08:00 report contains all data between 18:00 and 08:00 (14 hours). For an accurate report of the 08:00 to 09:00 hour, schedule reports to begin at 7:00.

TFS401 36 CCS terminals

A TFS401 message, which prints when a call disconnects, identifies connections held for more than 36 CCS but fewer than 50 CCS (between approximately 60 and 83 minutes). Although the regular traffic data measurements include the traffic data for these lengthy connections, a data analyst may decide that these calls represent abnormal usage and choose to exclude the data from statistical calculations.

TFS402 50 CCS terminals

A TFS402 message identifies connections, including data connections, that were held for 50 CCS or longer. The traffic data for these connections is not included in regular traffic measurements (pegs and usage). If network blockage occurs even though usage does not exceed recommended maximum CCS, long calls may trigger the TFS402 message. Be sure that terminals used for long connections are evenly distributed on your network loops. If no apparent reason for the message exists, the problem may be faulty hardware.

Format
TFS402 CCS TN1 TN2 TYPE
Example
TFS402 64 002 01 09 10 039 07 05 01 11

Legend

CCS gives the connection usage CCS.

TN1 and TN2 identify the terminal numbers. TFS001, TFS002, TFS005, TFS007, TFC001, and TFC002 figures can be corrected for previous hours because loops are involved.

TYPE identifies how the network path was used.

- 0 dial tone
- 1 busy tone
- 2 overflow tone
- 3 ringback tone
- 4 tone ringing
- 5 miscellaneous tones
- 6 outpulsing
- 7 unknown use of a TDS
- 8 **Digitone Receiver**
- 9 incoming trunk speech path
- 0 outgoing trunk speech path
- 1 intra-customer speech path
- 2 random trunk speech path
- 3 reserved path not used

Customer traffic reports

LD02 defines the different report schedules and options available for each customer.

TFC001 networks

TFCOO 1 describes traffic details for each customer group defined in LD 1.5 on a per-call (not timeslot) basis, showing Failures to Match (FTMs), usage (CCR), peg count, partial dial counts, and abandoned call counts. See Figure 10 for the TFCOO I report format.

The measurements in TFC001 total half those in TFSOO 1, as TFCOO 1 measurements increment for established calls only.

The maximum blockage for incoming, outgoing, and tandem calls on your system should be 1%. Intracustomer blockage should not be more than 4%. Determine the grade of service with this formula.

$$\text{FTM} \div (\text{peg count} + \text{FTM}) \times 100$$

Incoming FTM

The incoming FTM increments if a call is blocked (a stage of the call cannot be completed) between the time that an incoming call is recognized and the time that the trunk is idled.

For example, if a call cannot be presented to an idle attendant because of blocking, then an incoming FTM increments. If the call is successfully presented to an attendant, but the attendant cannot extend the call to an idle terminal because of blocking, then an incoming FTM increments. The incoming FTM increments once per incoming call regardless of the type of blocking, or a combination of blocking.

Incoming usage

When an established path between any terminal and an incoming trunk is idled, the incoming usage accumulates.

Incoming peg count

When a seized incoming trunk that had an established connection with a terminal (other than another trunk) is idled, the incoming peg count increments.

Outgoing FTM

If a path to an idle outgoing trunk is not found because no **timeslot** was available, the outgoing FTM increments. A call can increment the outgoing FTM only once. Further attempts to secure a trunk, for example, Ring Again, do not increment the FTM.

Outgoing usage

When an established path that includes an outgoing trunk is idled, the outgoing usage accumulates.

Outgoing peg count

When a trunk is seized for an outgoing call and establishes a connection with a non-trunk terminal, the outgoing peg count increments after the trunk is idled.

Intracustomer FTM

This measurement increments when a **timeslot** is not available between a customer's two non-trunk terminals.

Intracustomer usage

When a path is idled, this number increments to show the total calls between two terminals within a single customer.

Multi-User Login

A traffic file displays and stores system reports and user reports for the Multi-User Login feature.

Partial dial

Partial dial increments when a 2500 telephone goes on-hook before completely dialing a directory number or trunk access code.

Figure 10
TFCOOI networks

Format			
System ID	TFCOOI		
Customer number			
Incoming FTM	Incoming CCS	Incoming peg count	
Outgoing FTM	Outgoing CCS	Outgoing peg count	
Intracustomer FTM	Intracustomer CCS	Intracustomer peg count	
Tandem FTM	Tandem CCS	Tandem peg count	
Permanent signal	Abandon	Partial dial	
Example			
200	TFCOOI		
000			
00001	0001985	01143	
00002	0002909	01732	
00003	0000339	00047	
00000	0000046	00062	
00001	00004	00002	

TFC002 trunks

Each trunk group generates a TFC002 report that displays trunk usage. The TFC002 report always prints when an All Trunks Busy (ATB) condition occurs during the reported period. ATB and overflow indicate that additional trunks may be needed. See Figure 11 for the TFC002 report format.

To determine grade of service, use the following formula:

$$\text{Outgoing CCS} \div \text{Number trunks working} = \text{CCS per trunk}$$

$$(\text{CCS per trunk} \div 36) \times 100 = \text{grade of service}$$

Trunk types

TFC002 includes usage, peg count, overflow, ATB, and toll peg count for these trunk types:

ADM	Data port interfacing with Data Line Card
AIOD	Automatic Identification of Outgoing Dialing
ATVN	AUTOVON
C A A	Common Control Switch Arrangement with AN1
CAMA	Centralized Automatic Message Accounting
CCSA	Common Control Switch Arrangement
c o	Central Office
DICT	Dictation
DID	Direct Inward Dialing
FEX	Foreign Exchange
FGDT	Feature Group D
I S A	Integrated Services Access (X11 release 16 and later)
M D M	Modem interfacing with 500 type line card
MUS	Music
PAGE	Paging
RAN	Recorded Announcement
RCD	Emergency Recorder
RLM	Release Link Main
RLR	Release Link Remote
TIE	Tie trunks
WAT	WATS lines

Integrated Services Access (ISA) trunks

Two types of routes are configured for ISA trunks: ISA master routes and ISA service routes. ISA master routes are eligible for the full traffic report; the service routes only contain data for the incoming ISA peg count and outgoing ISA peg count fields. No other traffic is tracked for ISA service routes. See Figure 11 for an example of the report containing ISA fields and also *ZSDN Primary Rate Interface description and administration (553-2901-100)* for more information on ISA trunks.

Trunks equipped

Trunks equipped are the number of trunks working in the route.

Trunks working

The number of trunks enabled in the route appears in this column.

Incoming ISA peg count

A path that is eligible for the two following fields, incoming trunk usage and incoming trunk peg count, increments for the ISA service route and for the ISA master route. See *ISDN Primary Rate Interface description and administration (553-2901-100)* for more information.

Incoming trunk usage

Incoming trunk usage shows CCS for each trunk and may exceed 36 CCS an hour since it includes the entire time the connection was established. A connection spanning more than one period appears in the report for the period in which it ended. This may result in an understatement of CCS reported for some periods.

Incoming trunk peg count

The incoming trunk peg count increments when a trunk assigned to the customer becomes idle.

Outgoing ISA peg count

A path that is eligible for the two following fields, outgoing trunk usage and outgoing trunk peg count, increments for the ISA service route and for the ISA master route. See *ISDN Primary Rate Interface description and administration (553-2901-100)* for more information.

All Trunks Busy

All Trunks Busy (ATB) increments when all trunks in a group (with more than one trunk) are busy. A high ATB combined with high overflow indicates system blockage. High ATB and low overflow reflect efficient system use. To calculate the percentage of calls seizing the last available trunk, use the following formula.

$$\text{All trunks busy} \div (\text{outgoing peg count} + \text{outgoing overflow peg count}) \times 100$$

To determine blockage based on the overflow, use this formula.

$$\text{Overflow peg count} \div (\text{outgoing peg count} + \text{overflow peg count}) \times 100$$

Toll peg count

Toll peg count for CO and FX routes increments when the first or second meaningful digit dialed after the access code is either a "0" or a "1." (Use the NATL and TDIG prompts in LD16 to define other digits as toll digits.) A meaningful digit is one that is not absorbed by either the Meridian 1 or by the connecting CO. Even if the call is abandoned after the first meaningful digit, the toll peg count increments, possibly resulting in a toll peg count that exceeds the actual number of completed calls. Determine the percentage of toll calls by using the following formula.

$$\text{Toll peg count} \div \text{outgoing peg count} \times 100$$

A high percentage of toll calls reflects a need to evaluate alternate routing or trunk use.

Incoming Integrated Services Access (ISA) peg count

Beginning with X11 release 16, the incoming ISA peg count increments for the trunk group when an incoming ISA trunk assigned to the customer becomes idle.

Outgoing ISA peg count

Beginning with X11 release 16, the outgoing ISA peg count increments for the trunk group when an outgoing trunk assigned to the customer becomes idle.

Figure 11
TFC002 trunks with ISA service routes (X11 release 16 and greater)

Format	
System ID	TFC002
Customer number	
Route number	Trunk type
Trunks equipped	Trunks working
Incoming usage	Incoming peg count
Outgoing usage	Outgoing peg count
Outgoing overflow	All Trunks Busy
Toll peg count	
Incoming ISA peg count	Outgoing ISA peg count
Example	
200	TFC002
007	
004	ISA
00008	00007
0000088	00046
0000114	00052
00001	00002
00006	
00000	00000
<p>Note 1: In Generic X11, the customer and route numbers are expressed as 3-digit numbers.</p> <p>Note 2: ISA master routes do not include incoming ISA peg count and outgoing ISA peg count in the traffic reports.</p>	

TFC003 customer console queue measurements

TFC003 examines the treatment of calls in customers' queues: speed of response, number of calls delayed, number of calls abandoned, average wait time of delayed calls, and average wait time of abandoned calls. Timing measurements accumulate in two second units and appear in .01 second units. The fewer the calls in the sample (fewer than 10), the less reliable the data. See Figure 12 for TFC003 report format.

Systems with the Centralized Attendant Service (CAS) remote feature also receive TFC003 measurements for Release Link Trunk (RLT) for both local and remote attendants. Refer to *Centralized Attendant Service description and engineering* (553-2681-100).

Average speed of answer

Average speed of answer shows how long (in .1 seconds) a delayed call waits in the attendant queue. Attendant response time indicates how long the attendant takes to answer the call after it has been presented to a loop key on the console. Determine average answer speed with the following formula:

[(calls delayed x avg time in queue) ÷ total calls] + avg attendant response

Example

Peg count in queue = 2

Average time in queue = 3 seconds

Average attendant response = 2.4 seconds

Total calls = 9

Average speed of answer = $(2 \times 3) \div 9 + 2.4 = 3.1$ seconds

The percentage of the total calls (including incoming calls, dial "0" calls, and recalls) that enter the attendant queue is not recorded, preventing analysis of the correlation between average speed of answer, average attendant response, and average time in queue.

Average attendant response

Average attendant response is the average time (in .1 seconds) that elapses between a call being presented to an attendant console and the attendant answering it. If the attendant answers a different call via Incoming Call Identification (ICI) keys, time accumulates as if the call answered were the one first presented.

Average wait time of abandoned calls

This is the average time in tenths of seconds that a call waited before disconnecting.

Figure 12**TFC003 customer console measurements**

Format	
System IDTFC003	
Customer number	
Average speed of answer	Average attendant response
Calls delayed peg count	Average time in queue
Abandoned calls peg count	Average wait time of abandoned calls
Example	
200TFC003	
003	
00107	00048
00289	00079
00015	00192

TFC004 individual console measurements

These measurements examine calls by attendant, providing the total number of calls handled by each attendant console, the calculated work time per call, and the total amount of time that the console was attended. A call that is answered by an attendant, extended to an internal DN, and recalled to an attendant, appears as a new call in these measurements. See Figure 13 for the TFC004 report format.

Compare the figures in TFC004 with those in TFC003 to determine whether any problems originate with equipment or with attendants.

Peg count of internal calls handled by attendant

This measurement increments when an internal call disconnects from the console. This includes calls originated by the attendant, internal calls to the attendant (dial "0"), attendant accessing paging, and recalls from camped on or ring no answer calls. Any internal call increments this peg count when it is removed from the console, whether or not it has been extended.

The peg count for internal calls handled by the attendant plus the count for external calls handled by the attendant equals the total calls the attendant handles.

Total time spent servicing internal requests

This is the total time, in CCS, that an attendant handles active internal or outgoing calls originating in the system. (The system records the CCS after the call is removed from the console or held on the console. A held call that is reactivated accrues additional CCS.)

Peg count of external calls handled by attendant

This peg count includes calls to a Listed Directory Number (LDN) in a direct inward dial (DID) system, and CO, WATS, and Foreign Exchange (FX) trunks that terminate on the console as well as busy DID calls that hunt to the attendant. Any internal call increments this peg count whenever it is removed from the console, whether or not it is extended.

If a call comes in, and the attendant extends it to a telephone, it is pegged as an external call. If that same call recalls back to the attendant, it is pegged again as an internal call.

Total time spent servicing external requests

This is the total time, in CCS, that an attendant has active incoming calls on the console. Time accumulates when the call is removed from the console or is held on the console. A call on hold accumulates more time after it is reactivated.

Total time console is attended

This is the total time, in CCS, that the console is not in Night Service or Position Busy. Calls that originate or complete when the console is in Night Service or Position Busy do not appear in this figure.

Total time spent servicing calls

This is the total time, in CCS, that each attendant spends servicing internal (including those originated by the attendant) and external call requests, with a peg count and work time. The total time spent servicing calls may not equal the sum of the total time spent servicing internal and external requests because of approximations.

The total time a console is in use plus the total time the console is in Night Service or Position Busy is equal to the total available time.

Number of times all attendant loops are busy

This measurement increments when all loop keys on the attendant console are busy.

Attendant Alternative Answering (AAA) peg count

This measurement, available beginning with X11 release 15, indicates the total number of attempts to forward a call to AAA. For a complete discussion of *AAA*, see *X11 features and services* (553-3001-305).

Successful AAA termination peg count

The termination peg count, available beginning with X11 release 15, indicates the total number of successful terminations to an AAA position. For a complete discussion of *AAA*, see *X11 features and services* (553-3001-305).

Figure 13
TFC004 individual console measurements

System IDTFC004	
Customer number	
Attendant number	
Peg count of internal calls handled by an attendant	Total time spent servicing internal requests
Peg count of external calls handled by an attendant	Total time spent servicing external requests
Total time a console is attended	Total time spent servicing calls
Number of times all attendant loops are busy	
Total AAA attempt peg count	Successful AAA termination peg count
Example	
200TFC004	
000	
001	
00076	0000011
00167	0000017
000036	0000029
00000	
00005	0000003
002	
00057	0000012
00066	0000021
000036	0000033
00000	
00004	0000003

TFC005 feature key usage

This report looks at patterns of customer usage: which features are activated from multi-line telephone sets (excluding 500/2500 sets) or attendant consoles and the call selection procedures. Feature key usage does not include programming changes (for example, changing a call forward directory number). See Figure 14 below for TFC005 report format.

Figure 14
TFC005 feature key usage

Format	
System ID	TFC005
Customer number	
Feature number	Peg count
Example	
200	TFC005
000	
000	00012
001	00002
002	00003
003	00015
004	00002
005	00000

Each member of a conference causes an increment to the count. For example, a 5-party conference pegs three times, once for each conferee added to the original two parties.

A peg count appears for each feature per specified customer. Each feature has its own output line, identified by number. (See Figure 15).

Figure 15
TFC005 feature key numbers (Part 1 of 2)

Number	Feature	Number	Feature
000	Auto Dial	023	Message Center INCALLS
001	Call Forward	024	Attendant Overflow
002	Call Pickup	025	Group Call
003	Call Transfer	026	Auto Answerback
004	Call Waiting	027	See Note
005	3-Party Conference	028	See Note
006	6-Party Conference	029	Call Park
007	Manual Signaling	030	Stored Number Redial
008	Override	031	Last Number Redial
009	Privacy Release	032	Manual Continuity Test
010	Private Line Service	033	Enhanced Hot Line
011	Ring Again	034	Group Pickup
012	Speed Call	035	DN Pickup
013	Voice Call	036	Attendant End-to-End Signaling
		036	EES Digit Count
014	Volume Control	037	Internal Call Forward
015	Busy Verify	038-045	See Note
016	Barge-in	071	Conference-Autodial
017	Call Selection	072	Conference-Speed Call
018	Attendant Recall	073	Conference-Hot Line

TFCOOG Radio Paging

These measurements give the number of calls processed by Radio Paging. See Figure 16 for TFC006 report format.

Figure 16
TFCOOG radio paging

Format	
System ID (up to 8 digits)	TFCOOG
Customer number	
Pre-selection count	
Post-selection count	
Paging time-out count	
Paging recall count	
Average answering time	
Automatic mode count	
Manual mode count	
Example	
200	TFCOOG
000	
00040	
00060	
0020	
0018	
0019	
0019	
0015	

Radio Paging measurements

The radio paging measurements count each time a call is made with the pre-selection method, the post-selection method, or the paging time limit (paging timeout).

Parallel Radio Paging measurements

Paging Recall counts increments whenever an attempted paging call returns to the attendant.

Average answer time count is the average time that the paged calls are in queue before being answered.

Serial Radio Paging measurements

Automatic mode counts increments each time an automatic serial paging call is attempted.

Manual mode counts increments each time a manual serial paging call is attempted.

TFC007 Call Park

Traffic measurement data accumulates for the following Call Park items. See Figure 17 for TFC007 report format.

System Park peg count

This count identifies the number of calls parked to a System Park DN.

System Park overflow peg count

This count identifies the number of calls that could not be parked because a System Park DN was not available.

Station Park peg count

This count identifies the number of calls parked to a Station Park DN.

Parked call access peg count

This count identifies the number of parked calls successfully accessed.

Park recall peg count

This count identifies the number of parked calls that were recalled after the Call Park Recall Timer expired (defined in LD50).

Average wait time in Call Park

This value (expressed in units of 0.1 second) reflects the average time that parked calls waited before access.

Figure 17
TFC007 call park

Format							
System ID	TFC007						
Customer number							
System Park peg count	System Park overflow peg count	Station Park peg count	parked call access peg count	parked call recall peg count	average wait time in park in seconds		
Example							
0001	TFC007						
000							
00004	00000	00000	00003	00001	00360		

Message attendant queue

This section describes the Automatic Call Distribution DN (ACD DN) assigned to the queue, showing the ACD DN assigned as well as operation information.

- Command Status Link (CSL) Value Added Server ID (VAS ID)
- APL number
- total calls in the message attendant queue
- total direct calls to the message attendant
- total indirect calls to the message attendant
- total abandoned calls to the message attendant
- average time calls waited before abandoning
- average delay (time spent waiting for calls ÷ number of calls answered)
- direct call processing time each message attendant spent handling answered calls to the ACD DN
- post call processing time each message attendant was in Not Ready

Telephone set status

This part of the report gives information regarding the telephone usage. The information it provides includes the following:

ACDDN

Value Added Server ID (VAS ID)

total telephone status calls

total calls accessing Special Prefix (SPRE) codes

total call forward access calls

- total key access calls
- total unsuccessful messaging calls

Telephone messaging

This section of the report provides information about telephone messaging. The information provided includes the following:

- A C D D N
- Value Added Server ID (VAS ID)
- APL number
- total calls in the message attendant queue
- total telephone status calls
- total successful telephone status calls
- total abandoned calls
- total unsuccessful telephone status calls
- average telephone message processing time (in seconds)
- total telephones requesting the message attendant

Figure 18
TFC008 messaging and Auxiliary Processor links (Part 1 of 2)

System ID	TFC008									
Customer number										
APL (Auxiliary Processor Link)										
apl#	outq	inpq	avgoq	avgiq	down	icr	to	nak	char	
	ovfl	ovfl	size	size	time	uav			synch	
omsg	cas	crs	pci	ans	dis	dnp	digit	tmg	tst	mwi
	uts	tnmn	confm	data	audit	cts	dsi	timstp	query	ovd
	calans	calds	usm	ceq	cab	setftr	mon	iqs	its	iss
	icc	ias	itc	init	isis	iei	icss	sfn		
imsg	con	incl	rls	offh	rdy	nrdy	msi	msb	conf	mwi
	opr	gts	tnmn	alm	confm	data	audit	rtsc	tmsp	query
	calans	calds	setftr	mon	iqr	itr	isr	isi	iei	icsr

Figure 18
TFC008 messaging and Auxiliary Processor links (Part 2 of 2)

PACKET	xxxxx								
MAQ (Message Attendant Queue)									
acddn	vasid	apl#	qlngth	drct	indr	abn	avgwt	avgdly dcp	
TST (Telephone Set Status)									
acddn	vasid	apl#	total calls	spre	cfw	ust	fail		
TMG (Telephone Messaging)									
acd	vasid	apl#	qlngth	total calls	succ	abn	fail	avg time	rqst

Legend for TFC008

- abn total number of abandoned calls
- acd dn Automatic Call Distribution (ACD) Directory Number (DN)
- apl# Auxiliary Processor Link (APL) number, if used
- avg dly the average delay equals total waiting time for all calls divided by the number of calls answered on this ACD DN (abandoned calls are not included in total)
- avg time average telephone messaging processing time in seconds
- avg wt average time (in seconds) that calls waited before being abandoned
- avg iq size average input queue size
- avg oq size average output queue size
- cfw total number of call forward access calls
- char synch input characters from processor to Meridian 1 out of synchronization
- dcp direct call processing time is the average time (in seconds) that each message attendant spent handling answered calls to this ACD DN
- down time total APL down time in seconds
- drct total number of direct calls to the message attendant or Voice Mail System (VMS) processor queue

tst	Telephone Status Message
mwi	Message Waiting Indication
uts	Update Terminal Status
tnmn	Terminal Maintenance
confm	Administration Confirmation
data	Data Message
audit	Audit Message
cts	Change Terminal Status
dsi	Device State Information
timstp	AML Time Stamp
query	Server Query
ovd	Overload Warning
calans	Call Answer
calds	Call Disconnect
usm	Unsolicited Status Message
ceq	Call Enters Queue
cab	Call Abandons Queue
setftr	Feature Invocation Message
mon	Host Control Monitor of the Unsolicited Status Messages
iqs	Queue/Dequeue Request Response
its	Treatment Request Response
iss	ACD Statistics Request Response
icc	Incoming Call
ias	ACD Statistics
itc	Treatment Completed
init	Meridian 1/SL-1 Initialization
isis	Start Up/Shut Down Indication Response
iei	Error Indication
icss	Check CDN State Response
sfn	Set Feature Notification
Input Messages (imsg):	
con	Connection Request
incl	Incoming Call Accept

rls	Call Disconnected Request
offh	Off-hook
rdy	Ready
nrdy	Not Ready
msi	In Service
msb	Make Set Busy
conf	Confirmation Message
mwi	Message Waiting Indication
opr	Operator Revert
gts	Get Terminal Status
tnmn	Terminal Maintenance
alm	Alarm Message
confm	Administration Confirmation
data	Data Message
audit	Audit Message
rtsc	Report Terminal Status Change
tmsp	AML Time Stamp
query	Server Query
calans	Call Answer
calds	Call Disconnect
setftr	Feature Invocation Message
mon	Host Control Monitor of the Unsolicited Status Messages
iqr	Queue/Dequeue Request
itr	Treatment Request
isr	ACD Statistics Request
isi	Start Up/Shut Down Indication
iei	Error Indication
icsr	CDN Check Request

TFCOOS Network Attendant Service

The traffic data for the Network Attendant Service (NAS) describes attempts to route to NAS. See Figure 19 for TFCO09 report format.

NAS TRY

This number indicates the number of attempts to route to the Network Attendant Service (NAS).

ALT

This number is the total number of attempts to route to NAS across alternate routes.

DB

This shows the number of drop back busys over the NAS alternate route.

$$ALT + DB = NAS\ TRY$$

Figure 19
TFCOOS Network Attendant Service

Format		
Customer number		TFCOOS
NAS TRY		
	ALT1	DB
Example		
087		TFCOOS
NAS TRY	00048	
	ALT1: 00004	DB: 00000
	ALT2: 00010	DB: 00003
	ALT3: 00025	DB: 00000
	ALT4: 00000	DB: 00006

TFC102 outgoing matching loss threshold

This threshold is based on the percentage of outgoing calls (expressed in units of 0.1%) that encounter a Failure To Match when connecting to an outgoing trunk. A call counts as one outgoing FTM regardless of further failures to complete the call. TFC102 triggers a TFS001 network report.

Format	
System ID	TFCIO2
Customer number	
Outgoing FTM	Threshold
Example	
200	TFC102
002	
00014	00010

The Threshold figure represents the desired maximum percentage of **FTMs** in units of .1%.

TFC103 average speed of answer threshold

The speed of answer threshold is the minimum acceptable time, in units of 0.1 seconds, that calls wait to be answered by the attendant. The recommended setting is 00120, which translates to 12.0 seconds. TFC103 shows the actual average speed of answer. If the average speed exceeds the threshold, the TFC003 (queue) and TFC004 (console) reports print.

Format	
System ID	TFC103
Customer number	
Average speed of answer	Threshold
Example	
200	TFC103
000	
00152	000120

TFC104 percent all trunks busy threshold

This threshold level indicates the desired maximum percentage of time (in units of 0.1%) that all trunks in a trunk group should be busy. (Only trunk groups with more than one member are measured.) The recommended maximum is 00050, which is equivalent to 5%. TFC104 shows the actual percentage of time that all trunks are busy.

All calls except outgoing trunk calls are considered successful as soon as they are answered or established. Outgoing trunk calls are considered successful only when the end-of-dialing timer expires or a pound sign (#) is pressed to force an end of dialing. Calculate the threshold using the following formula:

$$\text{All trunks busy peg count} \div (\text{successful calls} + \text{overflows})$$

Format	
System ID	TFC1 04
Customer number	
Trunk group	
All trunks busy	Threshold
Example	
200	TFC1 04
002	
004	
0014	00017

Route list requests served without delay

This measurement indicates the number of calls that did not encounter blockage or queuing. The count increments when a route list is selected, and a call is assigned to a trunk immediately. The count includes expensive route acceptances.

Expensive route acceptances

Callers can choose to route a call over an expensive route by choice after being informed of the additional cost by the Expensive Route Warning Tone (ERWT). The count increments after call completion.

Route list requests standard blocking

This measurement shows calls that could not access a route or a queue. The blocked call may be given an overflow tone or a recorded announcement, or routed to the attendant. The count increments when one of the following occurs:

- the caller's Facility Restriction Level (FRL) is not sufficient to select any route choice
- no route choice is available, and the caller is only allowed Off Hook Queuing (OHQ) but too many calls are already queued
the call times out in the Off Hook Queue
- blocking occurs and the system cannot select another route choice, and OHQ and Call Back Queuing (CBQ) are denied

Route list entry use

This measurement is the number of calls successfully routed over each particular route list entry (trunk route). The count increments when one of the following occurs:

- an entry is selected without being offered OHQ or CBQ
- an entry is selected after OHQ or OHQ time-out
- an entry is selected to process a CBQ callback

Off Hook Queuing measurements (OHQ)

Each route list has associated OHQ traffic measurements.

OHQ calls

This measurement identifies the number of calls that attempted to use a route list entry when facilities were unavailable. The count increments each time a call is placed in the OHQ to await facilities, including calls from stations at a node, main or conventional main and calls made using the Direct Inward System Access (DISA) feature.

Average time in OHQ

The queue handler records the time that the call is placed in the OHQ and the time that it is removed from the OHQ. The route list accumulates this elapsed time, in units of .1 seconds, only under one of these conditions:

- an entry becomes available
- the OHQ time limit expires and the call is removed from the OHQ
the caller abandons a call while waiting in the OHQ

Quantity of calls abandoned while in OHQ

This measurement identifies the number of calls placed in the OHQ then disconnected by the caller or the OHQ timer. The count increments when a station at a node, main, or conventional main disconnects during the OHQ offer or while waiting in the OHQ.

Call Back Queuing measurements

Traffic measurements for Call Back Queuing (CBQ) are associated with each route list and identify the use of the feature.

CBQ calls

This measurement shows how many calls were offered CBQ, how many accepted the offer, and how many were placed in the CBQ. The count increments each time a call is placed in the CBQ.

Average time in CBQ

This measurement identifies the average time that calls remain in the CBQ. The measurement increments when a local station accepts the CBQ offer and places the call in the CBQ.

The queue handler stamps the time that a call is placed in the CBQ and the time that it is removed from the CBQ. The elapsed time, in units of 0.1 seconds, is added to the accumulating count for the route list.

Quantity of CBQ offerings

This measurement identifies the number of calls offered CBQ call backs, regardless of whether the CBQ call back was answered. The count increments when the caller is presented with the CBQ call back.

Quantity of CBQ user cancellations

This measurement identifies the number of times that a caller deactivates Ring Again to remove a call from the CBQ.

Figure 20
TFNOOI route list measurements (Part 1 of 2)

System ID	TFNOOI							
Customer number								
?LST xxx	route list requests	route list requests served without delay	expensive route acceptance	route list requests standard blocking	not defined	not defined		
RT		route list use	route list entry use	route list use	route list entry use	route list entry use	route list entry use	route list entry use
		TD calls	TD calls	TD calls	TD calls	TD calls	TD calls	TD calls
OHQ	OHQ calls	time in OHQ	abandoned calls					
CBQ	CBQ calls	average time in CBQ	CBQ offerings		CBQ user cancel			
	RVQ	RVQ calls	average time in RVQ	RVQ offerings	RVQ user cancel			
0434	TFN001							
000								
?LST 000	00345	00344	00012	00000	00000	00000		
RT		00000	00000	00000	00000	00000	00000	00000

Figure 20
TFN001 route list measurements (Part 2 of 2)

		00000	00000	00000	00000	00000	00000	00000
		00000	00000	00000	00000	00000	00000	00000
		00000	00000	00000	00000	00000	00000	00000
		00000	00000	00000	00000	00000	00000	00000
		00000	00000	00000	00000	00000	00000	00000
		00000	00000	00000	00000	00000	00000	00000
		00000	00000	00000	00000	00000	00000	00000
OHQ	00000	00000	00000					
CBQ	00000	00000	00000	00000				
RVQ	00000	00000	00000	00000				

TFN002 Network Class Of Service measurements

Traffic measurements for each defined Network Class Of Service (NCOS) group indicate the grade of service, in terms of blocking and queuing delay. If a grade of service is not appropriate for users in a particular NCOS group, users can be reassigned to another NCOS group, the characteristics of the existing NCOS group can be redefined, or the routing parameters can be changed. See Figure 21 for the TFN002 report format.

Note: Fields for features not equipped or activated always show zeroes (0).

Quantity of calls attempted

This measurement identifies the total number of network call attempts by users assigned to this NCOS group.

Routing requests served without delay

This measurement identifies the number of call attempts routed without encountering blockage or being offered queuing.

Expensive route acceptances

This count increments if a user allows a call to complete over an expensive facility.

Network call standard blocking

This measurement identifies the number of call attempts by NCOS user groups that could not be served because a route or queuing process was not available.

Calls refusing expensive routes

This measurement identifies the number of callers that received an Expensive Route Warning Tone (ERWT) and either abandoned the call or activated the Ring Again feature to place the call in the Call Back Queue.

Quantity of calls placed in OHQ

This measurement identifies the number of calls by NCOS groups that were offered Off Hook Queuing (OHQ) and accepted the offer.

Figure 21
TFN002 Network Class of Service measurements

Format							
System ID	TFN002						
Customer number							
NCOS	network class of service group	calls attempted	routing requests served without delay	expensive route acceptances	network call standard blocking	not defined	calls refusing expensive routes
	OHQ	OHQ calls	average time in OHQ				
	CBQ	CBQ calls	average time in CBQ				
	RVQ	RVQ calls	average time in RVQ				
Example							
0423	TFN002						
000							
NCOS	000	00207	00197	00000	00001	00000	00000
	OHQ	00007	00237				
	CBQ	00000	00000				
	RVQ	00000	00000				

TFN003 incoming trunk group measurements

These measurements provide an indication of the incremental traffic that network queuing features impose on incoming trunk groups. Data accumulates for each incoming or 2-way trunk group offered OHQ, Coordinated Call Back Queuing (CCBQ), or Call Back Queuing to conventional main (CBQCM). These measurements are available at both the node and main switches. See Figure 22 for TFN003 report format.

Beginning with X11 release 15, Meridian 1 system options 51, 61, and 71, plus the SL-1 NT, RT, and XT machines support 512 trunks (O-511). X11 release 14 supports 512 trunks (O-511) on the SL-1 NT, RT, and XT machines only. All other systems and earlier releases support 128 trunks (O-127).

Quantity of calls placed in OHQ

This measurement identifies the number of incoming trunk calls placed in the OHQ for possible connection to another trunk group.

Average time in OHQ

This measurement reflects the average time (in units of 0.1 seconds) that calls waited in the OHQ for a trunk to become available. The average time includes calls removed from the OHQ by caller abandonment or removed from the queue after expiration of the OHQ time limit.

Quantity of incoming calls offered CCBQ or CBQCM

This measurement identifies the number of blocked incoming trunk calls that were offered a node-initiated call back. The measurement tracks users at an Electronic Switched Network (ESN) main (Coordinated Call Back Queuing) or conventional main (Call Back Queuing for Conventional Mains).

Quantity of calls accepting CCBQ or CBQCM

This measurement identifies the number of blocked incoming trunk calls that accepted a node-initiated call back. The measurement tracks users at an ESN Main or Conventional Main.

Average time in CBQ

This measurement (in 0.1-seconds) reflects the average time that main or conventional main users remained in the CBQ at the ESN node for an available facility.

When a CCBQ call back is offered to a busy station at the main, the call is removed from the queue for 5 minutes, then reinserted in the same place in the queue. This process occurs only once. The additional queuing time is included in the computation of average time. The five-minute suspension time is not included, and reinsertion into the queue does not count as an additional CBQ call.

When a conventional main station is too busy or fails to answer a CBQCM call back, the call is removed from the queue and reinserted into the queue as specified in the preceding paragraph.

Quantity of calls blocked in call back

This measurement identifies the number of node-initiated CBQ call backs (CCBQ or CBQCM) that could not be completed because an outgoing trunk group to the main or conventional main was not available.

Call back attempts no answer and cancellation

This measurement identifies the number of call back attempts that failed because the caller did not answer the call back. CBQ call backs to a main station that previously cancelled CBQ are treated as unanswered call back attempts.

Quantity of incoming calls offered RVQ or RVQCM

This measurement identifies the number of blocked incoming trunk calls that were given the option of accepting a call back. Calls from an ISDN main (Remote Virtual Queuing) or conventional main (Remote Virtual Queuing for conventional mains) are included in this measurement.

Quantity of calls accepting RVQ or RVQCM

This measurement identifies the number of blocked incoming trunk calls that accepted an RVQ offer. The count includes RVQ acceptances by users at the ISDN main or conventional main.

Figure 22
TFN003 Incoming Trunk Group

Format						
System ID	TFN003					
Customer number						
TRKG	incoming trunk group					
	OHQ	calls placed in OHQ	average time in OHQ			
	CBQ	incoming calls offered CBQ, CCBQ, CBQCM	calls accepting CBQ, CCBQ, CBQCM	average time in CBQ, CCBQ, CBQCM	blocked CBQ, CCBQ, CBQCM call backs	call back attempts not answered or cancelled
	RVQ	incoming calls offered RVQ, RVQCM	calls accepting RVQ, RVQCM	average time in RVQ, RVQCM	blocked RVQ, RVQCM call backs	call back attempts not answered or cancelled
Example						
0423	TFN003					
000						
TRKG	003					
	OHQ	00006	00263			
	CBQ	00000	00000	00000	00000	00000
	RVQ	00000	00000	00000	00000	00000

TFN101 OHQ overflow threshold

This threshold measurement indicates that an abnormally large number of users are timing out in the OHQ because the OHQ time limit has expired (defined in LD16) before a trunk is available. This overflow results from trunks being out of **service**, incorrectly defined OHQ time limits, or temporary traffic overload.

Off-Hook Queueing Timer (OHQT)

The OHQT report (see Figure 23) shows the percentage of OHQ calls that timed out (overflowed) in the OHQ before an available trunk was found. This value (in units of 0.1 percent) represents the total number of OHQ overflow, divided by the total number of OHQ offers, plus the OHQ overflows. It also shows the threshold defined (in LD16).

Figure 23
TFN101 OHQ overflow threshold

Format	
System ID	TFNIOI
Customer number	
OHQT timed out OHQ calls	threshold
Example	
0423TFN101	
000	
OHQT 00333	00000

Traffic Control (LD02)

This section discusses traffic commands and traffic measurements.

How to use traffic commands

LD02 sets traffic options, system ID, and time and date. The following conventions help describe the traffic commands in this section.

- user entered data is shown in UPPER CASE
system output data is shown in lower case
- a period (.) prompt indicates the system is ready to receive a new command
- a double dash (- -) indicates the system is ready to receive data
- a <cr> means that the user should press the return key

If a traffic program is running on the switch, the message TFC000 is output.

Setting and querying daylights savings information

Beginning with X11 release 19, the daylight savings time adjustment can be programmed so that it occurs automatically on the desired dates. (The system clock must have already been set.)

The daylight savings commands FWTM and BWTM set the date and time for the clock changes (FWTM = spring; BWTM = fall), SDST enables or disables the automatic change feature, and TDST queries the information using the following formats (variables shown in brackets):

```
FWTM <month> <week> <day> <hour>
BWTM <month> <week> <day> <hour>
SDST ON (OFF)
TDST
```

The month and day of week can be entered as numerics or abbreviations as shown below. The possible variable values (defaults in parentheses) are shown as follows:

```
month = 1-12 or JAN-DEC
        where 1=January and 12 = December; 4 or APR is FWTM
        default;
        10 or OCT is BWTM default
week = 1-5, L
        where 1 = the first week and L = the last week of the month
        1 is FWTM default; L is BWTM default
day = (1)-7 or (SUN)-SAT
        where 1 = Sunday; 7 = Saturday
hour = 0-(2)-23
        where 0 = midnight and 23 = 11 p.m.
```

Examples of each command:

Set daylight savings time in the spring

```
FWTM4112
```

or

```
FWTM APR 1 SUN 2
```

Return to regular time in the fall

```
BWTM10412
```

Turn on the automatic feature

SDST ON

Query the settings

TDST

Daylight savings information set by these commands survives sysload.

Set traffic report schedules

This legend applies to format fields used when printing the customer and system traffic report schedule. Possible variable values appear in parentheses:

C = customer number

D = day of the week:

1 = Sunday

2 = Monday

3 = Tuesday

4 = Wednesday

5 = Thursday

6 = Friday

7 = Saturday

ED = end day (1-31)

EH = end hour (0-23)

EM = end month (1-12)

SD = start day (1-31)

SH = start hour (0-23)

SM = start month (1-12)

SO = schedule options:

0 = no traffic scheduled

1 = hourly on the hour

2 = hourly on the half-hour

3 = every half-hour

Print current customer report schedule

TSHC C sd sm ed em

sh eh so

d d . . .

Example

To print current customer report schedule:

```
TSHC 6 0102 15 12?08 17 1
```

Print current system report schedule

```
TSHS sd sm ed em
```

```
sh eh so
```

```
dd . . .
```

Example

To print current system report schedule:

```
TSHS 03 04 15 04?08 17 3
```

Change customer report schedule

```
SSHC C sd sm ed em -- SD SM ED EM
```

```
sh eh so -- SH EH SO
```

```
dd . ..-D D . ..<cr>
```

Example

To change current customer report schedule:

```
SSHC 6 4 16 7- • 110 112
```

```
12 21 2 -- 0 23 1
```

```
2 3 4 5 6 . . 17 <cr>
```

Change system report schedule

```
SSHS sd sm ed em -- SD SM ED EM
```

```
sh eh so -- SH EH SO
```

```
dd . ..-D D . ..<cr>
```

Example

To change the system report schedule:

```
SSHS 2.5 4 16 7 -- 1 10 112
```

```
12 212 -- 0 23 1
```

```
2 3 4 5 6 -- 1 7<cr>
```

Meaning

Old schedule

start time: April 25 at 12 noon

end time: July 16 at 9 P.M.

frequency: hourly on the half-hour (SO = 2)

days of the week: Monday to Friday

New schedule

start time: October 1 at 12 midnight

end time: December 25 at 11 P.M.

frequency: every half-hour (SO = 3)

days of the week: Saturday and Sunday

Note 1: To obtain traffic reports at the scheduled intervals, the output device must have prompt USER = TRF in LD17. If TRF is not defined for any device, reports are still generated.

Note 2: Half-hour start and end times are not possible.

System reports

R is traffic report type:

- 1 = networks
- 2 = service loops
- 3 = dial tone delay
- 4 = processor load
- 5 = selected terminals
- 7 = junctor group traffic
- 8 = CSL and AML links
- 9 = D-channel
- 11 = MISP traffic
- 12 = MISP D-channel management
- 13 = MISP messaging
- 15 = MPH traffic

Print the current report types:

TOPS r r...

Set one or more report types:

SOPS r r... --RR ..<cr>

Clear one or more report types:

COPS r r... --R R... .<cr>

To use the print command, enter a space (not a carriage return) after the customer number.

If no reports are currently set, the system outputs NIL.

Customer reports

C = customer number

R is traffic report type:

1 = networks

2 = trunks

3 = customer console measurements

4 = individual console measurement

5 = feature key usage

6 = Radio Paging

7 = Call Park

8 = messaging and Auxiliary Processor links

9 = Network Attendant Service

Print the current report types:

TOPC C r r . . .

Set one or more report types:

SOPC C r r . . . -- RR . . . <cr>

Clear one or more report types:

COPC C r r . . . -- R R . . . <cr>

To use the print command, enter a space (not a carriage return) after the customer number.

If no reports are set, the system outputs NIL. For report 5, see "Set customer for feature key usage measurement" on page 114

Network reports

C = customer number

R is traffic report type:

1 = route list measurements

2 = network class of service measurements

3 = incoming trunk group measurements

Print the current report types:

TOPN C r r ...

Set one or more report types:

SOPN C r r ... -- RR ... <cr>

Clear one or more report types:

COPN C r r ... --RR ... <cr>

To use the print command, enter a space (not a carriage return) after the customer number,

If no reports are currently set, NIL is output by the system.

Set customer for feature key usage measurement

Print current customer being measured:

TCFT c

Set the customer to be measured:

SCFT c -- C

C refers to the customer number. Only one customer can have feature measurement set at a time.

Stop printing title, date, and time

Suppress the printing of the title (TFS000), date and time in cases where traffic measurement is scheduled but no other data is printed by issuing the following command:

Stop printing:

IDLT 0

Start printing:

IDLT 1

0 = no title is printed unless further data is also printed

1 = the title is always printed

Set traffic measurement on selected terminals

These commands print and change the Individual Traffic Measurement (ITM) class of service for specific terminals, trunks, and DTI channels in traffic report TFS005.

Note: Do not use these commands on superloops or octal density cards: NT8D02, NT8D03, NT8D09, NT8D14, or NT8D16.

Print the current TNs with ITM set:

TITM

Example

TITM

shelf 4 0 (all units on loop 4 shelf 0 have ITM set)

loop 5 (all units on loop 5 have ITM set)

tn 1 1 3 4 1 (unit on TN 113 4 1 has ITM set)

card 13 2 1 (all units on card 13 2 1 has ITM set)

chn15 21 (only loop 15 channel 21 has ITM set)

Set ITM on terminals:

SITM

Example

SITM

shelf 4 1 (current settings)

loop 05

tn 1134 1

card 19 1 1

chnl34 18

-- 7 (set ITM on all units on this loop)

-- 6 1 (set ITM on all units on this shelf, or on channel 1)

-- 8 1 1 (set ITM on all units on this card)

-- 8 1 1 1 (set ITM on all units on this unit)

.. <cr> (stop "--" prompt)

Clear line traffic TNs:

CITM (the ITM class of service is removed from all units)

Set blocking probability for Line Load Control (LLC)

x = 1, 2, or 3 LLC level

aaa = blocking probability in %

Print current LLC level and blocking probability:

TLLC

Set blocking probability:

SCTL x aaa

Activate Line Load Control at level x:

SLLC x

Set time and date

Print the current time and date:

TTAD day-of-week day month year hour minute second

Example

TTAD WED 24 111976 15 4149

Set the time and date:

STAD DAY MONTH YEAR HOUR MINUTE SECOND

Example

STAD 24 11 1976 15 4149

All entries in the time-of-day output, except the year, are two-digit numbers. The year, which can be any year from 1901 to 2099 inclusive, is input as a full four-digit field (for any year between 1901 and 2099 inclusive) or in a two-digit short form (for years between 1976 and 2075).

Also see “Setting and querying daylight savings information” on page 108.

Set daily time adjustment

The time of day can be adjusted during the midnight routines to compensate for a fast or slow system clock.

x = 0 for negative increment

= 1 for positive increment

y = 0-60 second adjustment in increments of 100 ms

Print the current adjustment:

TDTA x y

Set the adjustment:

SDTA x y -- X Y

Set system ID

Each Meridian 1 system has a unique system ID number (SID) of up to four digits. The ID number can be printed or set by the following commands.

Print the current SID:

TSID sid

Change the SID:

SSID sid -- SID

Set thresholds

The system thresholds (TH) and range of values (TV) appear as percentages or CCS:

- 1 = dial tone speed (range 0.00% to 99.9%)
- 2 = loop traffic (range 000 to 999 CCS)
- 3 = junctor group traffic (range 0000 to 9999 CCS)
- 4 = superloop traffic (range 0000 to 9999 CCS)

Print the current system thresholds:

TTHS TH tv

Set the system thresholds:

STHS TH tv -- TV

Thresholds and range of values for customer care appear as percentages or seconds.

- 1 = incoming matching loss (TV range 00.0% to 99.9%)
- 2 = outgoing matching loss (TV range 00.0% to 99.9%)
- 3 = average Speed of Answer (TV range 00.0 to 99.9 seconds)
- 4 = percent All Trunks Busy (TV range 00.0% to 99.9%)
- 5 = percent OHQ overflow (TV range 00.0% to 99.9%)

Print the current customer thresholds:

TTHC C TH tv

Set the customer thresholds:

STHC C TH tv -- TV

Perform threshold tests on last reports

For thresholds on customer reports:

C = customer number

TH = threshold type:

1 = incoming matching loss

2 = outgoing matching loss

3 = average Speed of Answer

4 = percent All Trunks Busy

5 = percent OHQ overflow

Perform threshold tests on customer reports:

ITHC C TH

For thresholds on system reports:

TH = threshold type:

1 = dial tone speed

2 = loop traffic

3 = junctor group traffic

Perform threshold tests on system reports:

ITHS TH

Note: When a threshold test passes, "OK" is output.

Print last reports

The last traffic reports can be printed or tested against threshold values. Data accumulating for the next reports is not accessible.

For printing the last customer report:

C = customer number

R is traffic report type:

1 = networks

2 = trunks

3 = customer console measurements

4 = individual console measurement

5 = feature key usage

6 = Radio Paging

7 = Call Park

8 = messaging and Auxiliary Processor links

9 = Network Attendant Service

Print one or more of the last customer reports:

INVCCRR . . .

For printing the last network report:

C = customer number

R is traffic report type:

1 = route list measurements

2 = network class of service measurements

3 = incoming trunk group measurements

Print one or more of the last network reports:
INVNCR...

For printing the last system report:

R is traffic report type:

1 = networks (per loop)

2 = services

3 = dial tone delay

4 = processor load

5 = selected terminals

7 = junctor group traffic

8 = CSL and AML links

9 = D-channel

Print one or more of last system reports:
INVSRR . . .

SL-1

Traffic measurement

Formats and output

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ANI feature description

Introduction

Certain applications involve automatic message accounting. The telephone system must identify the parties involved in a call and automatically transmit this information. Automatic Number Identification (ANI) provides this capability.

A system with ANI sends information about stations involved in an outgoing toll call via Multifrequency (MF) signaling over Central Automatic Message Accounting (CAMA) trunks to toll-switching CAMA, Traffic Operator Position System (TOPS), or Traffic Service Position System (TSPS) offices.

Document overview

This document outlines the functions, interconnections, characteristics, operation, and maintenance of Automatic Number Identification (ANI). Engineers and designers who work on connecting customer-provided apparatus to the trunk service can use this document as a guide.

The document does not include complete information about the Feature Group D trunking feature, which is described in ***and operation*** (553-2901-102).

ANI signaling

E&M, DX, or loop signaling can send ANI information to the central office. ANI supports three basic methods: Bell, NT400, and NT500.

The Bell method can interface the Meridian 1 to

- Bell system TOPS, TSPS, or CAMA offices.
 - Strowger Automatic Toll Ticketing (SATT) systems types 57, 59, 62, and 70A. These systems can be made to accept 1+ and 0+ calls from the Meridian 1 using MF pulsing by means of customer-provided adapter circuitry.
 - Stromberg Carlson Ticketing Systems.
- The NT400 method (modes A and B) provides an interface to the Northern Telecom NT400 ticketing system. Mode A repeats the toll access code (0 or 1) in the called number, whereas mode B does not.
- The NT500 method (modes A, B, and C) interfaces to Northern Telecom NT500 ticketing systems.
- Mode A repeats the access code (0 or 1) in the called number format for central offices that use MF outpulsing and combined trunk groups.
 - Mode B does not repeat the access code.
 - Mode C is used in offices with MF outpulsing and trunk groups dedicated only to 1+ or 0+ calls.

The Bell method and the NT400/500 method have different supervisory signals and different number formatting as shown in Figures 1 and 2. There are also formatting differences between the NT400 and NT500 method. Tables 1 through 4 summarize the possible combinations of trunk types and ANI methods.

The MF sender cable enables the Meridian 1 to independently **output** up to 16 digits (including starting and ending digits, called KP and ST, respectively) in each of the 30 permissible network loop time slots.

Figure 1
Supervisory signals (Bell method)

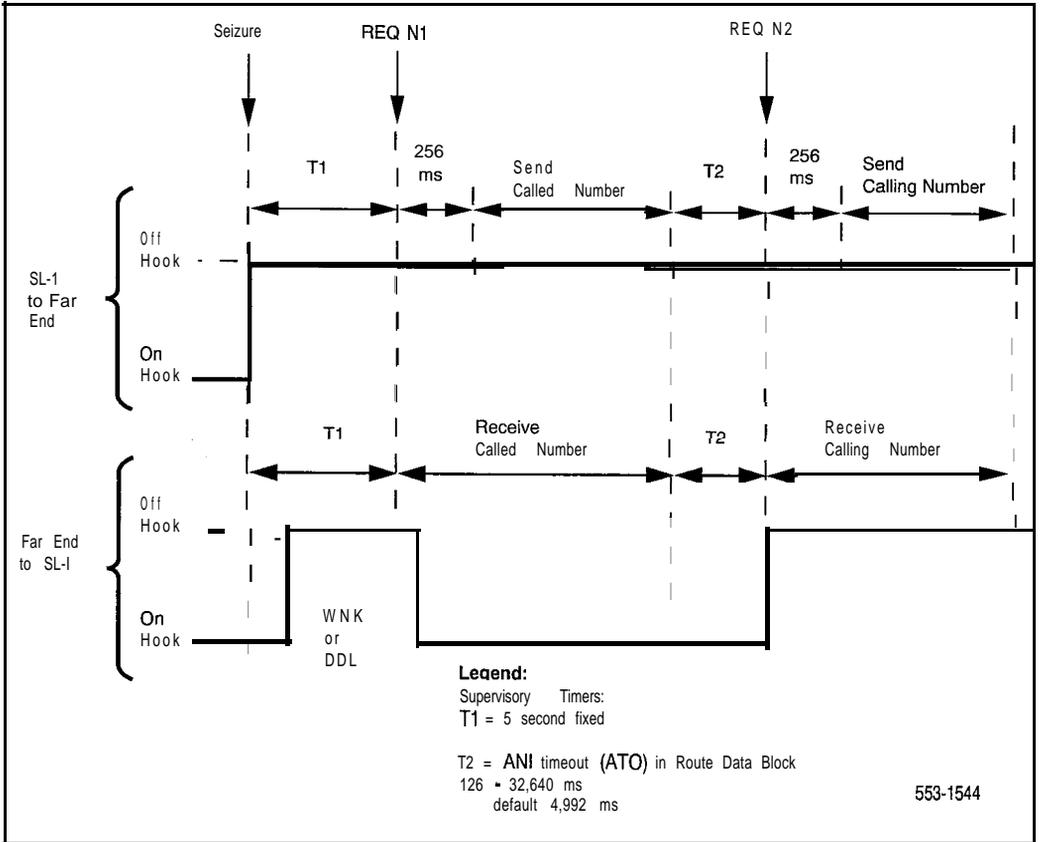


Figure 2
Supervisory signals (NT400/500 method)

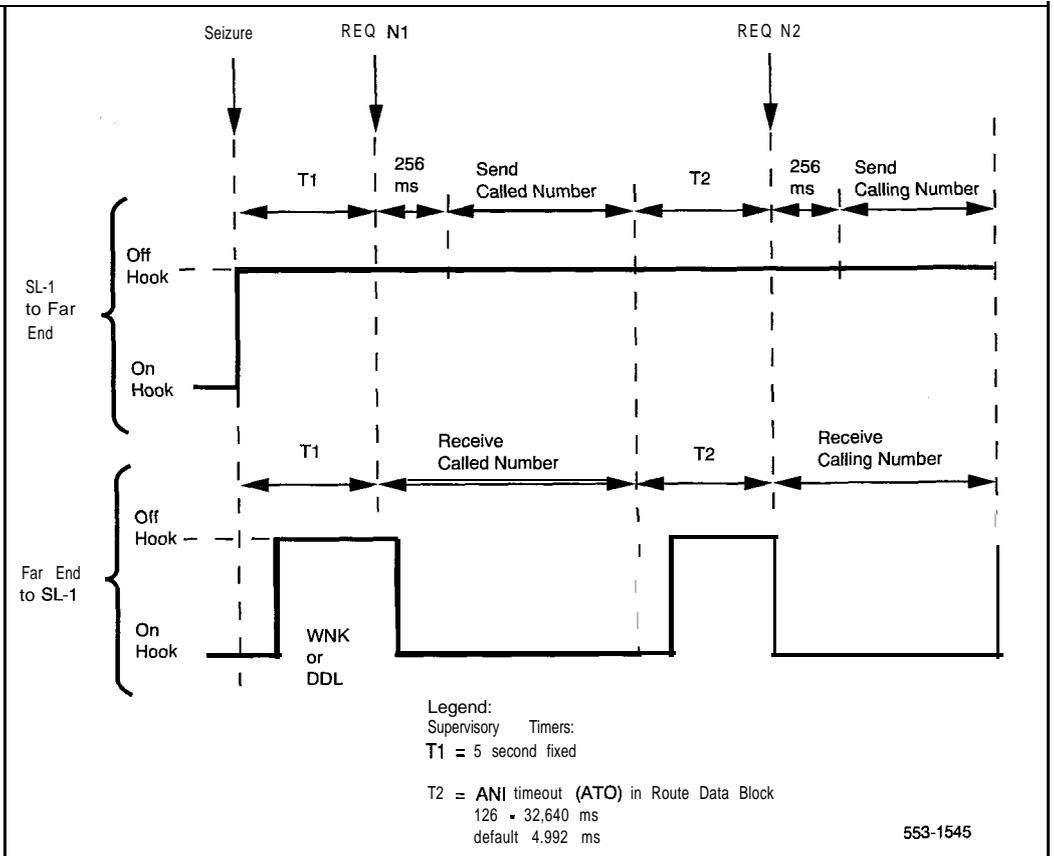


Table 1
Called and calling number information format (Bell method)

DP sending of called numbers			
Call type	Called number	Calling number	
		Regular trunk group	Super trunk group
0	seizure no digits	KP+ID+7D+STP	KP+ID+ST3P
0+7/10D	7/10D	KP+ID+7D+STP	KP+ID+7D+STP
1+7/10D	7/10D	KP+ID+7D+ST	KP+ID+7D+ST2P
011+CC+NN	11 +CC+NN	KP+ID+7D+ST	KP+ID+7D+ST2P
01 +CC+NN	1 +CC+NN	KP+ID+7D+STP	KP+ID+7D+ST3P
010	10	KP+ID+7D+STP	KP+ID+7D+ST3P
Modified Bell MF sending mode (M2B)			
Call type	Called number		Calling number
	Regular trunk group	Super trunk group	
0	KP+STP	KP+ST3P	KP+ID+7D+ST
0+7/10D	KP+7/1 0DtSTP	KP+7/10D+ST3P	KP+ID+7D+ST
00	KP+0+STP	KP+0+ST3P	KP+ID+7D+ST
00+7/10D	KP+0+7/1 0DtSTP	KP+0+7/10DST3P	KP+ID+7D+ST
1+7/10D	KP+7/10D+ST	KP+7/10D+ST2P	KP+ID+7D+ST
011+CC+NN	KP+1 tCC+NNtST	KP+1+CC+NN+ST2P	KP+ID+7D+ST
01 +CCtNN	KP+1 tCC+NN+STP	KP+1+CC+NN+ST3P	KP+ID+7D+ST
010	KP+1 +STP	KP+1 tST3	KP+ID+7D+ST
	or	or	or
	KP+10+STP	KP+10+ST3P	KP+ID+7D+ST
Legend:			
0+	= Operator-assisted call, more digits dialed		
0-	= Operator-assisted call, no other digits dialed		
00+	= Toll operator assisted call, and any other digits dialed (X11 release 12 and later)		
00-	= Toll operator assisted call, no other digits dialed (X11 release 12 and later)		
1+	= DDD call		
c c	= Country code		
NN	= National number		
ID	= Information digit		
KP	= Prepare for digits signal		
ST	= End of pulsing		
STP	= Premium		
ST2P	= Identifier error		

Table 2
Called and calling number information format (NT400 method)

Mode	Call type	Called number	Calling number
A	0+	KP+0+7/1 OD+ST	KP+CAT+7D+ST ¹
	0-	KP+O+ST	KP+CAT+7D+ST ¹
	1+	KP+1+7/1 OD+ST	KP+CAT+7D+ST ¹
B	1+	KP+7/10D+ST	KP+CM+CAT+7D+ST ¹
	0-	KP+ST	KP+CM+CAT+7D+ST ¹
	1+	KP+7/10D+ST	KP+CM+CAT+7D+ST ¹

Legend:

CM = 1 (for 1+ calls)
 = STP (for 0± calls)

CAT = XX (category digits)

x = 0, 1,...,9, and XX is customer-defined data defining the type of long-distance call

ST¹ = ST (normal)
 = ST2P (identifier failure)

ST² = ST2P (identifier error)
 = KP (station-to-station 1+)
 = STP (premium 0±)

Table 3
Called and calling number information format (NT500 method)

Mode	Call type	Called number		Calling number
		DP sending	MF sending	
A	o+	0+7/10D	KP+0+7/1 OD+ST	KP+CAT+7D+ST ¹
	0-	0	KP+O+ST	KP+CAT+7D+ST ¹
	1+	1+7/10D	KP+1+7/1 OD+ST	KP+CAT+7D+ST ¹
B	o+	not applicable	KP+7/1 OD+ST	KP+CAT+7D+ST ²
	0-	not applicable	KP+ST	KP+CAT+7D+ST ²
	1+	not applicable	KP+7/1 OD+ST	KP+CAT+7D+ST ²
C	o+	not applicable	KP+7/1 OD+ST	KP+CAT+7D+ST ¹
	0-	not applicable	KP+ST	KP+CAT+7D+ST ¹
	1+	not applicable	KP+7/1 OD+ST	KP+CAT+7D+ST ¹

Legend:

CM	=	1 (for 1+ calls)
	=	STP (for 0± calls)
x	=	0, 1, ..., 9, and XX is customer-defined data defining the type of long-distance call
ST'	=	ST (normal)
	=	ST2P (identifier failure)
ST ²	=	ST2P (identifier error)
	=	KP (station-to-station 1+)
	=	STP (premium 0±)

Table 4
Possible combinations of trunk types and ANI methods

Trunk type	Bell	NT400 A	NT400 B	NT500 A	NT500 B	NT500 C
CAMA-MF	A	A	A	A	A	A
CAMA-DP	A	N	N	A	N	N
CCSA-MF	A	A	A	A	A	A

Legend:
A = Allowed
N = Not allowed

Trunk types

The type of signaling determines the trunk circuit pack required.

- For E&M or DX signaling, use the QPC71 **E&M/DX/Paging** trunk circuit pack, which does not have to be modified for ANI. Refer to *QPC71 E&M/DX Signaling and Paging Trunk Card description (553-2001-187)* for a complete description of this trunk circuit pack.
- For loop signaling, the QPC72 loop signaling trunk circuit pack is used. Connections are the same as those described in *QPC449 Loop Signaling Trunk Cards description (553-2201-186)*.

These two types of trunks provide compatibility with the signaling and supervision requirements of **CAMA** trunks. They also provide a path for the eventual analog transmission of the MF tones and for speech transmission.

Note: ANI/DTI supports **CAMA** but not **CCSA-ANI** trunks.

Calling and called number information

The called number information always includes the number dialed (typically 7 or 10 digits). It may also include the toll access code (typically 0 or 1). MF sending includes additional control signals such as KP (preparatory digits) or ST (end of pulsing).

The calling number information is always sent in MF. It consists of a calling number (always 7 digits), the preparatory and end-of-pulsing signals, and other auxiliary signals. For example, information digit with the Bell method and class mark, and category digits with the NT methods.

Each customer in the Meridian 1 system is assigned a three-, four-, or five-digit ANI Listed Directory Number (**ANI LDN**) that identifies the customer to the toll office. The calling number for ANI is obtained by combining the ANI LDN with one of the following:

- 500/2500 telephone: Directory Number (DN) of the telephone.
- SL-1 telephone: primary DN of the telephone.
- Attendant: ANI attendant number specified on a “per customer” basis.
- Tie trunk: ANI trunk number specified on a “per trunk group” basis. See *X11 features and services (553-3001-305)* for information on how to assign these numbers in software.

The Directory Number Expansion (DNXP) package allows an internal DN to have up to 7 digits. If the system is equipped with this package, all DN types listed can be expanded to 7 digits maximum. Their combined length with the AN1 LDN must remain at 7 digits.

The AN1 LDN must be properly assigned based on the customer's dialing plan. Otherwise, only the leading digits of a DN (station, attendant, or tie trunk) will be retained in the AN1 calling number. In an extreme case, the full 7 digits of a DN can be used as the AN1 calling number provided that no AN1 LDN is configured.

The calling number information is obtained immediately before being sent. Calls that are subsequently modified (attendant extended calls and transfer, for example) are billed against the party that initiated the trunk call. (This publication is consistent with AIOD.)

ANI call sequence

The Meridian 1 system intercepts all outgoing calls over **CAMA** trunks if 1 or 0 is not dialed following the trunk access code. This restriction does not apply to outgoing calls over CCSA-ANI trunks.

Software

The software portion of AN1 performs the following functions:

- identifies an originating outgoing toll call
- determines the calling station identification, and controls the signaling and supervision of the AN1 trunk circuit according to the call sequence described in the next section
- connects the MF sender and the AN1 trunk circuit
- loads up to 16 digits that are to be MF outpulsed over the AN1 trunk into the MF sender
- orders initiation of the outpulsing
- removes the connection between the trunk and the MF sender and establishes the speech path to the trunk according to the call sequence described in the next section

ANI call sequence by means of CAMA MF trunk

The CAMA MF trunk ANI call sequence follows these steps:

- 1 The calling party accesses the trunk group by dialing the CAMA trunk group access code or the optional route selection mechanism for ANI, the Automatic Route Selection (ARS). See *Automatic Route Selection* (553-2001-190).

The call is intercepted if the station is denied access to the CAMA trunk group or if the station has a toll denied (TLD) class of service and the CAMA trunk group is not code restricted. The call terminates.

If the call is not intercepted, continue to Step 2.

- 2 An overflow tone signals that all trunks are busy. A free CAMA trunk is assigned, and it is made busy for outgoing calls. An optional second dial tone is provided if the trunk group was accessed directly. The trunk is not seized at this time.
- 3 The calling party dials the called number. The second dial tone (if given in Step 2) is removed with the first digit dialed. Invalid digits result in an overflow tone and the call sequence terminates.
- 4 The Meridian 1 identifies the last digit dialed, as described in Table 5. If the call is incomplete, the calling station is locked out. Otherwise, the CAMA trunk is seized by sending the seizure signal. The Meridian 1 sends the called number using one of these methods:
 - Immediate Start: Waits 1 second, then sends the called number and goes to Step 5. CAMA MF trunks are not normally immediate start.
 - Wink or Delay Dial: A 5-second timer T1 starts. If the wink or delay dial signal is received before T1 expires, reset T1, wait 256 ms, and go to Step 5. If wink or delay dial signal is not received, go to Step 8.
- 5 The called number information is sent using MF. After sending the called number, the Meridian 1 number system sets up the speech connection and starts time T2 (adjustable timer, maximum 64 seconds, default is 5 seconds). Continue to Step 8 if the timer expires. If the timer does not expire, go to Step 6.

- 6 The **CAMA** office sends the AN1 request signal. Timer T2 is reset. Speech connection is removed, and the calling number information is sent (in MF). Having sent the calling number information, the Meridian 1 establishes the speech connection.
- 7 **ANI** sequence is completed.
- 8 Timer T1 or T2 expires, the trunk trouble threshold increments, and the trunk is released (after 3 seconds, it is made idle for outgoing calls). Second and subsequent attempts are made.

Note I: Auto dial or speed calling may be used for AN1 calls. No second dial tone is provided.

Note 2: The Bell method can interface the Meridian 1 to Stromberg Carlson Type 40 systems, in which case timer T2 is not set in Step 5 of the AN1 call sequence.

Note 3: Some **CAMA** offices do not send the AN1 request signal for **unbillable** calls. Examples include calls to long distance directory information and calls intercepted by an operator or recorded announcement. If an operator answers a call, answer supervision replaces the request signal. If not, no supervisory signal is sent. Set timer T2 to a large value, for example, 64 seconds, to prevent expiration during an intercepted call. Answer supervision aborts the AN1 sequence and establishes the call.

ANI call sequence by means of CAMA DP trunk

To minimize post-dialing delay, the sending of the called number starts as soon as the first digit has been dialed, and the toll office is ready to receive. The call sequence is the same as described in the steps above, with the following differences:

- 1 As soon as the trunk access code has been dialed, the **CAMA** trunk is assigned “made busy” for outgoing calls and seized. A second dial tone is provided locally if appropriate for the trunk group class-of-3; otherwise, a speech path is set up.
- 2 Calls are sent digit-by-digit after the **CAMA** office is ready.

Recognition of the last digit

Table 5 shows how the Meridian 1 identifies the last digit with CAMA trunks.

Table 5
Recognition of last digit with CAMA trunks

Call type	Recognition method
0-	4-second timer after first digit (if 0)
(0 + 1) XI X2...X7	XI ≠ 1, 4-second timer after X7
(0 + 1) XI X2...X10	XI ≠ 1, 4-second timer after X7, X8 dialed before timer expires
01 XI X2...Xn 7 ≤ n ≤ 12	first 2 digits = 01, XI ≠ 1 and 4-second timer after X7, X8, X9,... X11
011 XI X2...Xn 7 ≤ n ≤ 2	first 3 digits = 011, 4-second timer after X7, X8, . . . X11
010	first 3 digits = 010

Supervisory signals between the Meridian 1 and toll office

Table 6 shows which signals the Meridian 1 receives and recognizes.

Table 6
Signals recognized by Meridian 1

Signal	Meaning
REQ_N1	Requests the called number information
REQ_N2	Requests the calling number information
DISCONNECT	Disconnects the call, unless the class-of-service specified for the Near End is Originating Party Control.
HIT	Meridian 1 ignores this signal.
BUSY-OR-ORIG	This signal is a permanent off-hook from an idle trunk.

M911 and ANI

With X11 release 19 and later, the Meridian 911 permits special treatment for emergency calls. This feature requires the QPC916 MF receiver card. See **Feature Group D description and operation** (553-2901-102) for more information about this card.

Valid ANI combinations

When the Meridian 1/SL-1 receives a call from a 911 trunk, the trunk receives the AN1 information by way of MF signaling from the central office. A valid AN1 received via 911 includes a 1-digit NPD or ID digit followed by a 7-digit calling number. The NPD or ID digit can be displayed directly on the answering set display or can be translated to an NPA via the NPID translation table in LD16.

The following are valid AN1 digit combinations:

- KP A NXX-XXX ST (where A= the NPD, which can be O-9)
- KP I NXX XXX ST (where I = an information digit, which can be O-9)
- **KP I** ST (where I = the information digit for AN1 failure or Operator Number Identification. AN1 failure is usually designated by a 2; **ONI** by a 1.
- KP A ST (where A denotes maintenance testing, typically the digit 8)

If only one digit is received and that digit is defined in the NPID table as TEST or FAIL, the call is treated as a test case or a call with AN1 failure.

The following table shows an example of an NPID table. The last two fields, ANI Failure and Test Calls, are mutually exclusive: if the **NPID/ID** digit 0 is interpreted as ANI failure it cannot also be interpreted as a test call.

Table 7
Interpreting NPD/ID numbers

NPI/Info Digit	NPA	ANI Failure	Test Call
0	408	No	No
1	415	No	No
2	NONE	No	No
3	NONE	No	No
4	NONE	No	No
5	NONE	No	No
6	NONE	No	No
7	NONE	Yes	No
8	NONE	No	Yes
9	NONE	No	No

If the NPA is not specified (that is, NONE), the **NPID/ID** digit appears on the set. Otherwise, the NPA appears on the set for calls with a valid **ANI**.

Seven zeros indicate a failure (for example, MF receive fault, garbled tones, a timeout). After all ANI digits are received or a timeout occurs, the Meridian 1 processes the call.

A test call has no display.

Trunk route assignments

The 911 trunk must auto-terminate to a Controlled Directory Number (**CDN**) defined in LD23. The start arrangement must be WINK and the class of service should be defined as Priority Trunk (**APY**) and MFR.

ANI failure

If ANI information is incorrectly delivered, the call may not have a valid ANI, as indicated by the seven zeros in the display.

ANI failure affects the incoming call Application Module Link (AML) message, which informs the application with a special DN type value. The 911 caller's DN type Information Element (IE) contains one of these types: ANI with NPD, ANI with ID, or ANI failure.

Some central offices indicate ANI failure with an 8-digit string consisting of NPD followed by 911-OYYY, where YYY denotes the problem. The ANI string 911-OYYY is not treated as a failure so that the digits appear on the screen rather than being overwritten by seven zeros.

Redundancy and call loss requirements are very strict. If the AML terminal display is unavailable (for example, if the host computer is down), the ANI information still appears on the set display.

CDR for 911 ANI calls

The 911 ANI information is included in CDRQ records (connection records) if CLID is set to YES in LD17. CDR records affected are Normal Records, Start/End Records, Authorization Code Records, Connection Records (Q, R, F), and Charge Account Records.

The CDRQ record option is not recommended since the Meridian 911 application does not need Connection Records and they consume valuable CPU real time. The CDRQ record can nonetheless be configured to include ANI.

ANI/CAMA enhancement

Two call types available in XI 1 release 12 and later allow the AN1 Bell mode to handle 00- and 00+ calls. Subscribers who dial 00 can transmit KP + 0 + STP to access toll operator assistance. When 0 is dialed, subscribers can transmit KP + STP to access local operator assistance. Signals recognized by the Meridian 1 are shown in Table 6. Table 8 shows the actions taken by calling 00 and other combinations starting with 0.

Table 8
Actions taken with 00- and 00+ calls

Called number	Bell MF M1A action taken	Bell MF M2B action taken
0	KP + STP	KP + STP
0 + 7/10D	KP + 7/10D + STP	KP + 7/10D + ST3P
00	Overflow	KP + 0 + ST3P
00 + 7/10D	Overflow	KP + 0 + 7/10DST3P

Feature operation

After an ANI/CAMA route has been accessed, the Meridian 1 receives digits representing the called number. Table 8 identifies the actions taken.

Note: M1A represents the current Bell MF signaling mode. M2B represents the modified Bell MF signaling mode.

Feature interactions

ANI/CAMA CAMA routes using Bell MF signaling mode B **outputpulse** KP + 0 + ...) + START and allow 00- and 00+ calls. 00- and 00+ calls are denied for routes using a different signaling mode.

CCSA CCSA routes do not support ANI/CAMA.

RS-AN1 Route Selection for AN1 does not support 00- and 00+ dialing. Calls made using 00+ or 00- are treated as 0+ calls. The RS-ANI Data Block determines the 0+ call routing.

Requirements

ANI/CAMA operates on a route basis and applies to CAMA routes using the Bell MF signaling method only.

All route members must have a Multifrequency Route (MFR) class of service (CLS).

Note: ANI/CAMA is not supported over Dial Pulse trunks; therefore, when assigning this feature, do not use mixed trunk members.

Route Selection (RS-ANI) option

Provided with ANI is the optional Route Selection (RS-ANI). RS-ANI routes toll calls automatically through specified trunks to toll offices and it routes local calls through CO trunks to local switching offices.

To place an outgoing CO call, the station user dials the RS-ANI access code (typically 9), followed by a CO directory number. If the user dials 0 or 1 after the access code, the call routes through a toll trunk group; otherwise, the call routes through a CO trunk group.

Operation

After receiving the RS-ANI access code, the Meridian 1 sends the user the second dial tone. The user has 30 seconds to dial a digit or digits; otherwise, the Meridian 1 removes the dial tone and provides overflow tone for an additional 15 seconds. The Meridian 1 removes the second dial tone after the first digit or digits are dialed. Table 9 shows the Meridian 1 action that corresponds to the digit dialed.

Meridian 1 ignores the asterisk (*) key, but provides the overflow tone if the user presses the octothorpe (#) key unless the user dials 0#. In this case, the Meridian 1 activates a 4-second timer and times out.

Table 9
RS-ANI operation

Digit dialed	Meridian 1 action taken
0	A 4-second timer starts to monitor the next digit dialed. Routing is based on this digit, as follows:
none	The timer times out and the call (0-) routes through the trunk group specified for 0- calls.
1	The timer cancels and the call (IDD) routes through the trunk group specified for 1+ of IDD calls.
2-9	The timer is canceled and the call (0+) routes through the trunk group specified for 0+ calls.

Trunk types

Tie trunks access RS-ANI as stations do, but all other trunks are intercepted. Any type of trunk can be used for RS-ANI, with the exception of special-purpose trunks such as paging, dictation, or recorded announcement. Normally, the trunk routes shown in Table 10 are used.

Table 10
Trunk route types

Call type	Trunk type
0±	CAMA
1+, 011+, 01+, 010-	CAMA
other	c o

Class of service options

Conditionally Unrestricted station class of service (CUN) places non-ARS-handled toll calls through **ANI**. Refer to *X11 features and services* (553-3001-305) and *X11 input/output guide* (553-3001-400) to implement this option. See Table 11 for RS-ANI class of service options.

Table 11

RS-ANI class of service options

Option	Explanation
UNR	Allowed to receive calls from and originate calls to the exchange network (CO, FX, WATS). This includes toll calls.
CUN	UNR for calls placed through ARS and for calls placed through ANI TLD for all other calls
CTD	UNR for calls placed through ARS TLD for all other calls
TLD	Allowed to receive calls from the exchange network; allowed dial access to local exchange network; allowed access to toll network by means of Meridian 1 attendant only; denied access to exchange operator.
Legend	
UNR = Unrestricted CUN = Conditionally Unrestricted CTD = Conditionally Toll Denied TLD = Toll Restricted Service	

Trunk Optimization

Unlike standard public network trunk calls, AN1 trunks allow the Trunk Optimization (**TRO**) feature to be used whenever calls are routed over PRI and ISL facilities. For additional information on this feature, refer to *ISDN Primary Rate Interface description and administration* (553-2901-100).

Installation and maintenance

This section describes hardware requirements, including the Loop Signaling Trunk option, for ANI. The end of the chapter discusses error detection procedures.

Hardware

Use the QPC 189 MF sender or NT8D17AA circuit packs, plus additional trunk circuit packs as needed, to transmit ANI. Each trunk circuit pack can manage two trunk lines, and each MF sender pack can handle 1400 calls per hour, with outpulsing at 10 or 20 pps provided by the TDS circuit packs. Systems that need to receive ANI must be equipped with QPC916 MF receiver cards. For additional information, see *Feature Group D description and operation* (553-2901-102).

The QPC189 MF sender, which is located on the common equipment (CE) shelf, provides for MF signaling of ANI digits over CAMA trunks to toll switching CAMA, TOPS, or TSPS offices. The MF sender designed for the Meridian 1 system has the following characteristics:

- The maximum number of digits in an ANI string that can be outpulsed by the MF sender is 16.
- The minimum number of digits in an ANI string must be 2 (for example, KP + ST).
- No MF signaling is permitted over time slots 0 and 1. Any number of MF-ANI sequences (up to a maximum of 30) can be outpulsed simultaneously over various CAMA trunks.
- The first digit (usually KP) in an ANI digit string is pulsed for 136 ms followed by a silent interval of 68 ms. The remaining digits are each pulsed for 68 ms followed by 68 ms of silence.

- The MF sender is located in any one of pack slots 3 through 11 in a QSD2 network shelf.
- The MF sender has a control memory of 12 bits for every time slot and a digit buffer that contains 16 digits (4 bits each) per time slot. The processor can write into four types of registers and read two types of registers. Data store requirements are the same as those of a tone and digit switch (2 words protected, 55 words unprotected). See **capacity engineering** (553-3001-149) for a detailed calculation of memory requirements.

Loop signaling trunk option

Refer to Figure 3 for information on loop signaling trunk option switch settings. See Table 12 for information on loop signaling trunk circuit characteristics.

Table 12
Loop signaling trunk circuit characteristics

Capacity	2 trunks
Power feed	3061306 Ω balanced, 48 V nominal
Loop termination	270 Ω
Pack options	(a) 600/900 Ω nominal impedance (b) ANI or non-ANI (c) loop, or battery and ground pulsing on ANI
External circuit resistance	2000 Ω max (for 16.2 mA)
Ground potential difference	± 10 V maximum
Far end battery limits	42.75 V to -52.5 V
Line leakage	30 kM minimum
Pack applications	(1) Direct Inward-Dialing Trunk (DID) (2) Direct Inward-Dialing/Direct Outward-Dialing (DID/DOD) trunk (see note) (3) 2-way Dial Repeating (2DR) trunk (see note) (4) Outgoing Automatic Incoming Dial (OAID) trunk (5) Outgoing Automatic Number Identification (OANI) trunk
Note: In applications (2) and (3), battery and ground pulsing is provided.	

Figure 3
Loop Signaling Trunk option switch settings

Switch setting location	Single density port 0/1 f/30 switch						Double density port 0/1/2/3 H17/H3/A17/A3 switch					
Application	1	2	3	4	5	6	1	2	3	4	5	6
Outgoing ANI only: — Loop pulsing	0	0	0	0	0	0	0	0	0	0	0	0
Battery and ground pulsing	○	○	○	○	●	○	○	○	○	○	●	○
Other than Outgoing ANI	●		□	○	□	□	●	○	●	○	●	○
	Jumpers (QPC560) Units 0/1/2/3											
Note:	● = On	600 Resistive impedance				pins 1 to 2						
	○ = Off	3 Component impedance				pins 2 to 3						
Note:	The above switch settings apply to the following loop signal trunks QPC720/288/449/559/560											

553-1547

Installation

Locations of both QPC71 and QPC72 packs are the same as those for any trunk circuit pack in the peripheral equipment (PE) shelf. Trunk connections are the same as those shown in *Loop signaling trunk* (553-2001-186) and *QPC71 E&M/DX Signaling and Paging Trunk Card description* (553-2001-187).

The MF sender pack, however, must be located in a network card position in a common equipment (CE) shelf. Installation procedures for all packs are described in *Circuit card installation and testing* (553-3001-211). To test the MF sender pack for proper operation, refer to Table 13.

For details of service change procedures, refer to **XI 1 features and services** (553-3001-305) and **X11 input/output guide** (553-3001-400).

Table 13
Signal frequencies for MF outpulsing

Digit or symbol	Frequencies (Hz)
1	700 + 900
2	700 + 1100
3	900 + 1100
4	700 + 1300
5	900 + 1300
6	1100 + 1300
7	700 + 1500
8	900 + 1500
9	1100 + 1500
0	1300 + 1500
KP	1100 + 1700
ST	1500 + 1700
STP	900 + 1700
ST2P	1300 + 1700
ST3P	700 + 1700
Power output	Each frequency is -6 ± 0.7 dBm at the MDF
Power variation	Less than 0.5 dB between any two output frequencies
Background level	Signal transmitted-any frequency other than the two signal frequencies to be 30 dB below the signal frequency level
Signals not transmitted	50 dB below signal frequency

Error detection

The Meridian 1 system detects errors by monitoring signaling -irregularities and failures. Such irregularities cause trunk trouble thresholds to be incremented and, if persistent, they result in a diagnostic message on the maintenance teletype (TTY).

The TRK L S C U command in LD36 can test **CAMA** trunks used with **ANI**. Another diagnostic (LD46) tests the MF sender.

All diagnostic output messages and input formats are explained in the *X11 input/output guide (553-3001-400)*.

Testing the MF Sender

- 1 Load program 46.
- 2 Input the command MFS L. If the MF sender pack passes the tests, but seems to be sending incorrect digits, use the TONE command. TONE requires a maintenance telephone input pad. The user presses the pad keys and listens to the **MF** tones being generated.
- 3 Enter TONE#L#ALL##. This causes the diagnostic to produce a 10-second burst for each digit from 0 through 15 to check that each digit sounds different.

If some tones sound the same, use TONE#L## to pursue the problem. This command enters the user into a special input mode, which causes the MF sender at Loop L to **output** a digit burst that corresponds to the key pressed. (See Table 14.) This feature allows comparison between arbitrary digits and digits suspected of producing the same MF frequencies.

- 4 To return to the command input environment, press the asterisk (*) key.

Table 14
Tone commands

Key pressed	MF digit outputted
pad key 1	1
pad key 2	2
pad key 3	3
pad key 4	4
pad key 5	5
pad key 6	6
pad key 7	7
pad key 8	8
pad key 9	9
pad key 0	0
pad key *	END TONE command
strip key 0 (prime DN)	10 (ST-3P)
strip key 1	11 (STP)
strip key 2	12 (KP)
strip key 3	13 (ST-2P)
strip key 4	14 (ST)

SL-1

Automatic Number Identification

Description

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Release 6.0

Standard

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SL-1

Call Detail Recording

Description and formats

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Introduction

Call Detail Recording (CDR) provides information on incoming and outgoing calls for accounting and administration purposes. A Serial Data Interface (SDI) port sends the information to any RS-232 compatible output or storage device, for example, TTY or printer output device or a single/multi-port Call Detail Recording (CDR) storage system

System administrators can refer to this document for an overview of Call Detail Recording (CDR). The document includes detailed descriptions of data storage and retrieval, accompanied by sample report output.

Other documentation

When configuring CDR, refer to *XII input/output guide (553-3001-400)*. Additional feature description information is found in *XI I features and services (553-3001-305)*.

For information about engineering specifications and other product details, refer to *Traffic measurement formats and output (553-2001-450)* and *Meridian 1 capacity engineering (553-3001-149)*.

Record generation

The CDR software package contains the programs for gathering data and producing call records. A Normal record includes the time and date of call, caller identity, digits dialed, and other information.

Note: Automatic and manual clock changes affect CDR records. Make sure that the system time-of-day clock is correctly configured.

Calls transferred or modified in some way by feature treatment generate Start and End records instead of Normal records. Refer to the sections on “Call record generation” on page 5 and “Call record output” on page 25.

Record output and storage

Records generated by CDR can be output to any device with an RS-232-C compatible interface, a printer for example, for hard copy reports.

The SDI cable between the switch and the CDR collection device can be up to 15.24 m (50 ft) long. Beyond this distance, modems are required.

CDR magnetic storage

The CDR magnetic tape storage system has been discontinued, although it is still supported.

This storage option consists of a single equipment cabinet that contains a Central Processing Unit (CPU), a 9-track magnetic tape unit, and tape control circuitry. The multi-port system can store call records from a maximum of 12 different switches.

The CDR system collects the call records from the system, formats them into blocks and stores the blocks on tape. When the tape is full, it is removed from the CDR cabinet and sent for downstream processing into CDR reports, billing, and other call accounting applications.

Establishing baud rates

A CDR record typically has one **80-character** line (two if Multi-Tenant Service, **CLID**, or Feature Group D **ANI** is involved) and an average length of 100 bytes. A Meridian 1 system with CDR can run out of call registers (**CRs**) for call processing if the **SDI/IO** interface transmission rate is less than that of the CDR record generation. The **SDI** baud rate needs to be high enough so that records do not accumulate in the Meridian 1 output buffer, causing a shortage of call registers.

The Average Busy Season Busy Hour (ABSBH) traffic data provides a starting point for calculating the required capacity. The capacity includes a 30% reserve to accommodate traffic peaks.

Tables 1 and 2 show the relationship between baud rate and number of CDR calls per hour for two different record lengths: 100 characters (an average record) and 160 characters (the maximum length). The tables rely on the following calculations:

$$\text{SDI port baud rate} * .70 / \text{record length} = \text{records that can be transmitted per second}$$

$$\text{Records transmitted per second} * 60 * 60 = \text{CDR hourly call capacity.}$$

Table 1
CDR data rate and system call capacity: record length 100 characters

Baud Rate	300	1200	2400	4800	9600
CDR calls per hour	1,035	4,140	8,280	16,560	33,120

The tables, which apply to all MSL-1 CPUs, assume that each call uses one call per record. Table 2 shows the worst case scenario, with each record at the maximum 160 character length. For other record lengths, interpolate between the two tables.

Table 2
CDR data rate and system call capacity: record length 160 characters

Baud Rate	300	1200	2400	4800	9600
CDR calls per hour	649	2,596	5,192	10,384	20,768

The table data ignores potential system limitations such as real time or traffic constraints that need to be engineered separately. The tables apply to all Meridian 1 CPUs.

Only calls generating CDR records need be included in capacity estimations. Some systems keep CDR records only for outgoing calls, for example, or for 800-type services. Calls that do not generate records should be excluded from the capacity calculations.

Packaging

The following is a list of available CDR packages. Refer to *X11* features services (553-3001-305) for a complete list of feature packages. Consult your Northern Telecom representative for information regarding your specific system requirements.

- Authorization code (package 24)
- Automatic Call Distribution CDR queue record (package 83)
- CDR (package 4)
- CDR Expansion (package 151)
- CDR on Data Link (package 6)
- CDR on Teletype (package 5)
- Charge account for CDR (package 23)
- Internal CDR (package 108)
- Calling Line ID in CDR (package 118)

Call record generation

Each call generates a single call record. Calls that are modified (for example, transferred or placed in a conference) generate multiple records. This section outlines the different call records and their applications.

For every call, CDR generates one Normal record or several Start and End records. Additional record types are generated to accommodate certain features. If Internal Call Detail Recording (ICDR) is used, Internal records are generated in addition to Normal, Start and End records.

Normal record (N)

A Normal (N) record is generated when a call is established, whether or not it is extended through the Attendant Console, and when no other telephone feature is activated. The Normal call record contains the following information:

First line:

RECTYPE	call Record Type
RECNO	call Record Number
CUSTNO	Customer Number for the customer being recorded in this report
ORIGID	Originating Identification
TERID	Terminating Identification
AUXID (optional)	Auxiliary Identification
TIMESTAMP	Time of day call began
DURATION	Length of call
DIGITS	Digits dialed, output, or modified by software options

PRECLEVEL (optional)	Precedence level
ORIGTENANT (optional)	Originating tenant number, Multi-Tenant only
TERTENANT (optional)	Terminating tenant number, Multi-Tenant only
&	Ampersand (indicating second line)
CLID (optional)	Calling Line ID; ISDN must be equipped
FGD DIGITS (optional)	Feature Group D Digits
DNIS (optional)	Dialed Number Identification Service — (maximum four digits) included in the call record after FGD digits only if: the customer has the DNIS and CDR packages, the route is a DNIS route, and the DNIS option is turned ON in the Route Data Block. IAN1 also uses this field. See “In-Band Automatic Number Identification (IANI)” on page 38.

Beginning with X11 release 19, DNIS supports Network ACD (NACD) and Feature Group D (FGD). If a DNIS trunk call is rerouted to a remote target ACD agent through the NACD and the incoming ISDN trunk’s Route Data Block has DNIS-CDR enabled, the DNIS number appears at the end of CDR’s Normal, Start, and End records. The DNIS number also appears at the end of CDR records for incoming FGD trunks that have the DNIS-CDR option enabled in their Route Data Block.

For a Normal (N) record, telephone dial pad input appears in the call record (except as described in the next two paragraphs) and may include symbols and unused digits. For instance, Speed Call and Autodial calls using the asterisk (*) show the symbol in the CDR record of the Speed Call or Autodial call.

End-to-End Signalling (EES) digits are dialed after the timer expires, after the octothorpe (#) has been pressed, or after answer supervision is received. EES digits often include sensitive information such as authorization codes and account numbers. Beginning with X11 release 19, these digits appear in the CDR only if the customer chooses to include them by setting ECDR in the customer data block (LD15) to YES. The default is NO.

The digits field collects all input until an octothorpe (#) is entered.

When a Route Selection feature is used, the letter A precedes the DIGITS field on TTY outputs. These features are Basic Alternate Route Selection (BARS), Network Alternate Route Selection (NARS), Route Selection-Automatic Number Identification (RS-ANI) and Coordinated Dialing Plan (CDP). In BARS/NARS features, the letter E precedes the TTY DIGITS field if the call was completed over facilities that are designated through service change as expensive routes.

Incoming calls

A call answered and extended by the Attendant generates a Normal record showing the incoming trunk as the ORIGID and the terminating telephone as the TERID. No indication is given that the attendant is involved in the call.

If the calling party abandons the call before the called party answers, and before recall is activated, no record is generated. However, if the call is abandoned during recall, the Attendant Console is shown as the TERID. Incoming calls answered by the attendant but not extended to a telephone are shown with the Attendant Console as the TERID.

Outgoing calls

An outgoing call placed by the attendant generates a Normal record, indicating the Attendant Console as the ORIGID and the outgoing trunk as the TERID. However, when the call is extended to a telephone, the Normal record generated indicates the outgoing trunk as ORIGID and the terminating telephone as the TERID. The DIGITS field shows the telephone number dialed by the attendant.

Tie trunk operation

The duration of calls placed over tandem Tie trunks is calculated from the time the call is answered rather than from the time the trunk is seized. A Normal or Start record is generated only if Answer Supervision is received.

Start record (S)

A call that is modified by certain features (for example, call transfer, conference calling) generates a Start (S) record. A Start record contains the following information. Refer to the “Normal record (N)” on page 5 for descriptions of these field outputs.

RECTYPE

RECNO

CUSTNO

ORIGID

TERID

AUXID (optional)

TIMESTAMP

DURATION

DIGIT

PRECLEVEL (optional)

ORIGTENANT (optional)

TERTENANT (optional)

CLID (optional)

FGD digits (optional)

DNIS (optional)

A Start record will not be generated if an attendant extends the call.

Call Transfer

Transferring an established call outside the system generates a Start (S) record instead of a Normal record. The Start (S) record is a snapshot of the two involved parties immediately before feature activation: the TERID indicates the transferring DN. Call termination generates an End record showing its final disposition, with the trunk as the ORIG ID and the DN as the TER ID. Internal transfers do not generate Start records.

Transferring a call outside the system (external transfer) generates a second Start record indicating the transferring DN as ORIG ID, the trunk transferring the call as TERID, and the number to which the call is transferred as TERID.

Conference

An established call that activates the conference feature generates a Start record as described above for the Call Transfer feature. Each CDR trunk included in the conference has an associated Start record. The Duration field is calculated from the previous Start record timestamp to the current Start record timestamp. CDR processing routines may alter the sequence of related Start records, but the chronological (timestamp) data remains intact and each Start record is generated before its corresponding End record. The End record shows the conference bridge as the ORIGID and the **conferenced** trunk as TERID.

Call Forward

A forwarded call that results in a trunk-to-trunk (tandem) call generates a consecutive pair of Start records. The first record indicates the incoming trunk as ORIGID and the call forwarded DN as TERID. The second record indicates the call forwarded DN as the ORIGID and the outgoing trunk as the TERID. Both records have the same timestamp and duration data. An End record is generated at the end of the call.

When Call Forward is activated for an incoming Tie to outgoing Tie call, **two** Normal records are generated—one for incoming Tie trunk to telephone, and the other for the telephone to the outgoing Tie trunk.

Other features

On established calls, a Start record is generated for the following features:

- Barge-In/Busy Verify
- Privacy release
- Override

A Start record indicates that a feature was activated during a call, and reflects any changes to the parties involved. The trunk ID remains consistent throughout. An End record is generated on call termination.

End record (E)

Each Start record is associated with an End (E) record that is generated when the call terminates. The record shows the final disposition of each call. The timestamps on the corresponding Start and End records can be used to calculate the duration of a call. The End record contains the following information:

RECTYPE
RECNO
CUSTNO
ORIGID
TERID
AUXID (optional)
TIMESTAMP
DIGITS
PRECLEVEL (optional)
ORIGTENANT (optional)
TERTENANT (optional)
CLID (optional)
FGD DIGITS (optional)
DNIS NUMBER (optional)

Refer to “Normal record (N)” on page 5 for descriptions of these fields.

Initialization record (I)

A single (I) record notes system initialization and its time in the following format:

RECTYPE

TIMESTAMP

Refer to “Normal record (N)” on page 5 for descriptions of these fields.

Timestamp record (T)

Changing the system time or date from either the Attendant Console or a TTY generates a consecutive pair of T records that specify the old and new timestamps. The first record in the pair gives the old timestamp, and the second record shows the updated timestamp. Both records have the following format:

RECTYPE

TIMESTAMP

Refer to “Normal record (N)” on page 5 for descriptions of these fields.

Authorization Code record (A)

The Authorization Code (A) record is optional and is set using LD88. An A record is generated when the code is entered and one of the following occurs.

- a trunk is seized
- a local telephone answers Direct Inward System Access (DISA) calls
- Ring Again is activated, in which case both the ORIGID and TERID fields are the DN associated with the telephone entering the authorization code

When authorization codes are stored as Auto Dial or Speed Call entries, the number stored must contain the access code followed by the Authorization Code only. All digits after the access code are interpreted as Authorization Code digits. This record contains the following information:

RECTYPE
RECNO
CUSTNO
ORIGID
TERID
AUXID (optional)
TIMESTAMP
DIGITS
ORIGTENANT (optional)
TERTENANT (optional)
CLID (optional)

Refer to “Normal record (N)” on page 5 for descriptions of these fields.

Ring Again

When Ring Again is activated, a record is generated only after a trunk is seized.

If the Ring Again offer is cancelled or ignored, no CDR A record appears. If the Ring Again offer is accepted, the line is seized when accepted, and a CDR A record is generated.

If an Authorization code is entered, but the call is not completed, the call record has a blank TERID field.

CDR A records show the usual fields:

- If there is an internal connection, CDR shows the originating and terminating DN.
- If there is a trunk call, CDR shows the originating DN and the terminating route/trunk member.

Charge Account record (C)

The Charge Account (C) record lets customers bill calls to specific charge account numbers. LD15 defines individual charge account number lengths (2 to 23 digits) for each customer. A charge account number, which can be entered either before dialing or during an established call, causes a Charge Account record to be generated with the following information:

RECTYPE

RECNO

CUSTNO

ORIGID

TERID

AUXID (optional)

TIMESTAMP

DIGITS

ORIGTENANT (optional)

TERTENANT (optional)

CLID (optional)

Refer to “Normal record (N)” on page 5 for descriptions of these field outputs.

Charge numbers of fixed length

The system assumes that a charge account number is valid when the number of digits entered matches the account number length defined in LD15.

- When a charge account number is entered before establishing a call and too few digits are entered, the system waits 30 seconds (15 seconds for 2500-type telephones) before providing overflow tone. The telephone then returns dial tone. If the call involves a trunk, a Charge record shows the partially entered account number.
- When a user of any telephone other than a 500/2500 does not enter enough charge account digits, timeout occurs, followed by a fifteen second overflow tone and then by reconnection. When a 500/2500 telephone user dials too few digits, no timeout occurs. Instead, the system interprets each subsequent switchhook flash as the digit 1. When the account number field is filled, dial tone returns and the next switchhook flash reconnects the call.
- On Meridian 1 telephones without a charge key, if the user does not wait for a response and has dialed too few digits, the call is reestablished when the DN key is pressed. No charge record is produced.

Call Transfer

An external Call Transfer from one telephone (A) to another telephone (B) generates a Start record for telephone A and an End record for telephone B when the call terminates. However, if telephone B enters a charge account number and transfers the call to another telephone (C), the resulting Start and End records do not refer to telephone B, although telephone B is included in internal records. No Start or End records are generated when the call is an internal call.

Charge Conference record (M)

Charge Conference (M) records allow one or more charge account numbers to be assigned to one, some, or all members of a conference call. Individual Start, Charge Conference, and End records are generated for each trunk participating in the call. Individual End records are generated for each trunk as it disconnects. The Charge Conference record contains the following.

RECTYPE

RECNO

CUSTNO

ORIGID

TERID

AUXID (optional)

TIMESTAMP

DIGITS

ORIGTENANT (optional)

TERTENANT (optional)

CLID (optional)

Refer to “Normal record (N)” on page 5 for descriptions of these field outputs.

Different account numbers

500/2500 telephones users enter the account number after the switchhook flash and before the trunk is dialed. SL-1 and Meridian digital telephone users enter the account number after pressing the Conference key, either before or after the trunk is dialed, and before the Conference key is pressed again. Each trunk involved in a conference call has a separate charge account number.

Single account numbers

When all parties in a Conference call have the same charge account number, only one entry is required. Once all the trunks are included in the conference, the charge account number is entered in the usual manner. An M record shows the telephone entering the number, the trunk added, and the charge account number.

Calling Party Number record (P)

The Calling Party Number (CPN) record helps administrators match telephone company bills for collect calls against call detail records. The CPN key assigned to Attendant Consoles and SL-1 telephones lets users enter a Calling Party Number (CPN) of 1 to 23 digits to generate a P record. Every time the CPN key is used, a CDR (P) record is generated, allowing multiple CDR (P) records. The P record contains the following information.

RECTYPE

RECNO

CUSTNO

ORIGID

TERID

AUXID (optional)

TIMESTAMP

DIGITS

ORIGTENANT (optional)

TERTENANT (optional)

CLID (optional)

Refer to “Normal record (N)” on page 5 for descriptions of these field outputs.

Note: P records are not generated until the attendant extends the call.

Connection record (ACD calls)

Automatic Call Distribution applications that connect a telephone system with a host computer generate Connection records.

There are three types of Connection records:

- R records, for ACD calls that are transferred
- F records, for ACD Conference calls
- Q records, for calls connecting a trunk and an ACD agent

The Connection record allows agents to establish and modify the profile of a call in progress (such as the caller's name, address or other information) that is passed along with a call that is transferred or conferenced. This profile is entered in the host processor and can be displayed on ACD agent terminals.

R records and F records

When the host processor finds a Connection record, it scans the CDR records for other Connection records related to that call and displays existing call profiles on the ACD agent's screen. If the call is transferred or conferenced to another agent, the call profile appears on the monitor of that agent, who can change the call profile if required. This process is repeated for subsequent transfers and conferences until the agent terminates a call or transfers it to a non-agent.

Note: An incoming CO trunk does not create any digits in the R record.

Q records

The Q record helps customers link their Voice Response Unit (VRU) with the appropriate trunk for delivering an electronically-constructed message to callers. This reduces an agent's work time for the call.

Connection records contain the following information:

RECTYPE
RECNO
CUSTNO
ORIGID
TERID
AUXID (optional)
TIMESTAMP
DURATION
ORIGTENANT (optional)
TERTENANT (optional)
CLID (optional)

Refer to “Normal record (N)” on page 5 for descriptions of these field outputs. The CDR format of Connection records is similar to the N record except that the TERID field contains the TN (packed format) of the agent telephone.

The Connection record’s Duration field contains the length of time a call waits before service. An optional feature lets the host processor signal agents when calls are waiting too long.

Note 1: An incoming CO trunk does not create any digits in the Q record.

Note 2: Magnetic tape devices do not store Connection records.

Priority Connection record

Connection records integrate the ACD feature operation with host processor facilities so that call profiles can be transferred among agents. Call completion has three components:

- Switching through a voice path
- Informing the computer of the connection (Connection record)
- Having the host processor display the call profile on the terminal of the agent receiving the call

The time required to process all three parts of the call is cumulative. To reduce the real-time required to complete the call, Connection records have priority over other types of CDR records. Priorities are assigned in this order:

- 1** High priority timing queue
- 2** Network input messages
- 3** Regular timing queue
- 4** Call ringing
- 5** TTY input
- 6** CDR Connection Call Processing records
- 7** Other functions at lower priority levels (including other CDR records)

CDR record sequencing

The simplest type of call to an ACD DN is an incoming call from a trunk to an agent. The typical sequence of CDR record for this type of call is:

- Q record – indicates a connection has been established
- N record – indicates that the call is terminated

Calls involving transfer and conference generate a sequence of Connection, Start and End records. This is a typical sequence of those records:

- 1 **Q record** Indicates that a connection has been established.
- 2 **S record** Indicates that the first leg of the call was completed. Timing and other data are provided for this portion of the call. This record is only generated for the first leg of a call.
- 3 **R record** Indicates that the call was transferred to a second agent. This record may appear before the S record when the first agent disconnects after the second agent answers. Another R record is generated each time the call is transferred to subsequent agents. There can be any number of additional R records.
- 4 **E record** Indicates that the call ended. It provides timing and other data for that call.

Because Connection records are processed at a higher priority than other CDR records, the actual sequence of CDR records may vary. Connection records are always output before other types of records. Under heavy traffic conditions, Connection records may be output five or more seconds before other types of records. Serial numbers indicate the actual sequence of the CDR records.

Internal record (L)

With XI 1 release 10 and later, an L record is produced when the Internal CDR criteria are satisfied. At least one L record is produced when internal calls are modified or transferred.

Internal records contain the following information,

RECTYPE
RECNO
CUSTNO
ORIGID
TERID
AUXID (optional)
TIMESTAMP
DURATION
ORIGTENANT (optional)
TERTENANT (optional)
CLID (optional)

Refer to the section about N records for descriptions of these fields.

Requirements

ICDR requires basic CDR. To receive a printout in ICDR, the customer must have either CDR-TTY (CTY) or CDR Link (CLNK) enabled.

Data input for ICDR is not supported by Attendant Administration.

An internal call record is output under the following conditions.

- The Call Detail Recording (CDR) feature is enabled.
- All connected parties are stations, attendants, or in conference.
- At least one of the parties involved has ICDR allowed.

If these criteria are satisfied, then the following applies.

- An Internal record is produced at the release of an internal call.
- One or more Internal records are produced at the completion of call modification of an internal call.
- Internal records are produced at the release of a multi-party call.

Automatic Call Distribution (ACD)

Internal records are produced for ACD:

- At the completion of an internal call.
- Following release of Agent Observe.
- When the supervisor activates or releases the Answer Emergency feature.

In all cases, the ACD Position ID appears in the ORIGID or TERID fields,

Busy Verify

When the attendant conducts Busy Verify on a telephone, the established parties are connected in a conference and an Internal record is produced. Internal records are produced when Busy Verify is released, as described for Conference calls.

Call Park

An Internal (L) record is output when an ICDR call is parked.

Conference

Internal records are produced for Conference calls when:

- A party joins or leaves a Conference call.
- Internal records indicate the conference loop as the ORIGID.

The last two parties remaining on a Conference call are recorded as a normal call.

Group Call

The L record produced when a party is disconnected from a group call identifies the party and the conference loop.

Override

When telephone A overrides telephone B which is connected to telephone C, a three-party conference is established. When telephone A releases, Internal records are produced showing the conference loop and each party.

Internal records are also produced when the attendant releases from Override on a Do-Not-Disturb telephone.

Voice messaging

Internal records for calls routed to a voice messaging system contain the agent ID in the terminator field.

Japan features

The existing CDR and Answer Supervision features are accurate to within a half second. The Internal L record Duration field is accurate to within two seconds.

For complete details on CDR in Japan, refer to (553-2001-100).

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Call record output

Teletype (TTY) output

Each call record is output on a TTY as a single line of data, or two lines if either Multi-Tenant Service, Calling Line Identification (CLID), or Feature Group D Automatic Number Identification (FGD ANI) is enabled. The data is broken up into fields, the significance of which is determined by their position in the line. Fields are separated by one or more blank characters. The unused fields in a given record are left blank. The second position of the second line begins with an “&” if the CDRE package is equipped.

Figures 5 through 9 show some examples of the TTY output formats. The output is dependent on the XI 1 software release and features enabled.

Screen or printer output uses the standard ASCII character set. Data may contain the ASCII NUL character randomly interspersed among the CDR characters. The NUL character is a control character that means “Do nothing” and does not appear on the printed output. It may be deleted without affecting the record, and it does not affect beginning and ending positions for any field in the record.

Tape output

When call records are stored on magnetic tape, they are collected in the system memory and then transferred to the tape device as a block of 16-bit binary words by the Serial Data Interface (SDI) port. Null records may be used to fill up blocks. Individual call records may not span tape blocks.

In link format, AN1 field follows the CLID field or the digits field, whatever applies. A bit flag in the first word of the CDR record indicates if the ANI field is present. The AN1 field has a fixed length of three words. This document describes the output produced by the 9-track single/multi-port tape format.

Figures 10 through 12 show examples of tape output. To separate call records within a tape block, the length of each record must be known. See the following figure.

Figure 1 shows the record length formula for tape output.

Figure 1
Tape formulas for X11 release 12 with CLID and Multi-Tenant

Record type	Record length formula
Normal	$6 + T + \text{Ceiling}(N/4) + A + \text{TEN} + \text{CL}$
Start	$6 + T + \text{Ceiling}(N/4) + A + \text{TEN} + \text{CL}$
End	$5 + T + A + \text{TEN} + \text{CL}$
Initialization	3
Time Stamp	3
Authorization Code	$5 + T + \text{Ceiling}(N/4) + A + \text{TEN} + \text{CL}$
Charge	$5 + T + \text{Ceiling}(N/4) + A + \text{TEN} + \text{CL}$
Charge Conference	$5 + T + \text{Ceiling}(N/4) + A + \text{TEN} + \text{CL}$
CPN	$5 + T + \text{Ceiling}(N/4) + A + \text{TEN} + \text{CL}$
Connection	$4 + T + \text{Ceiling}(N/4) + A + \text{TEN} + \text{CL}$
Internal	$6 + \text{Aux Orig} + \text{Aux Term} + \text{TEN} + A$
N	the number of digits to be recorded
T	= 1 if AUXID is included, 0 if not
Ceiling (N/4)	= the smallest integer greater than or equal to N/4 (for example, if N = 29, Ceiling = 8)
A	= 1 if AUTOVON is equipped
TEN	= 2 if Multi-Tenant Service is provided
CL	= 3 if Calling Line Identification (CLID) is provided
Aux Orig	= 1 when OrigType = 1 (telephone) = 0 when OrigType ≠ 1
Aux Term	= 1 when TerType = 1 (telephone) = 0 when TerType ≠ 1

Record type

The Record Type (RECTYPE) field indicates the type of call record.

' TTY output

This field consists of a single letter identifying the type of record:

- A Authorization Code
- C Charge record
- E End record
- F Connection record (Conference connection)
- I Initialization record
- L Internal call record
- M Charge for Conference
- N Normal record
- P Calling Party Number
- Q Connection record (initial connection)
- R Connection record (transfer connection)
- S Start record
- T Timestamp record

A Charge record is generated for a charge code entered either before establishing a call, while the call is established, or when charge codes are entered prior to conferencing in each party. An M record is generated when a charge account code is entered after a conference is completed.

Tape output

This five-bit field can be 0-15 in binary and defines the type of record:

- 0 Null record
- 1 Normal record
- 2 Start record
- 3 End record
- 4 Charge record
- 5 Initialization record
- 6 Timestamp record
- 7 Normal record for RS-ANI, **BARS/NARS**, or CDP
- 8 Start record for RS-ANI, **BARS/NARS**, and CDP
- 9 Calling Party Number (CPN)
- 10 Authorization Code
- 11 Charge for Conference
- 12 Normal record for a call on an expensive route (**BARS/NARS**)
- 13 Start record for a call on an expensive route (**BARS/NARS**)
- 14 Connection record
- 15 Internal record

Record Number

The Record Number (RECNO) field identifies the number of the current record in the CDR sequence.

TTY output

This three-character field gives the record sequence number, module 128, right-justified.

Tape output

This seven-bit field gives the record number in binary, module 128.

Customer Number

The Customer Number (CUSTNO) field identifies the customer associated with the call.

TTY output

A two-character field identifies the customer number (00–99).

Tape output

A five-bit field identifies the customer (00-99 in binary).

Originator Type (tape only)

The three-bit Originator Type (ORIGTYPE) field identifies the type of apparatus that originated the call or call record:

- 0 = 500/2500 telephone or Meridian 1 telephones
- 1 = 500/2500 telephone or Meridian 1 telephone with which AUXID is associated
- 2 = Trunk
- 3 = Attendant
- 4 = Trunks, End record expected
- 5 = Conference
- 6 = Answered Answer Supervision Trunk

Terminator Type (tape only)

The Terminator Type (TERTYPE) field identifies the type of apparatus to which the call was terminated. Definition of fields is the same as for ORIGTYPE.

Originator Identification

The Originator Identification (ORIGID) field identifies the apparatus that originated the call.

TTY output

The TTY output format depends on the type of equipment as follows:

- Stations are identified in the form **DNxxxx**, where xxxx is the prime DN for the telephone.

When CDRE package is equipped, the format DNxxxx is replaced by xxxxxxxx to accommodate up to 7 digits.

Trunks have the ORIGID field in the format Trrrmmm, where rrr is the route number and mmm is the member number. For ISA calls, rrr represents the service route number and mmm represents the master route member number.

- Attendants are identified in the form **ATTNxx**, where xx is the console number (1-63).
- Conference loops are identified in the form **CFIInn**, where 111 is the loop number 0-159 and nn is the conference number.

Tape output

The format of the 16-bit field depends on the type of equipment as follows:

- Stations: If the ORIGTYPE or TERTYPE fields are 0 or 1 (for example, a telephone), this field identifies the **500/2500** telephone DN or Meridian 1 prime DN of the telephone that originated the call. Up to four decimal digits are stored in a binary field of 16 bits.
 - zero is represented by binary 10 (that is, 1010)
 - * is represented by binary 11 (1011)
 - # is represented by binary 12 (1012)

Trunks

If the ORIGTYPE or TERTYPE fields are 2, 4, or 6 (as when the originator is a trunk), this field is 15 bits long.

- the trunk route number is 7 bits
- the trunk route member number is 8 bits

Attendants

If the ORIGTYPE or TERTYPE field is 3 (for example, an attendant), attendant number is identified in 4 bits.

Conference loops

If the ORIGTYPE or TERTYPE field is 5 (for example, conference), loop and conference number are identified in 12 bits:

- 8 bits loop number (7 bits prior to X11 release 4)
- 4 bits conference number

Terminating Identification

The Terminating Identification (TERID) field identifies the apparatus on which a call is terminated. Trunks have the TERID field in the format Trrrmmm or Arrrrmmm, where rrr is the route number and mmm is the member number. For ISA calls, rrr represents the service route number and mmm represents the master route member number.

The “A” indicates that the call is answered on an answer supervision trunk. If the call is made on an answer supervision trunk but is not answered, a “T” (for Terminating) will prefix the route number and member number.

Connection records are identified in the form TNxxxx, where xxxx is the loop, shelf, card, and unit in packed format.

Digit Count (tape only)

This field gives the total number of digits dialed in 5 bits.

Digits Lost (tape only)

This field consists of one bit, which is set to 1 if the total digits dialed exceeds 32.

Auxiliary Identification

The Auxiliary Identification (AUXID) field identifies the TN of the originating telephone when the telephone has a multiple appearance Prime DN, and cannot be uniquely identified by ORIGID.

TTY output

The AUXID field is in the form 111, s, cc, uu and uniquely identifies the originating telephone loop, shelf, card and unit.

Tape output

This field (16 bits) depends on the card density of the originating telephone.

- Single density XLLLLLLLSSCCCUU (X = not used)
- Double density XLLLLLLLSUCCCUU

Timestamp

CDR printouts show the timestamp as the start date and time. Add call duration to this value to get the end time. Inaccurate billings can occur.

The exact definition of timestamp depends on the type of record:

Normal records — start of call

Internal records without call modification — start of call

Internal records with call modification — at completion of the call modification

Start record — start of call

End record — end of call

Initialization record — time of system initialization

Timestamp — old or new timestamp

Transfer record — completion of transfer

Connection record — time of connection

If the call started on the last day of a month and stopped on the first day of the next month, then the start day is shown as day 0 of the next month.

TTY output

The format is **MM/DD HH:MM** as shown below:

- MM is month (1-12)
- DD is day (1-31)
- HH is hour (0-23)
- MM is minute (0-59)

Tape output

The Timestamp field occupies 20 bits as follows:

- Month (4 bits) where January = 1 and December = 12
- Day (5 bits) where first day of month = 1
- Hour (5 bits) which can be 0 to 23
- Minute (6 bits) which can be 0 to 59

Call Duration

The Duration field measures the call duration in units of 2 seconds. In a Normal record, this is the duration of the call from start to disconnect. In a Start record, this is the duration of the call from start to first feature usage at time given by **TIMESTAMP**. Incoming call durations are measured from the time the call is first presented to the terminating telephone. Outgoing call duration is measured from the time a trunk is first seized (dial tone removed).

In an Internal record, the duration of a simple call is measured from connection to release. With call modification, the duration is measured from the start of the call or call modification to disconnect or another call modification.

On a route where trunks are equipped with answer supervision and supervision is received during the call, the duration of the call is calculated from the time answer supervision is received to the time of disconnect.

Answer Supervision

CDR Answer Supervision for Ground Start (available with X11 release 18) and Loop Start (available with X11 release 14) trunks detects answer supervision on Ground and Loop Start trunks when sent as reverse battery from the Central Office, and generates Call Detail Records based on actual answer received rather than trunk seizure. Call Detail Recording begins when answer supervision is received from the CO.

Beginning with X11 release 19, the Trunk Improvement Program (TIP) allows XUT to have LOOP Start Answer Supervision capability via the PSP c o s .

Trunks without answer supervision capability generate a Call Detail Record when the trunk is seized.

An A in the **TerID** (Terminating ID) field indicates that an answer was received on an answer supervision trunk. If not, a T appears in that field. For Ground and Loop Start trunks, the A appears when answer supervision is detected from the CO. Select this option with the **AIA** prompt in LD16.

Digits

The Digits field identifies the digits dialed, digits outpulsed, or Charge Account code entered. Up to 32 digits can be recorded. If more digits are dialed, only the first 16 are recorded correctly. Digit 33 and succeeding digits are cycled over digits 17 to 32. On tape, each digit is stored as a four-bit word. Total digit storage is a maximum of eight 16-bit words.

Dictation and paging trunks

The CDR printout for dictation and paging trunks accessed by a **2500-type** telephone specifies only the trunk access code in the Digits field. Dictation trunks require tones to instruct the machines at the far-end. The **2500-type** telephone sends these tones directly to the dictation trunk without using a call register to store digits. As these digits are not stored in a call register, the CDR cannot print them out.

With 500 and Meridian 1 telephones, the digits must be stored in a call register and then a **Digitone Receiver (DTR)** translates the digits into tones. Then, the CDR output shows all digits dialed by these telephones.

Route Selection

The digits that appear in the Digits field of Normal or Start records depend on Route Selection as shown in the following.

RS-ANI Digits shown are those that are actually outputted by the system after route selection and any required digit manipulation. The actual digits dialed are reflected only if no digit manipulation was required to process the call.

- **BARS, CDP** Digits shown are those that are dialed with the exception of the BARS access code or CDP steering code which are replaced with the trunk access code.

With X11 release 9 and later, an enhancement to CDR for CDP allows the customer the following options:

- Using the current method of replacing the Distant Steering Code (DSC) or Trunk Steering Code (TSC) with the trunk access code,

or

- Inserting the access code before the dialed digits so that no digits are removed from the CDR record.

- **NARS** Digits shown are those that are actually dialed. If NARS and RS-ANI exist together, the RS-ANI format is used. If NARS and BARS exist together, the BARS format is used.

BARS/NARS with Outputted digits As an option, the digits shown can be the digits actually outputted by the system. Outputted Digit (OPD) option is available with X11 release 12 and later.

Outputted Digits (X11 release 12)

When the Outputted Digits (OPD) feature is enabled, the DIGITS field contains the digits actually outputted by the system. This only applies to Basic Alternate Route Selection (BARS) and Network Alternate Route Selection (NARS) calls. If both the BARS and NARS packages are equipped, then the CDR record follows the BARS format by default, and the ESN access code is replaced by the trunk access code.

The following figures show what will be placed in the DIGITS field of the CDR record. See also the Normal (N) Call record examples in this publication.

Figure 2
BARS calls

Digits dialed: ESN Access Code + dialed digits	
OPD option used	Digits recorded in CDR
OPD = NO	Trunk Access Code + the digits dialed after the ESN Access Code The ESN Access Code is replaced by the Trunk Access Code.
OPD = YES	Trunk Access Code + the outpulsed digits

Figure 3
NARS calls

Digits dialed: ESN Access Code + Location Code + extension	
OPD option used	Digits recorded in CDR
OPD = NO	Actual digits dialed
OPD = YES (the call stays in the ESN network)	ESN Access Code + Location Code + outpulsed digits
OPD = YES (the call overflows to the public network)	ESN Access Code + Trunk Access Code + outpulsed digits

Figure 4
All other NARS calls

Digits dialed: ESN Access Code + some more digits	
OPD option used	Digits recorded in CDR
OPD = NO	Actual digits dialed
OPD = YES	ESN Access Code + Trunk Access Code + outpulsed digits

Originating/Terminating Tenant Number

When the Multi-Tenant Service feature is present, CDR formats include the originating and terminating Tenant Numbers.

TTY output

A second line of data is printed. This consists of the Originating and Terminating Tenant Numbers. The fields are located directly under the Originating and Terminating ID fields of the CDR record.

Tape output

The Originating and Terminating Tenant Numbers each occupy a 10-bit binary field (range 0–512).

Calling Line Identification (CLID)

Calling Line Identification (CLID) is a feature provided with Integrated Services Digital Network (ISDN). Refer to *ISDN Primary Rate Interface description and administration (553-2901-100)* for a description of all ISDN features.

When CLID is enabled (in LD17), the calling party's number (if available), is included in the CDR call records. This gives customers information needed to charge back the calling party for services rendered in connection with an incoming call.

The CLID is always 16 characters: the actual CLID digits, followed by Xs (for example, 1234567xxxxxxxx).

TTY output

The CLID is printed on a second line. It appears after the Tenant Numbers.

Tape output

The CLID occupies four 16-bit words.

In-Band Automatic Number Identification (IANI)

In-Band Automatic Number Identification (**IANI**) displays the ANI number of a call when it terminates on an ACD DN. For a complete description of the **IANI** feature, see *X11 features and services* (553-3001-305). Since In-Band ANI (**IANI**) and ISDN cannot be configured on the same trunk group, this feature's reports appear in place of the CLID reports. The ANI number is 10 digits long, with xxxxxx filling up the remaining character spaces.

Dialed Number Identification Service (DNIS) number

Dialed Number Identification Service (DNIS) is a three-digit or four-digit number that (after translation within Meridian 1) refers to a specific product line in a telemarketing environment. The DNIS Name Display feature displays a name associated with an Incoming DID Digit Conversion (IDC) number on an alphanumeric terminal.

For CDR records, the DNIS information is included in the call record after the Feature Group D digits if the customer has the DNIS and CDR packages, the route is a DNIS route, and the DNIS option in the Route Data Block has been turned on. This applies to Incoming IDC DNIS routes within the same system.

Beginning with X11 release 19, DNIS supports Network ACD (NACD) and Feature Group D (FGD). If a DNIS trunk call is rerouted to a remote target ACD agent through the NACD and the incoming ISDN trunk's Route Data Block has DNIS-CDR enabled, the DNIS number appears at the end of CDR's Normal, Start, and End records. The DNIS number also appears at the end of CDR records for incoming FGD trunks that have enabled the DNIS-CDR option in their Route Data Block.

Terminating carriage return (TTY only)

As a customer option, the system can output a Line Feed (carriage return) character at the end of each call record.

Figure 5
Format of call records on TTY

N	001	00	DN4999	A000009	07.1.02.1	06/28	10:1500:00:20	98289124	0
N	002	00	TO00004	DN5064		06/28	10:1500:00:12		
S	003	00	TO00004	DN5064		06/28	10:15		
N	004	00	DN4999	TO00004	07.1.02.1	06/28	1 0:1 500:00:22	98289124	
E	005	00	TO00004	DN5055		06/28	10:16		
N	006	00	DN4999	T000004	07.1.02.1	06/28	10:1 500:00:20	98289124	
N	007	00	DN4999	TO00004	07.1.02.1	06/28	10:1 500:00:20	98289124	
T						06/28	10:16		
T						06/28	10:17		
N	008	00	ATTN02	A000003	07.1.02.1	06/28	10:2000:00:07	950260411	
s	009	00	DN5555	A000001		06/28	10:2200:00:17	A 98291112	
E	010	00	CF0615	A000001	07.1.02.1	06/28	10:22		

↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
	Record Number	Customer Number	Originating I.D. (Note 21)	Terminating I.D. (Notes 2 and 3)	Auxiliary I.D. — Ill.s.cc.u (Note 4)	Date	Time	Call Duration	Digits Dialed or Outpulsed (Note 1)

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The notes for this figure are found in Table 3.

Table 3
Notes on the format of call records on TTY (Part 1 of 2)

1	<p>Digits prefixed with A identify an RS/ANI route selection; those prefixed with E identify a BARS/NARS or CDP call. An E prefix indicates an expensive route was used.</p>
2	<p>The Originating and Terminating IDs can be:</p> <p>Trrrmmm Trunk route (rrr) and member number (mmm) DNxxxx Directory Number ATTN xxxx Attendant number CF III nn Conference loop number</p> <p>If the system is equipped with the CDR Expansion (CDRE) package, the DNxxxx format will be replaced by the xxxxxx format to accommodate up to 7 digits for the telephone directory number or ACD position ID.</p>
3	<p>Terminating ID for Connection records is TNxxxx, where xxxx is the shelf/card/unit (packed format) of the agent telephone. The terminating ID for answered calls on supervision trunks is explained here:</p> <p>Arrrrmm Trunk route (rrr) and member number (mmm).</p>
4	<p>The Auxiliary ID identifies the Terminal Number (TN) of the originating telephone when the telephone has a multiple appearance prime DN. The format is loop, shelf, card, unit:</p> <p>III = loop s = shelf cc = card uu = unit</p>
5	<p>When Multi-Tenant Service is equipped, the Tenant Numbers of the originating and terminating parties are printed on a second line, below the ORIGID and TERID fields, as shown below:</p> <p>N 001 00 DN4999 A0000009 7.1.02.1 06/28 10:15 00:00:20 9828124 006 102</p>

Table 3

Notes on the format of call records on TTY (Part 2 of 2)

6	<p>When Calling Line Identification (CLID) is equipped (beginning with X11 release 12), along with CDRE package 151, the CLID is printed on a second line, below the record number, as shown below:</p> <pre>N 002 00 DN4999 DN5064 7.1.02.1 06/28 10:22 00:00:12 9828124 & 95551111 (& was introduced in X11 release 17)</pre>
7	<p>When Calling Line Identification (CLID) and Multi-Tenant Service are both equipped, they are printed as shown below:</p> <pre>N 003 00 DN4999 DN5064 7.1.02.1 06/28 10:26 00:00:08 9828124 & 006 102 95551111 (only generated with CDRE package is equipped with FGD)</pre>
8	<p>When In-Band ANI (IANI) is operating, the ANI number will be generated in the same field as the CLID feature. It appears on the second line, below the record number, in the format shown below:</p> <pre>N 002 00 TO00004 01 03/24 10:15 1234567890xxxxxx</pre>

Figure 6
TTY output format (beginning with XI 1 release 7) (Part 1 of 2)

Character position	Name	Format	Definition
Line 1:			
1	RECTYPE	Y	Record Type
2	<blank>		Blank space
3-5	RECNO	XXX	Record Sequence Number
6	<blank>		Blank space
7-8	CUSTNO	XX	Customer Number
9	<blank>		Blank space
10-16	ORIGID	TRRRMMM, or ARRRMMM, or DNXXXXX, or ATTNXX, or CFLN	Originating Identification: Trunk Answered Answer Supervision Trunk Directory Number (see Note) Attendant Number Conference Number
17	<blank>		Blank space
18-24	TERID	TRRRMMM, or ARRRMMM, or DNXXXXX, or ATTNXX, or CFLN	Terminating Identification Trunk Answered Answer Supervision Trunk Directory Number (see Note) Attendant Number Conference Number
25	<blank>		Blank space
26-36	AUXID	LLL.S.CC.U	Auxiliary Identification
38	<blank>		Blank space
39-49	TIMESTAMP	MM/DD_HH:MM	Timestamp
50	<blank>		Blank space

Figure 6
TTY output format (beginning with XI 1 release 7) (Part 2 of 2)

Character position	Name	Format	Definition
This format is used for E, F, N, Q, R and S records.			
51-58	DURATION	HH:MM:SS	Duration
59	<blank>		Blank space
60-93	DIGITS	XXX...X or A XXX...X E XXX...X	Digits dialed: Up to 32 normal digits Route Selection was used BARS/NARS call placed over expensive route
94	<blank>		Blank space
95	AUTOVON	X	AUTOVON must be equipped
Note: If the system is equipped with the CDRE package, the format for the DN (or ACD Position ID) in the ORIGID or TERID field is XXXXXXX to accommodate up to 7 digits.			
This format is used for A, M and P records.			
48-90	DIGITS	XXX...X	Duration 4 Authorization code digits, or 23 Charge Account digits, or 23 Calling Party Number digits
, Line 2 (Tenant)			
1-9	<blank>		Blank space
10-12	ORIGTEN0	XXX	Originating Tenant Number
13-17	<blank>		Blank space
18-20	TERTENO	x x x	Terminating Tenant Number
21-23	<blank>		Blank space

Figure 7
Format for Internal records output (beginning with XI 1 release 10) (Part 1 of 2)

Character position	Name	Format	Definition
1	RECTYPE	L	Internal Record Type
2	<blank>		Blank space
3-5	RECNO	x x x	Record Sequence Number
6	<blank>		Blank space
7-8	CUSTNO	x x	Customer Number
9	<blank>		Blank space
10-16	ORIGID	DNXXXX, or ATTNXX, or CFLLNN	Originating Identification: Directory Number Attendant Number Conference Number
17	<blank>		Blank space
18-24	TERID	TRRRMMM or DNXXXXX, or ATTNXX, or CFLLNN	Terminating Identification: Trunk Directory Number Attendant Number Conference Number
24	<blank>		Blank space
25-35	ORIGAUXID	LLL.S.CC.UU	Originating Auxiliary Identification lll = loop number s = shelf number cc = card number uu= unit number

Figure 7
Format for Internal records output (beginning with XI 1 release 10) (Part 2 of 2)

Character position	Name	Format	Definition
36	<blank>		Blank space
37-47	TERMAUXID	LLL.S.CC.UU	Terminating Auxiliary Identification lll = loop number s = shelf number cc = card number uu= unit number
48	<blank>		Blank space
49-59	TIMESTAMP	MM/DD_HH:MM	Timestamp
60	<blank>		Blank space
61-68	DURATION	HH:MM:SS	Duration
69	<blank>		Blank space
70	AUTOVON	X	AUTOVON must be equipped
60	<blank>		Blank space
72-75	ORIGTENS	x x x	Originating Tenant Number
76	<blank>		Blank space
77-80	TERTENS	x x x	Terminating Tenant Number

Figure 8
TTY output format (beginning with X11 release 18) (Part 1 of 3)

Character position	Name	Format	Definition
Line 1:			
1	RECTYPE	Y	Record Type
2	<blank>		Blank space
3-5	RECNO	XXX	Record Sequence Number
6	<blank>		Blank space
7-8	CUSTNO	XX	Customer Number
9	<blank>		Blank space
10-16	ORIGID	TRRRMMM, or ARRRRMMM, or DNXXXX, or ATTNXX, or CFLN	Originating Identification: Trunk Answered Answer Supervision Trunk Directory Number (see Note) Attendant Number Conference Number
17	<blank>		Blank space
18-24	TERID	TRRRMMM, or ARRRRMMM, or DNXXXX, or ATTNXX, or CFLN	Terminating Identification Trunk Answered Answer Supervision Trunk Directory Number (see Note) Attendant Number Conference Number
25	<blank>		Blank space
26-37	AUXID	LLL.S.CC.U	Auxiliary Identification
38	<blank>		Blank space
39-49	TIMESTAMP	MM/DD_HH:MM	Timestamp
50	<blank>		Blank space

Figure 8
TTY output format (beginning with XI 1 release 18) (Part 2 of 3)

Character position	Name	Format	Definition
This format is used for E, F, N, Q, R and S records.			
51-58	DURATION	HH:MM:SS	Duration
59	<blank>		Blank space
60-93	DIGITS	XXX...X or AXXX...X E XXX . .X	Digits dialed: Up to 32 normal digits Route Selection was used BARS/NARS call placed over expensive route
94	<blank>		Blank space
Note: If the system is equipped with the CDRE package, the format for the DN (or ACD Position ID) in the ORIGID or TERID field is XXXXXXX to accommodate up to 7 digits.			
This format is used for A, M and P records.			
48-90	DIGITS	XXX...X	Duration 4 Authorization code digits, or 23 Charge Account digits, or 23 Calling Party Number digits
Line 2 (CLID and Tenant)			
1-9	<blank>		Blank space
10-12	ORIGTEN0	x x x	Originating Tenant Number
13-17	<blank>		Blank space
18-20	TERTENO	x x x	Terminating Tenant Number
21-23	<blank>		Blank space
24-40	CLID	XXXXXXXXXXXX xxxxxx	Calling Line Identification is always 16 digits, for example 1234567XXXXXXXXXX

Figure 8
TTY output format (beginning with XI 1 release 18) (Part 3 of 3)

Character position	Name	Format	Definition
Line 2 (SDRE only)			
1	<blank>		Blank space
2	&		Ampersand
Line 2 (FGD and DNIS)			
2	&		Ampersand
42-43	Digits	XX	Information digits
44	-		Dash
45-54	ORIGID	NPANXXXXXX	Calling number
55	<blank>		Blank space
56-59	Digits	XXXX	DNIS ID number

Figure 9
Format and Internal records output with CDRE (Part 1 of 2)

Character position	Name	Format	Definition
1	RECTYPE	L	Internal Record type
2	<blank>		Blank space
3-5	RECNO	x x x	Record Sequence Number
6	<blank>		Blank space
7-8	CUSTNO	x x	Customer Number
9	<blank>		Blank space
10-16	ORIGID	XXXXXXX, or ATTNXX, or CFXXXXX	Originating Identification: Directory Number or ACD Position ID Attendant Number Conference Number
17	<blank>		Blank space
18-24	TERID	XXXXXXX, or ATTNXX, or CFXXXXX	Terminating Identification: Directory Number or ACD Position ID Attendant Number Conference Number
25	<blank>		Blank space
26-36	ORIG AUXID	LLL.S.CC.UU	Originating Auxiliary Identification lll = loop number s = shelf number cc = card number uu= unit number
37	<blank>		Blank space

Figure 9
Format and Internal records output with CDRE (Part 2 of 2)

Character position	Name	Format	Definition
38-48	TERM AUXID	LLL.S.CC.UU	Terminating Auxiliary Identification ll = loop number s = shelf number cc = card number uu = unit number
49	<blank>		Blank space
50-60	TIMESTAMP	MM/DD_HH:MM	Timestamp
61	<blank>		Blank space
62-69	DURATION	HH:MM:SS	Duration
70	<blank>		Blank space
Second line			
1	<blank>		Blank space
2	&		Ampersand (XI 1 release 17 and later)
10-12	ORIG TENS	xxx	Originating Tenant Number
13	<blank>		Blank space
14-16	TER TENS	x x x	Terminating Tenant Number

Table 4
Notes on the format of call record on tape without DN Expansion

1	Words 0, 1, and 2 completely define the format of the record's balance.
2	The Auxiliary ID is allocated only if the OrigType or TerType requires it.
3	The CONF field is shifted one bit to the right.
4	Multi-Tenant feature must be equipped.
5	Internal records do not contain the Digits field. Only two possible words for Multi-Tenants for Internal Records may follow "Duration"
6	Calling Line Identification (CLID) is a feature of Integrated Services Digital Network (ISDN). CLID in CDR is enabled in the Configuration Record (LD17). When enabled, three words for CLID appear in all appropriate records even if the CLID is not available for that call. With X11 release 15 and greater, four words for CLID appear in all appropriate records even if the CLID is not available for that call.

Table 5
Notes on the format of call record on tape with DN Expansion

1	Words 0, 1, 2, and 3 completely define the format of the record's balance. New field RECLLEN is introduced to contain the actual word count of the whole CDR record.
2	Multi-Tenant feature must be equipped.
3	The AUXID is allocated only if either Originating type or Terminating type requires it.
4	One word is included only if the DURATION field is generated.
5	Calling Line Identification (CLID) is a feature of Integrated Services Digital Network (ISDN). CLID in CDR is enabled in the Configuration Record (LD17). When enabled, the three words for CLID appear in all appropriate records even if the CLID is not available for that call. With X11 release 15 and greater, four words appear for CLID in all appropriate records even if the CLID is not available for that call.
6	With X11 release 17 and later, two line CDR records begin with an & in the second position.

Table 6

Notes on the format of call record on tape for internal calls

1	Words 0, 1, 2, and 3 completely define the format of the record's balance. New field RECLEN is introduced to contain the actual word count of the whole CDR record.
2	The AUX ID is allocated only if either Orig type or Ter type requires it.
3	One word is included only if the DURATION field is generated.
4	Multi-Tenant feature must be equipped.

Figure 10
Format of a call record on tape without DN Expansion

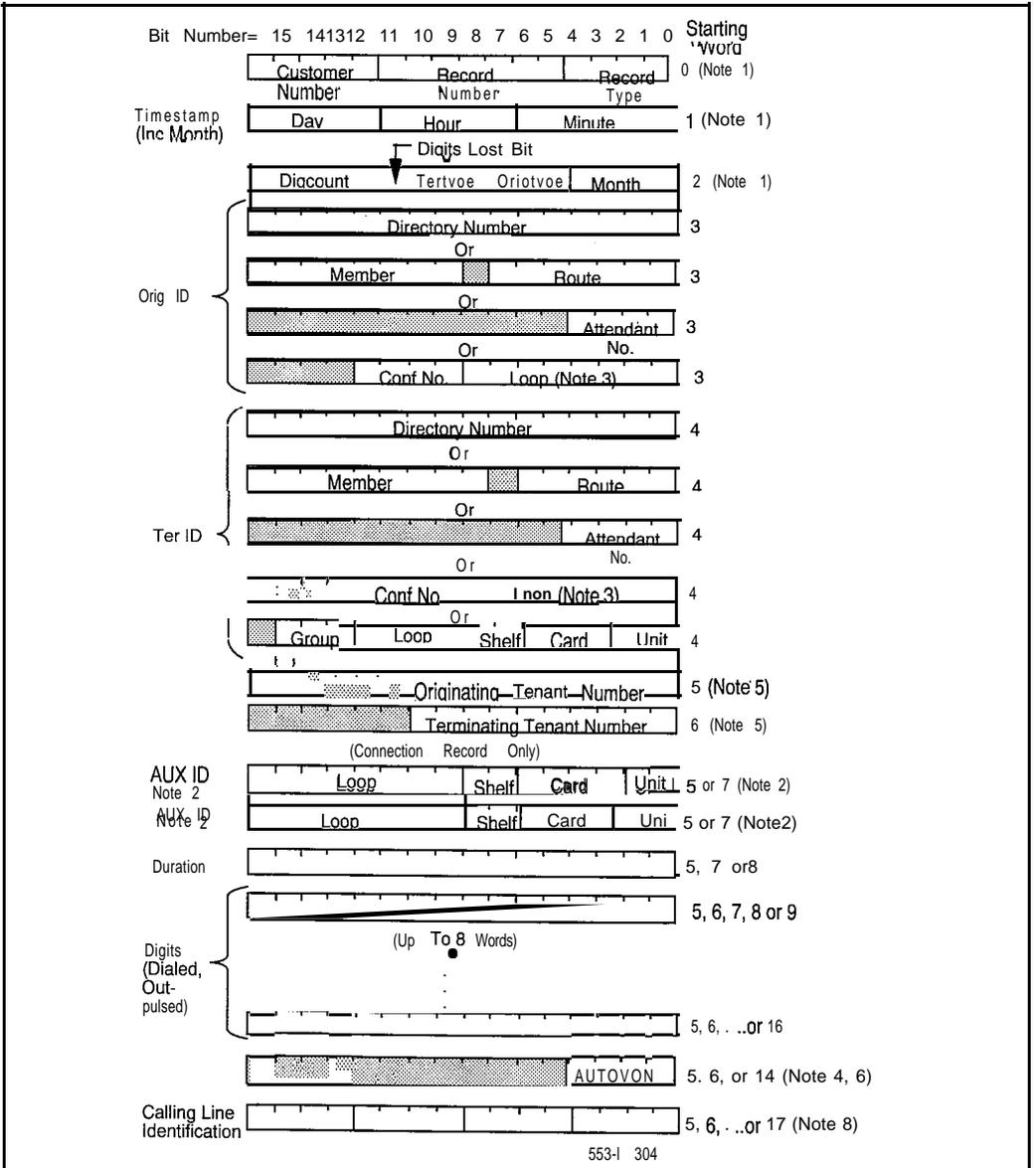


Figure 11
Format of call record on tape with DN Expansion

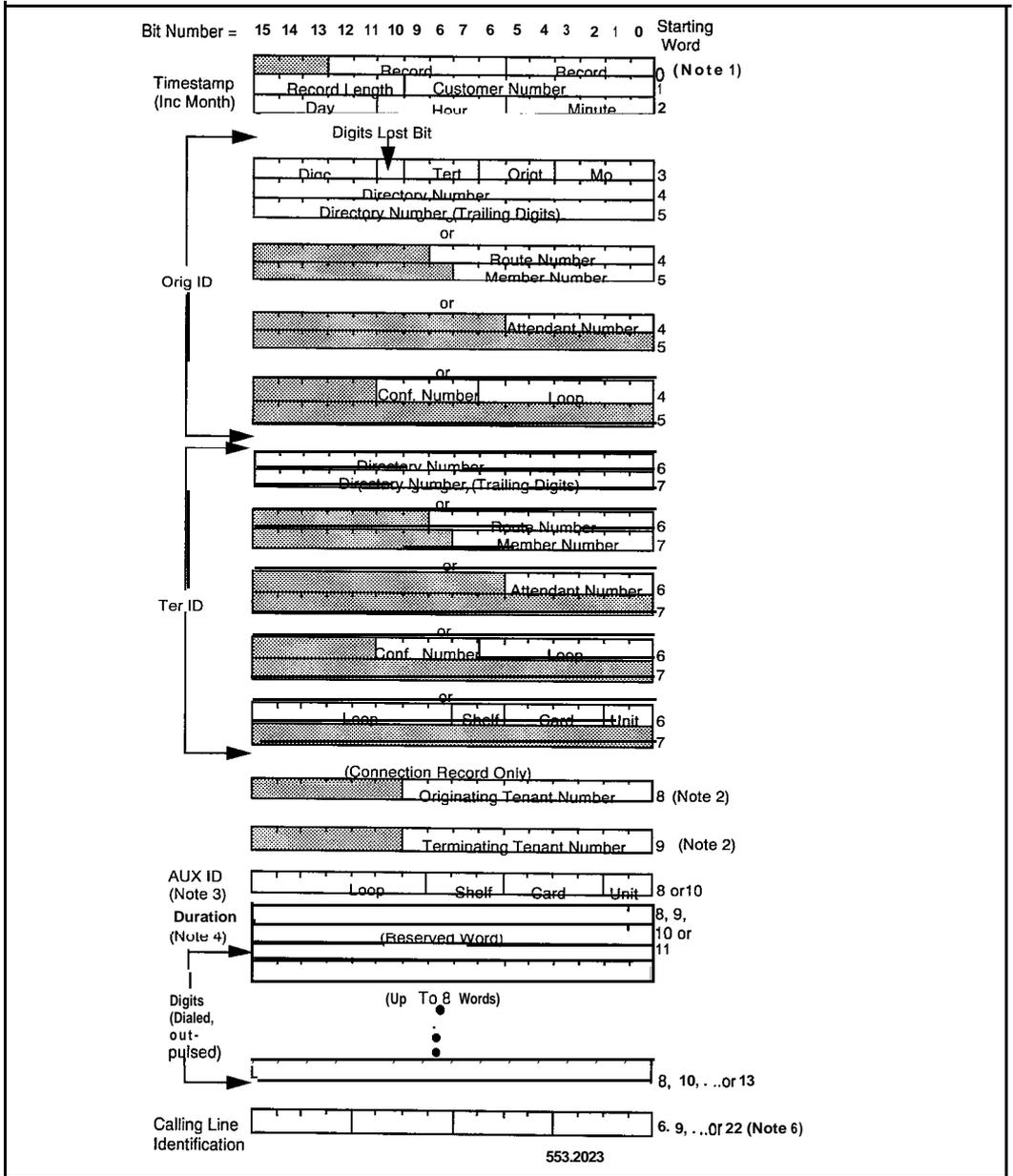
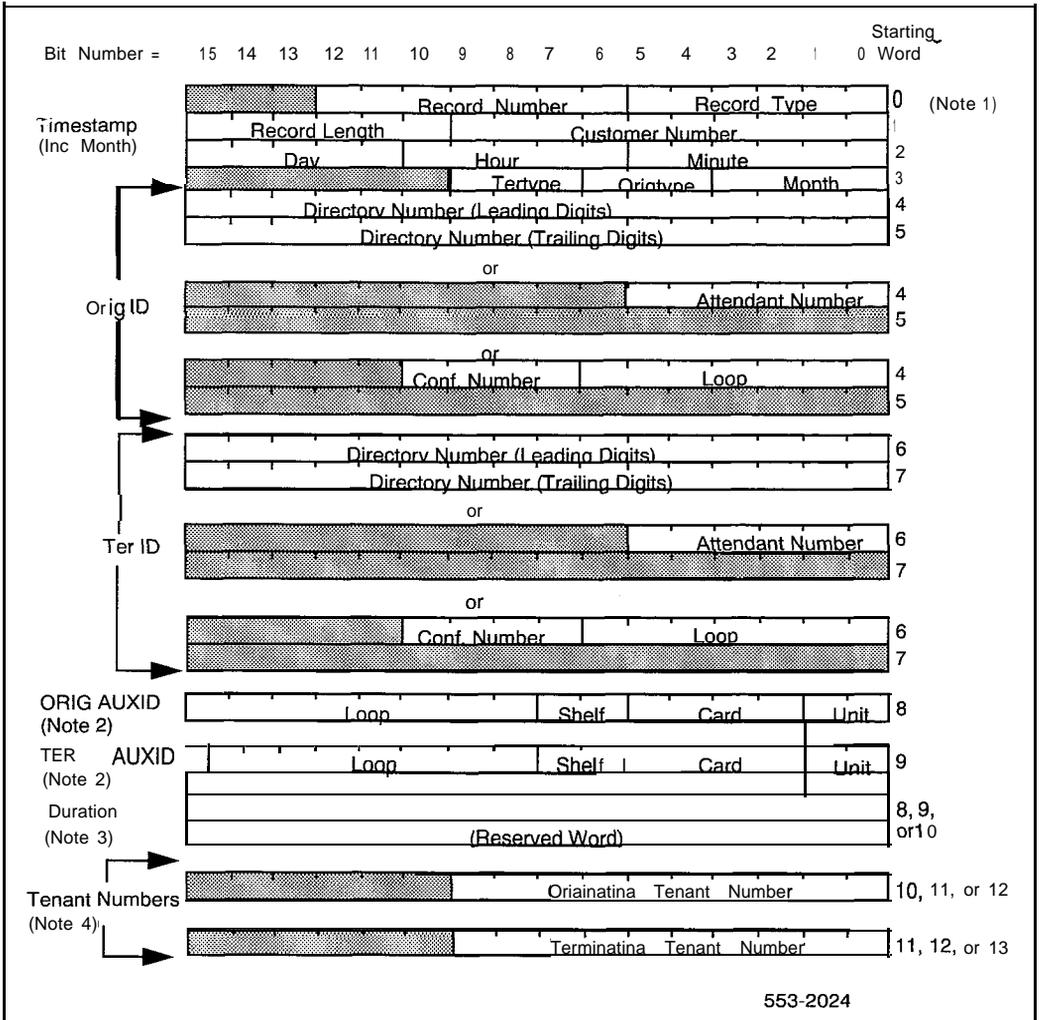


Figure 12
Format of call record on tape for internal calls (L-record)



CDR features and call record examples

The basic CDR call records include the identity of the called and calling parties, and the duration of the call. Additional records are generated when certain features are used (such as conference, authorization codes) or by certain system events (such as initialization, change of system time clock).

For all the examples shown in this section, the output described relates to that particular feature only. Other, unrelated call records may be inserted between the call records shown. Therefore, when using CDR outputs you should pay careful attention to the Record type (**RecType**) field definition.

Basic CDR software package

The basic CDR software package is required to generate call records. This package includes the features listed here.

- Reversed wired CO trunk
- Multi-customer operation
- Multi-Tenant Service
- Call types
- In-Band Automatic Number Identification (IANI)
- Multiple Appearance Directory Numbers (MADNs)
- Priority to CDR
- Connection Record
- Terminating Carriage Control
- Calling Line Identification (CLID)
- Outpulsed Digits
- Dialed Number Information Service (DNIS) on CDR

Optional CDR software packages

For more details on the optional features mentioned here, refer to *XII features and services (553-3001-305)*, or the special feature documents mentioned. In addition to the basic CDR software packages, the following optional packages are available for the type of CDR output selected.

- Call Detail Recording Expansion (CDRE)
- CDR with Charge Account (CHG)
- CDR Data Link (CLNK)
- CDR Teletype output (CTY)
- Coordinated Dialing Plan (CDP) with CDR Enhancement
- Internal Call Detail Recording (ICDR)
- Feature Group D Automatic Number Identification (FGD-ANI)

Reversed Wired CO trunk

CDR records will be affected by miswiring the Meridian 1 NT8D14 universal trunk card. Calls will not be released, and reports may indicate abandoned calls, or origination times that are not accurate. Be sure to check any trunk flagged as reversed wired to ensure accurate CDR reports. For a complete description, see *NT8D14 Universal Trunk Card description (553-3001-171)*.

Call types

Each customer may select for call recording any combination of the following call types on a trunk route basis:

- all incoming trunk calls
- all outgoing trunk calls
- all outgoing toll calls

Toll calls are defined as those calls where the first or second digit dialed after the trunk route access code is 0 or 1.

Meridian Packet Handler (MPH)

A CDR using an MPH has internal and external record types. When either or both originating and terminating Terminal Service Profiles (TSPs, defined in LD27) have CDR, the system generates an internal record type G. Internal CDR may be configured on the TSP whether or not the customer has CDR enabled in LD15. CDR data does not print if the customer with the TSP does not have CDR.

A call that connects to the public data network, including calls between two different MPH applications on the same switch, generates an external record type H. External CDR configuration is based on customer block data (LD15). Incoming and/or outgoing packet data calls may generate external CDR records.

PVC and B-channel calls have no CDR.

The report has ten columns as described below.

- **aa:** Meridian Packet Handler type, G or H
- **bb:** The current record in the CDR sequence; increments for all report types (three characters, module 128, right-justified)
- **cc:** The customer number field (two characters)
- **dd:** The originating ID is the originating DNA number. For external incoming calls, the value is the TN of the incoming link: MCU = LL SS cc uu, PRI = LL CC (filled to 14 characters, left-justified)
- **ee:** The terminating ID is the originating DNA number. For external incoming calls, the value is the TN of the incoming link: MCU = LL SS cc uu, PRI = LL CC (filled to 14 characters, left-justified)
- **ff:** Date is month and day where month is 1-12 and day is 1-31 (five characters)
- **gg:** Time is hour:minute where hour is 0-23 and minute is 0-59 (five characters)
- **hh:** Call duration, shown as hour:minute:second (eight characters)
- **ii:** Number of incoming data packets (up to ten digits)
- **jj:** Number of outgoing data packets (up to ten digits)

A sample report appears below. The exact field sizes could not be reproduced. The actual report wraps columns ii and jj to the second line.

Format									
aa	bb	cc	dd	ee	ff	gg	hh	ii	jj
Example									
G	123	11	LLCC	LLCC	02/26	21:59	00:20:06	00780	00568

Multiple Appearance Directory Numbers (MADNs)

As a customer option, a Multiple Appearance DN (MADN) may be supplemented by an auxiliary identification (AUXID), which provides the shelf, card, and unit of the originating telephone. An AUXID field is provided only if the originating telephone has an MADN as the Prime DN. If a call originates from an MADN which is not the Prime DN, the Prime DN is shown as the originating ID with no AUXID field provided. This is set up on a customer-by-customer basis in LD15.

Note: Multiple Appearance DN Redirection Prime (MARP) in X11 release 18 and later does not affect CDR records.

CDR Answer Supervision

CDR Answer Supervision for Ground Start (available with X11 release 18) and Loop Start (available with X11 release 14) trunks detects answer supervision on Ground and Loop Start trunks when sent as reverse battery from the Central Office, and generates Call Detail Records based on actual answer received rather than trunk seizure. Call Detail Recording begins when answer supervision is received from the CO.

Beginning with X11 release 19, loop start trunk answer supervision for XUT is available.

Trunks without answer supervision capability generate Call Detail Record when the trunk is seized.

An A in the **TerID** (Terminating ID) field indicates that an answer was received on an answer supervision trunk. If not, a T appears in that field. For Ground and Loop Start trunks, the A appears when answer supervision is detected from the CO. Select this option with the AIA prompt in LD16.

Class of Service

To enable answer supervision, the Polarity Sensitive Pack (PSP) Class of Service must be set. PSP indicates that answer supervision is detected by battery reversal on the CO trunk. If Polarity Insensitive Pack (PIP) is set, battery reversal is not detected, and Call Detail Records begin at trunk seizure.

Refer to the following table for the various classes of service, and effects on answer supervision and Call Detail Records. This table applies to both Ground and Loop Start trunk types.

Table 7
Call Detail Record generation with answer supervision

OAL	OTL	OAN	PSP	CDR effected	CDR begins
NO	NO	*	YES/NO	No CDR	
YES	N/A	N/A	NO	All calls	Trunk seizure
NO	YES	N/A	NO	Toll calls	Trunk seizure
YES	N/A	NO	YES	All calls	Reverse battery for answered calls Trunk seizure for unanswered calls
NO	YES	NO	YES	Toll calls	Reverse battery for answered calls Trunk seizure for unanswered calls
YES	N/A	YES	YES	Answered calls	Reverse battery
NO	YES	YES	YES	Toll calls	Reverse battery

Note: If OAL and OTL are No, then OAN is always No.

Legend:

- PS = Answer Supervision CLS for Ground Start and Loop Start trunks
- OAL = CDR for outgoing calls
- OTL = CDR for outgoing toll calls
- OAN = CDR for answered calls only
- N/A = Not applicable. The option can be Yes or No, and does not affect CDR.

Priority to CDR

This option ensures that every call is recorded by having idle call registers selected for CDR before being used for call processing. This does not apply to packet calls.

Connection record

Connection records are used in the Integrated ACD/CDR Call Processing Interface feature to inform a customer-provided computer in real-time of which Automatic Call Distribution (ACD) agent is connected to which trunk. Connection records are generated on incoming calls upon connection between an agent and a trunk and on each conference and transfer connection. The feature is implemented through a CDR-TTY (CTY) port which provides a data link to the customer-provided computer.

Terminating Carriage Control

A carriage return option can be implemented to inform a customer-provided computer that a CDR message is complete. An additional carriage return precedes every CDR record. A single CDR record consists of a carriage return, a line of data, then another carriage return, resulting in every other record being a null record. This option is implemented through service change and, when implemented, applies to all CDR TTY ports in the system.

CDR Expansion (CDRE)

CDRE (package 151) has three basic functions:

- modifies ORIGID and TERID fields to accommodate a 7 digit DN
- adds Feature Group D AN1 (**FGD ANI**) information to a second line
- adds a BLANK and & to the second line

If the DNXP (DN Expansion) package is equipped without the CDRE package, CDR records are generated in the unexpanded format. The feature truncates the leading digits, and the DN fields contain only the trailing 4 digits of a DN.

This does not apply to packet data.

CDR Data Link (CLNK)

This feature (package 6) is required when the single/multi-port CDR storage system is used. The CLNK software formats call records into a form suitable for storage on magnetic tape.

Beginning with X11 release 19, CLNK is not supported for packet data.

CDR Teletype output (CTY)

This software option (package 5) is selected when it is required to output call records on one or more RS-232-C compatible devices. It provides a hard copy of the call records and may be used with other CDR optional packages.

Coordinated Dialing Plan (CDP) with CDR Enhancement

Available with X11 release 10 and later, the CDP/CDR Enhancement allows a customer to preserve the CDP digits in the CDR output. The customer can decide between the previous application which *replaced* leading digits with the trunk route Access Code (ACOD) and a new ability to include the leading digits in the CDR output.

The previous method *replaced* the Distant Steering Code (DSC) or Trunk Steering Code (TSC) with the ACOD, so the CDP digits were not in the report output. The CDP/CDR Enhancement *inserts* the ACOD before the DSC/TSC in the outpulsed digits, so the CDP digits are preserved and included in the report output.

For a complete description of Coordinated Dialing Plan and Electronic Switched Network, refer to *Coordinated Dialing Plan description* (553-2751-102).

Dialed Number Identification Service (DNIS) on CDR

For CDR records, the Dialed Number Information Service (DNIS) information is appended after the Feature Group D digits if the customer has the DNIS and CDR packages, the route is a DNIS route, and the DNIS option in the Route Data Block is on.

The DNIS number is appended to the end of the existing CDR record when the trunk disconnects. The DNIS number is put into the:

- Start record in all cases.
- Normal record when the call is established.
- End record in all cases except cases where the incoming trunk disconnects first.

If a DNIS trunk call is rerouted to a remote target agent through the NACD and DNIS-CDR option of the incoming ISDN trunk's Route Data Block is enabled, the DNIS number is appended to the end of the CDR record.

For additional information, see "Dialed Number Identification Service (DNIS) number" on page 38.

For details, refer to ***description*** (553-2671-101).

Internal Call Detail Recording (ICDR)

The ICDR feature (package 108) provides call records for internal calls. An internal call record is output for stations and attendants with Internal Call Detail Allowed (ICDA) Class of Service.

The system generates an internal record type G. Internal CDR may be configured on the TSP whether or not the customer has CDR enabled in LD15. CDR data does not print if the customer with the TSP does not have CDR.

Authorization Code

This feature (package 24) generates call records when the Authorization Code is used. This figure gives an example involving the Authorization Code feature.

The originator, DN 3456, enters an Authorization Code number (12345678) and dials 9-212-555-3333. The call is completed on trunk group 0, member 45.

The Authorization Code record is generated after the code is entered and accepted. The Normal call record is generated at the termination of the call.

Figure 13
Example of Authorization Code feature

Rec Type	Rec No	Cust No	OrigID	TerID	AuxID Ill.s.cc.uu	Date mm/dd	Time hh:mm	Duration hh:mm:s	Digits
A	039	00	DN3456	TO00045		09/07	11:39	20194930000 (See note)	
N	051	00	DN3456	TO00045		09/07	11:51	00:12:05 92125553333	

Note: When the Duration is not recorded, the Calling Party Number digits are output in that column.

Authorization Code and Call Transfer

In the example shown below, the originator (DN7865) dials 9-*714-555-9292#, and the call completes through trunk 19. The call transfers to DN 3131 after an Authorization Code (87654321) has been entered. The call terminates shortly after the transfer is made.

An Authorization Code record is generated after the entry is complete. When the call is transferred, a Start record is generated. When the call terminates, an End record is generated.

Figure 14
Example of Authorization Code and Call Transfer features

Rec Type	Rec No	C u s t No	OrigID	TerID	AuxID Ill.s.cc.uu	Date mm/dd	Time hh:mm	Duration hh:mm:s	Digits
A	057	00	DN7865	TO001 9		09/07	12:52		87654321
S	059	00	DN7865	TO001 9		09/07	13:10		9*7145559292
E	079	00	TO001 9	DN3131		09/07	13:18		

CDR with Charge Account (CHG)

CHG (package 23) provides capability for direct billing of calls to specific Charge Account numbers.

Charge Account with AUXID

Refer to the figure below for an example of the Charge Account and AUXID features. The originator, DN 7234, a multiple appearance prime DN, dials 9-555-2212 on TN 8243 (as shown in the example below) and enters a charge account number (123456). The call is completed on trunk group 4, member 16.

The Charge Account record is generated as soon as the account number is entered. The Normal record with AUXID (loop/shelf/card/unit) is generated at call termination.

Figure 15
Example of Charge Account and AUXID features

Rec Type	Rec No	C u s t No	OrigID	TerID	AuxID Ill.s.cc.uu	Date mm/dd	Time hh:mm	Duration hh:mm:s	Digits
C	008	00	DN7234	TO04016	008.2.04.03	09/07	10:07	12345	
N	017	00	DN7234	TO04016	008.2.04.03	09/07	10:07	00:02:10	95552212

Note: When Duration is not recorded, the digits entered are output in that column.

Charge Conference

The following figures give several examples for the Charge Conference feature.

Example 1

The originator, DN6543, makes a Conference call with three other parties, entering an account code before connecting to each party. The parties are connected sequentially on trunks 16, 45, and 67. The parties disconnect in the order 67, 16 and 45. Conference bridge 1980 was used.

The account codes entered were 123456, 123457, and 123458, in that order.

The digits dialed were 9-555-9170 for the first party, 9-*-212-555-6170 for the second, and 9-201-542-8747 for the third.

A Charge Account record is generated after each entry is completed. A Start record is generated after each party is added; however, the first two Start records are generated together after the system recognizes the conference situation exists. An End record is generated as each trunk disconnects.

Figure 16
Example 1 of Charge Conference feature

Rec Type	Rec No	C u s t No	OrigID	TerID	AuxID Ill.s.cc.uu	Date mm/dd	Time hh:mm	Duration hh:mm:s	Digits
c	061	00	DN6543	TO0001 6		09/07	15:10		123456
C	063	00	DN6543	TO00045		09/07	15:11		123457
S	071	00	DN6543	TO001 6		09/07	15:10		95559170
S	072	00	DN6543	TO00045		09/07	15:12		92015558747
C	073	00	DN6543	TO00067		09/07	15:13		123458
S	079	00	DN6543	TO00067		09/07	15:25		
E	087	00	CF01980	TO00067		09/07	15:25		
E	088	00	CF01980	TO0001 6		09/07	15:31		
E	091	00	F01980	TO00045		09/07	15:31		

Note: If the Duration is not supplied, it can be calculated from S and E records using the Time field.

Example 2

The originator, DN 6543, places the same Conference call as in Example 1, but the account code is entered the conference has been established. The same account code (123456) applies to all 3 conference parties. Conference bridge 1122 is used in this example.

A Start record is generated as each party is connected. The first two Start records are generated at the same time the system recognizes a conference situation.

After the account code is entered, a separate Charge Conference record (M) is generated for each trunk involved.

Figure 17
Example 2 of Charge Conference feature

Rec Type	Rec No	C u s t No	OrigID	TerID	AuxID Ill.s.cc.uu	Date mm/dd	Time hh:mm	Duration hh:mm:s	Digits
S	103	00	DN6543	TO0001 6		09/07	11:17		99699170
S	104	00	DN6543	TO00045		09/07	11:17		9*2122626170
S	107	00	DN6543	TO00067		09/07	11:18		92015425749
M	112	00	TO00045	DN6543		09/07	11:19		123458
M	113	00	TO0001 6	DN6543		09/07	11:19		123456
M	115	00	TO00067	DN6543		09/07	11:40		123456
E	121	00	CF01122	TO00067		09/07	11:40		
E	126	00	CF01122	TO0001 6		09/07	11:45		
E	127	00	CF01122	TO00045		09/07	11:47		

Note: If the Duration is not supplied, it can be calculated from S and E records using the Time field.

Example 3

The originator, DN8765, makes a Conference call with 2 other parties on trunks 27 and 37. A charge account number (123456) is entered after the conference is established. Conference bridge 1122 is used.

Two Start records are generated after the conference is established.

Two Charge Conference (M) records are generated after the charge account number is entered.

During the same conference call, a fourth party on trunk 47 is added, but a new charge number (123457) is entered before adding the fourth party. A Charge record is generated after the new charge number is entered. A Start record is generated after the fourth party is added.

End records are generated as each trunk disconnects from the conference.

Figure 18
Example 3 of Charge Conference feature

Rec Type	Rec No	C u s t No	OrigID	TerID	AuxID Ill.s.cc.uu	Date mm/dd	Time hh:mm	Duration hh:mm:s	Digits
S	017	00	DN8765	TO00027		09/08	10:10		95551123
S	018	00	DN8765	TO00037		09/08	10:11		95551130
M	021	00	TO00027	DN8765		09/08	10:12		123456
M	023	00	TO00037	DN8765		09/08	10:12		123456
C	037	00	DN8765	TO00047		09/08	10:27		123457
S	039	00	DN8765	TO00047		09/08	10:29		9*5559170
E	051	00	CFOI I22	TO00037		09/08	11:10		
E	053	00	CF01 122	TO00047		09/08	11:10		
N	055	00	CFOI I22	TO00027		09/08	11:11		

Call Transfer and Charge Account features

In the figure below, the originator (DN 6789) enters account code 123451 and dials 9*232-555-9166. The call is completed on trunk 6 and later transferred to DN 5600.

Later the call transfers back to DN6789 and soon terminates.

A Charge Account Code record is generated when the entry of the code is complete.

When the call is transferred, a Start record is generated.

When the second transfer takes place, no record is generated as a Start record already exists for the trunk in use.

When the call terminates, an End record is generated.

Note that the identity of the intermediate party (DN 5600) is lost because an additional account code was not entered during or prior to the call transfer to DN6789.

Figure 19
Call Transfer with Charge Account features

Rec Type	Rec No	C u s t No	OrigID	TerID	AuxID lll.s.cc.uu	Date mm/dd	Time hh:mm	Duration hh:mm:s	Digits
C	076	00	DN6789	TO00006		09/08	11:15		123451
S	081	00	DN6789	TO00006		09/08	11:16		9*2325559166
E	097	00	TO00006	DN5600		09/08	11:31		

Note: If the Duration is not supplied, it can be calculated from S and E records using the Time field.

Calling Party Number (CPN)

This figure gives an example involving the Calling Party. Number (CPN) feature.

A telephone (DN9876) accepts a collect call on trunk 0, member 5, and enters CPN 201-555-3000.

The CPN record is generated after the calling party number is entered and the caller has returned to the call. The Normal record is generated on call termination.

Figure 20
Example of Calling Party Number (CPN) feature

Rec Type	Rec No	Cust No	OrigID	TerID	AuxID Ill.s.cc.uu	Date mm/dd	Time hh:mm	Duration hh:mm:s	Digits
P	025	00	TO0005	DN9876		09/07	11:09		2015553000 (See note)
N	027	00	TO0005	DN9876		09/07	11:10	00:12:05	

Note: When the Duration is not recorded, the CPN digits are output in that column.

Multi-customer operation

This feature aspect allows each customer within a single system to individually select the CDR feature and its options. The feature is enabled or disabled on a customer basis in the Customer Data Block (LD15).

Multi-Tenant service

When your system is equipped with Multi-Tenant service (package 86), the tenant numbers of the originating and terminating parties appear in CDR records.

Call records for Multi-Tenant environments (TENS) are shown in the examples below. The Multi-Tenant (TENS) feature can be used in several applications, which affect the CDR output as described here.

Record 1

DN 4999, a member of Tenant group 042, Customer 5, dials 9-555-9124. The trunk is a shared system resource.

Record 2

DN 5000 of Customer 4 receives an incoming call. Tenant 4 has not enabled Tenant Service, so all resources contain a 000 in the Tenant Number field.

Record 3

DN 5064 of Tenant 5 receives an incoming call. Customer 5 has Tenant Service enabled but the telephone does not belong to a Tenant group so all resources contain a 000 in the Tenant Number fields.

Figure 21
Example of Multi-Tenant feature

Rec Type	Rec No	C u s t No	OrigID	TerID	AuxID ill.s.cc.uu	Date mm/dd	Time hh:mm	Duration hh:mm:s	Digits
N	001	05	DN4999 042	000	27.1.02.1	06/28	10:14	00:00:20	95559124
N	002	04	TO00005 000	DN5000 000		06/28	10:15	00:00:40	
N	003	005	TO00006 000	DN5064 000		06/28	11:04	00:01:02	

Calling Line Identification (CLID)

This feature provides the calling party's number in call records. The CLID feature is part of an Integrated Service Digital Network (ISDN). Refer to the ISDN documents for more information.

The CLID digits appear to the right of the Originator and Terminator tenant information. If the Multiple-Tenant package is not equipped, the CLID is the first field of the second line. The AN1 field starts immediately at position 42, next to a blank, to the right of the rightmost position allocated to the CLID field.

Incoming Primary Rate Interface (PRI) calls contain a CLID field in the call set up message. When the CLID is provided by the far end, it is shown in the user's Digit Display, and as an option, is included in the CDR records.

The Configuration Record (LD17) enables CLID in CDR. Refer to **Primary Rate Interface description and administration** (553-2901-100) for more details.

This figure shows examples of calls with the Calling Line Identification (CLID) in a Multi-Tenant Service environment. The Calling Line Identification (CLID) software is provided in X11 release 12 and later software with ISDN applications.

Record 1 CLID and Multi-Tenant enabled for a customer.

Record 2 Only CLID enabled for a customer.

Figure 22
Calling Line Identification (CLID)

Rec Type	Rec No	Cust No	OrigID	TerID	AuxID Ill.s.cc.uu	Date mm/dd	Time hh:mm	Duration hh:mm:s	Digits
N	001	05	DN##499 042	A001 000	000027.1.02.1 95552222xxxxxxx	06/28	10:14	00:00:20	95559124
N	001	04	TO02010	DN5000		06/28	10:15	00:00:40	95552222xxxxxxx

Note: The CLID field always displays 16 characters. The feature inserts an "x" for each missing character.

In-Band Automatic Number Identification (IANI)

With X11 release 15 and later, In-Band Automatic Number Identification (IANI) displays the ANI number when a call terminates on an ACD DN. Since IANI and ISDN cannot be configured on the same trunk groups, the ANI display is shown in place of the CLID reports, appearing on the second display line. For a complete description of the ANI feature, see XII **and** services (553-3001-305). The figure below shows an example of a call with In-Band Automatic Number Identification (IANI) functioning for a customer.

Figure 23
In-Band ANI (IANI)

Rec Type	Rec No	Cust No	Trunk route and member number	ACD Agent position ID	Date	Time	Duration	ANI number
N	001	02	TO00004	01	03/24	10:15	00:00:38	4155551212xxxxxx
Note: The ANI number is always 10 digits, filling in the remaining character spaces with xxxxxx.								

Feature Group D Automatic Number Identification

With X11 release 17 and later, CDR records of calls with an incoming FGD trunk can include an AN1 digits field if the customer has installed CDRE (package 151). The option is defined in the FGD block for each route. AN1 field is supplied in “N” and “S” type records only, in both TTY and link formats. It includes two information digits (II) and either a 10 digit number (NPANXXXXXX) or a 3 digit number (NPA).

The CDR record notes that an AN1 field exists. The AN1 field printout is not dependent on the tenant or CLID fields being printed. For example, if no Tenant or CLID information is required, the CDR record consists of one line of AN1 as well as tenant and CLID. If the tenant package is equipped and it is printing a record which has tenant number fields, even if no tenant information is printed in the record, the second line prints. If only II + NPA are received in the call, these print in their usual positions and the rest of the AN1 field fills with blank characters. If no AN1 information is received for the call, the AN1 field is blank.

FGD AN1 displays the AN1 number of a call when it terminates on an FGD trunk. The option is per route, defined in its FGD block. AN1 field is supplied in “N” and “S” type records only in both TTY and link formats. It includes two Information Digits (II) and either a 10 digit number (NPXNXXXXXX) or a three digit number (NPA). An indication is included on the CDR record to recognize that it has an AN1 field.

TTY output

In TTY format, the AN1 field appears in the second line of the CDR report. The second character on the second line of a TTY CDR record is “&”. The two information digits (II) are separated from the 10 AN1 digits (NPANXXXXXX) by a minus sign “-”. A minus sign “-” on position 44 of the second line of a CDR record is a unique characteristic of TTY CDR record containing an FGD-AN1 field.

If only II+NPA are received in the call, these are printed in their usual positions and the rest of the AN1 field is filled with blank characters. If no AN1 information is received for the call, the AN1 field is blank.

Tape output

In link format, AN1 field follows the CLID field or the Digits field, whatever applies.

A bit flag in the first word of the CDR record indicates that the ANI field is present. The ANI field has a fixed length of three words.

Refer to *Feature Group D description and operation (553-2901-102)* for a complete description of this feature.

The figure below shows an example of a call with Feature Group D Automatic Number Identification (FGD ANI) with no CLID or tenant. The FGD ANI feature operates with X11 release 17 and later software.

Figure 24
FGD ANI

Rec Type	Rec No	Cust No	Trunk route and member number	ACD Agent position ID	Date	Time	Duration	ANI number
N	006	01	TO96003	5011	00/00	00:16	00:00:02	A
	&					00-2142341234		

Note: The second line begins with the "&" symbol if the CDRE package is equipped.

CDR with Outpulsed Digits (OPD)

When a CDR record is generated for an outgoing call on a route which has one of the CDR for outgoing call options specified, the dialed digits are placed in the call record. When the Outpulsed Digits feature is enabled for the route, the DIGITS field contains the digits actually outpulsed by the system.

This feature only applies to Basic Alternate Route Selection (BARS) and Network Alternate Route Selection (NARS) calls. If both the BARS and NARS packages are equipped, then the CDR record follows the BARS format by default. Coordinated Dialing Plan (CDP) and Route Selection-Automatic Number Identification (RS-ANI) are not supported.

The Outpulsed Digits (OPD) option is most useful when a Location Code call overflows onto the public network. With Outpulsed Digits (OPD) enabled for these types of calls it is much easier to match the calls with the appropriate toll charges, which are listed in the bill from the telephone company.

The OPD feature was introduced in X11 release 12, and is the minimum software version needed to support operations.

The following examples show how the CDR output is affected by the OPD feature. Each example shows the recorded digits for three CDR records,

Where:

Record 1 shows digits recorded before X11 release 12.

Record 2 shows digits recorded with OPD disabled.

Record 3 shows digits recorded with OPD enabled.

Note: In examples 1, 2, and 3, it makes no difference if the NARS package is equipped or not.

Example 1

For a Location Code call that stays within ESN:

Digits Dialed:	65552315
Digits Outputted:	2315
Trunk Access Code:	487
Equipped Package:	BARS

When OPD is not used, the Digits field = 4875552315

When OPD = NO (disabled), the Digits field = 4875552315

When OPD = YES (enabled), the Digits field = 4872315

Example 2

For a Location Code call that is routed to the public network:

Digits Dialed:	6 555 2315
Digits Outpulsed:	14089882315
Trunk Access Code:	487
Equipped Package:	BARS

When OPD is not used, the Digits field = 4875552315

When OPD = NO (disabled), the Digits field = 4875552315

When OPD = YES (enabled), the Digits field = 48714089882315

Example 3

Call onto the public network:

Digits Dialed:	64085552315
Digits Outpulsed:	14085552315
Trunk Access Code:	932
Equipped Package:	BARS

When OPD not used, the Digits field = 9324085552315

When OPD = NO (disabled), the Digits field = 9324085552315

When OPD = YES (enabled), the Digits field = 93214085552315

Example 4

Location Code call that stays within ESN:

Digits Dialed:	6 555 2315
Digits Outputted:	2315
Trunk Access Code:	457
Equipped Package:	NARS (BARS not equipped)

When OPD is not used, the Digits field = 65552315

When OPD = NO (disabled), the Digits field = 65552315

When OPD = YES (enabled), the Digits field = 65552315

Note: If the Location Code is outputted, then it appears twice in the CDR Digits field.

Example 5

Location Code call that is routed to the public network:

Digits Dialed:	6 555 2315
Digits Outputted:	14089882315
Trunk Access Code:	457
Equipped Package:	NARS (BARS not equipped)

When OPD is not used, Digits field = 65552315

When OPD = NO (disabled), Digits field = 65552315

When OPD = YES (enabled), Digits field = 645714089882315

Example 6

Call onto the public network:

Digits Dialed:	6 408 555 2315
Digits Outpulsed:	14085552315
Trunk Access Code:	932
Equipped Package:	NARS (BARS not equipped)

When OPD is not used, Digits field = 64085552315

When OPD = NO (disabled), Digits field = 64085552315

When OPD = YES (enabled), Digits field = 693214085552315



SL-1

Call Detail Recording

Description and formats

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SL-1

Centralized Attendant Service

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Feature description

The Centralized Attendant Service (CAS) feature allows customers with multiple locations to centralize their attendant services at a single location. A typical Centralized Attendant Service (CAS) configuration consists of one or more Remote locations, each served by its own switch and attendants, and a Main site location where the CAS attendants are located (see Figure 1). Each Remote location has access to the Main CAS attendant through Release Link Trunks (RLT), which can be either analog or digital. In addition, the Remote locations are interconnected by tie trunks.

The types of calls which require attendant assistance and can be handled by a CAS attendant follow.

listed Directory Number (LDN) calls

- dial “0” calls (“0” is optional if the flexible attendant DN is used)
- recalls, intercepts, or transfer to attendant
- operator assisted calls for restricted telephones, giving access to WATS, FEX and CO trunks

When any of the above calls are placed, an idle RLT at the Remote site is seized and the calls are presented to the CAS attendant. If an idle RLT is not available, the calls are queued until one becomes available. The CAS attendant can extend the call to a local or Remote telephone.

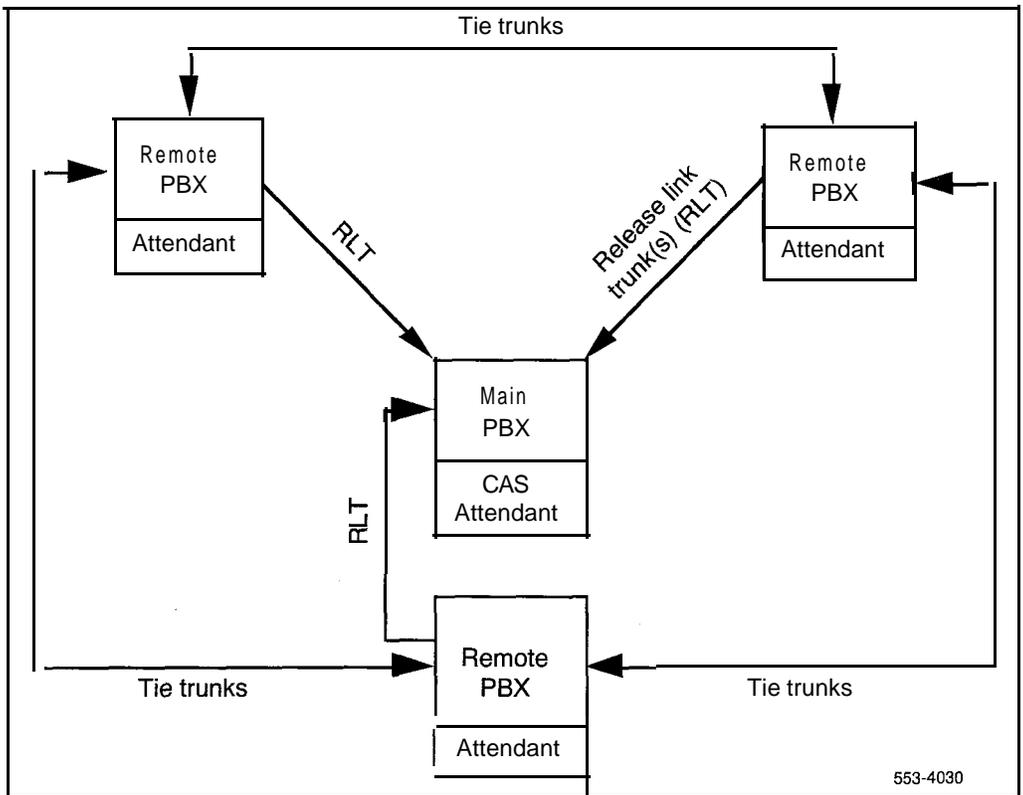
When a call is released by the attendant, the RLT is released. Information tones sent from the Remote site allow the CAS attendant to identify the type of incoming call, and to provide confirmation of features, such as Camp-on, during call processing.

2 Feature description

The system can serve as either a Main or Remote site. Operation is compatible with AT&T Technical Advisory Manual 10 (TA-10). CAS is therefore compatible with any system meeting the specifications in that document.

The attendant at the Remote location is automatically assigned a separate CAS key/lamp pair above the fifth loop key to control the CAS feature. As well, a Signal Remote key is automatically assigned above the fifth loop key on the consoles at the CAS Main location. On the M1250 and M2250 consoles, the C/H key acts as the CAS key. If an attendant console is not required at the Main location, up to ten multi-line telephones can be equipped with a CAS key to control CAS operation.

Figure 1
Typical CAS configuration



Feature packaging

Centralized Attendant Service Main (CASM) is package 26.

Centralized Attendant Service Remote (CASR) is package 27.

No package dependencies exist.

Feature Interactions

Access to special services

Special service circuits (such as WATS and FX trunks) can either be located and controlled at one location or distributed among various locations with each switch controlling access locally.

When special service circuits are located at the Main site, the CAS attendants have trunk group busy indicators and control of trunk group access. In this case, all Remote locations access the special service circuits through tie trunks. Tie Trunk Group Access Restrictions (**TGAR**) at the Main site can be arranged to provide dial access to the special services or automatically route incoming calls to the CAS attendants to control access manually.

If the special service circuits are situated at a Remote location, they can be dial accessed and controlled through TGAR, or a unique access code can be assigned to access the local attendant and bypass selection of an RLT. The local attendant DN can also be used by users who desire attendant controlled connections.

Alarm lamps

CAS attendants do not receive major or minor alarm indications for Remote locations. These alarms are provided at the local console at each Remote location.

Attendant End to End Signaling

Pressing the CAS key while using AEES may block the DTMF tones.

Attendant Overflow Position

CAS and AOP are incompatible with each other. If both are enabled, CAS takes precedence over AOP.

Automatic Identification of Outward Dialing

When Automatic Identification of Outward Dialing (AIOD) using the data link method is used in conjunction with CAS, each location must be individually connected to its respective CO or toll center for telephone detail billing for all locations to be provided.

Where possible, the CDR option is recommended for passive cost control and cost allocation when arranged in a CAS network. This is only practical if the Main and all Remote locations are Meridian 1 sites. An alternative is to provide toll-restriction at all Remote locations and force all toll calls to be routed through CAS attendants for manual record keeping.

Automatic Number Identification

When Automatic Number Identification (ANI) using direct toll trunks to the CAMA center is used in conjunction with CAS, each location must be individually connected to its respective CO or toll center for telephone detail billing for all locations to be provided.

Where possible, the CDR option is recommended for passive cost control and cost allocation when arranged in a CAS network. This is only practical if the Main and all Remote locations are Meridian 1 sites. An alternative is to provide toll-restriction at all Remote locations and force all toll calls to be routed through CAS attendants for manual record keeping.

Background Terminal

CAS and BGD are incompatible with each other. If both are enabled, CAS takes precedence over BGD.

Barge-In and Busy Verify

CAS attendants are able to barge-in on trunks located at the Main location and busy verify telephones at the Main location, but are not able to perform these functions for Remote locations. The local console at each Remote location can barge-in or busy verify its local trunks and telephones. Neither the CAS attendant or local attendant can barge-in on an idle or busy RLT.

Basic/Network Alternate Route Selection (BARS/NARS)

Where least-cost routing to all special services and toll routes is desired, the **BARS/NARS** feature can be provided at the Main CAS location and accessed through tie trunks from all Remote locations. This eliminates potential supervision problems with tandem tie trunk connections that occur when **BARS/NARS** is provided separately at each location. The centralized **BARS/NARS** feature can be used only if all special service outgoing toll calls are placed through the Main CAS location.

To ensure adequate Class of Service restrictions for controlling access to special services and toll routes, the following actions can be taken:

- supply two separate tie trunk routes from each Remote location to the Main location; one should be unrestricted or conditionally toll-denied, and the other toll-denied
- assign Trunk Group Access Restriction (TGAR) codes to control access from telephones at each Remote location, to one or the other of these two trunks routes

Busy Lamp Field Array

The busy lamp field indicates the status of telephones for the main location only.

Call Detail Recording

When a CAS network is equipped with Call Detail Recording (CDR), the following points should be noted.

- The CDR should be located at the Main site. This also applies to any special service trunks.
- Downstream-processing of the CDR tapes must correlate tandem calls from a Remote site through the Main site by means of tie trunks to special services. A record showing the facilities used or telephones involved in any tandem connection is given for each location separately. The CDR downstream-processing must rebuild the tandem call based on the time correlation and trunk route correlation. Every effort should be made to ensure time synchronization between the Main and Remote locations.
- Incoming calls completed by a CAS attendant only show the record for the completed connection to the destination, the same as if a local attendant had served the call.

Call Forward External Deny

A CAS local attendant is considered an internal DN, and is not excluded by CFXD activated on a telephone.

Call Park

Call Park is limited to the local switch. Call Park cannot be accessed from RLT, nor can RLT be parked at the Main location.

Call Party Name Display

The telephone number, or access code and route member number, of the originating telephone or trunk at the Remote location is not displayed to the CAS attendant answering the call. Instead, the access code and member number of the RLT over which the call is presented is indicated.

Calls to Tie trunks

The CAS attendant can connect an incoming CO call to a DN at another site, or transfer calls to the connecting site. The operation is the same as for completing an LDN or transfer call at the Main site, except that the attendant dials a trunk access code, corresponding to a Tie line, instead of a DN. When second dial tone is sent from the Remote site, the attendant dials the DN.

This type of call is limited in that:

- the recall on no-answer feature is inactive
- the camp-on feature is inactive
- the call transfer feature operates in accordance with the capabilities of the system on which the call transfer is being attempted
- Disconnect supervision must be provided either by the incoming CO trunk or repeated by the tie trunk from the Remote site. If not, the Meridian 1 disallows these types of connections.

Call Waiting Indication

Calls waiting in queue for RLT at each Remote location are not included in the call waiting indication given to the CAS attendants. Calls which have seized an RLT and are queued for service at the Main location are included in the call waiting indication.

Camp-on

When the CAS attendant attempts to complete a call to a telephone which is busy, the call is automatically camped-on to the busy telephone, provided a call is not already camped-on to that telephone. The Remote site transmits a camped-on confirmation tone (100-ms burst of 440-Hz tone) to the CAS attendant over the RLT, then connects to the calling party. If the calling party wishes to wait, the CAS attendant releases and a disconnect signal is transmitted to the RLT, which releases. When the camped-on telephone goes on-hook, the camped-on call is automatically presented.

If the called telephone does not answer within the specified time, the Remote site seizes an idle RLT and presents the calling party to the CAS attendant. When the CAS attendant answers, answer supervision is detected by the RLT and the Remote site sends a 100-ms burst of 440-Hz tone to the CAS attendant so the attendant can answer appropriately. The CAS attendant can then release from the calling party with the release key, or from the called telephone by operating the release destination key.

DID calls to a busy telephone can be routed to an RLT and provide the attendant the same tone as for a dial "0" call. This occurs only for telephones which have a call forward busy allowed (CFA) class of service and no other forwarding or hunting arrangements defined.

Coordinated Dialing Plan

The CDP routes calls from the Remote to the Main, and from the Main to the Remote.

Conference

Attendant controlled conference connections involving telephones or trunks require Tie trunk connections between the Main and Remote locations for each Remote party. RLT trunks cannot be **conferenced**. Tie trunks networks must be engineered with this fact taken into consideration.

Attendants must be trained to conference through Tie trunks, as well as handling potential difficulties with transmission and supervision. Alternatively (and preferably), Remote locations can access the local console by dialing the local attendant DN for attendant conference and other special services available at the Remote location.

Departmental Directory Number

When CAS is active at the Remote attendant console, **DLDN** calls at that Remote site are handled at the CAS Main as if the DLDN feature was not active.

Dial “0” calls

When the Remote site translates a dial “0” request, the calling telephone or trunk is connected to an idle RLT and the call is presented to the CAS attendant. When the CAS attendant answers, the RLT detects answer supervision, transmits two **100-ms** bursts of 440-Hz tone to the attendant, and connects the calling telephone or trunk to the CAS attendant. The call is then handled as an LDN call. See “Flexible Attendant Directory Number” for flexible attendant DN information.

The CAS attendant is restricted in placing dial “0” calls on hold. If the call hold DN (CHDN) is dialed, overflow tone is sent to the CAS attendant.

Directory Number Expansion

With DN Expansion, Attendant **DNs** and RLT access codes can be up to 7 digits.

Flexible Attendant Directory Number

Each Remote location can be assigned two attendant directory numbers to provide access to the attendants. The Customer Data Block (LD1.5) allows the modification of these two **DNs**. The DN assigned must be a DN taken from the numbering plan and must not conflict with any other DN. The first is called the attendant DN (**ATDN**). Calls to this DN are presented over an RLT to the CAS attendant if the Remote location is in CAS service. If it is desired that “0” be the access code for the attendants, it must be specified as the **ATDN**. If the Remote location is not in CAS service, the call is presented to the local attendant or the night number.

The second is called the local attendant DN (**LADN**). Calls to this DN are presented to the local attendant or the night number. A call dialed to the **LADN** is never terminated on an RLT.

These **DNs** cannot be made Do Not Disturb (**DND**) busy, and if they appear on a lamp field array the associated LED is always dark.

Listed Directory Number calls

Calls to the LDN of the Main site are treated in the normal manner; this means an Incoming Call Indication (ICI) is presented to the attendant and normal call handling procedures are used. If the Remote location is in the CAS deactivated mode, LDN calls to the Remote location are also handled in the normal manner by the attendant at the Remote location.

When the CAS feature is activated at the Remote location, LDN calls to that location are presented to the CAS attendant with an RLT X ICI indication, where X represents the RLT trunk route location of the Remote site. If the CAS attendant console is equipped with a numeric display, the RLT access code and route member number are displayed.

When the CAS attendant selects the incoming call by operating the loop key or ICI key, answer supervision is sent to the Remote site over the RLT. Two 100 ms bursts of 440 Hz are given, if defined in Customer Data Block (LD15). The RLT X ICI indication identifies the call and prompts the appropriate verbal response.

After obtaining the desired party's number, the CAS attendant presses the signal Remote (SIG REM) key, which is assigned automatically, located above the LPK 5 key. The Main site responds by sending a timed flash over the RLT to the Remote site. This signal prompts the Remote site to connect a register or **Digitone** receiver to the RLT. When an idle register or **Digitone** receiver has been applied to the RLT, dial tone from a Tone and Digit Switch (TDS) at the Remote location is sent to the CAS attendant. The CAS attendant then keys in the destination DN on the dial pad. When outpulsing is completed, the CAS attendant hears **ringback** or busy tone. At this time, the CAS attendant can disconnect from the RLT by operating the release (RLS) key.

If all RLTs from a Remote location are in use, LDN calls are queued and routed to an RLT when one becomes idle.

Message Registration

CAS and Message Registration are incompatible with each other. If both are enabled, CAS takes precedence over MR.

Night service

Night service at the Main CAS attendant location is applicable to calls at the Main location, and calls routed over the RLT from Remote locations.

Calls from Remote locations over an RLT can be transferred by the night answer location at the Main site back to the Remote location over a tie trunk; however, the RLT is held for the duration of the call.

Night service is activated separately by each Remote location at its local console or telephone. This is usually prearranged for a given time of day, or in response to a call from the Main CAS attendant and is done before the Main CAS attendant activates night service. If the CAS attendant activates night service before the Remote locations, calls routed to the RLT by the Remote site are directed to the night location at the Main site.

The three types of night service offered on Meridian 1 (flexible, night answer telephone, or Trunk Answer From Any Station [TAFAS]) can be assigned independent of any CAS arrangements. CAS service and night service are independent and, when both features are activated, CAS takes precedence.

When night service is activated at a Remote site, any calls in the RLT queue are automatically rerouted to the assigned night answer location or TAFAS as applicable. Calls in progress on the RLT are completed by the CAS attendants.

Property Management System

CAS and PMS are incompatible with each other. If both are enabled, CAS takes precedence over PMS.

Recorded Overflow Announcement

The Recorded Overflow Announcement feature cannot be associated with the RLT x (x = key number) ICI key on the CAS Main attendant console.

Remote Peripheral Equipment

For CAS operation, each Remote Peripheral Equipment (RPE) location in a CAS network is considered to be part of the site to which it is connected. This means the Remote end of the RPE connection shares the same numbering plan as the local end of the connection and is identified to the CAS attendant as part of the local site.

Room Status

CAS and Room Status are incompatible with each other. If they are both enabled, CAS takes precedence over RMS.

Silent hold

The attendant may wish to hold incoming calls at the Remote site when unable to camp them on to a busy telephone. To accomplish this, a silent hold feature is provided. When the attendant activates the silent hold feature, the CO trunk is placed in the hold state at the Remote site, and the RLT is released. After the timed reminder has timed out, the RLT is re-seized and the CO trunk is reconnected to the CAS attendant.

When the attendant decides to place the call on hold, the attendant presses the signal Remote (SIG REM) key to send a flash to the RLT. The attendant receives dial tone from the Remote site and dials the DN assigned for the silent hold code. The hold code is outpulsed to the Remote site and translated and the CO trunk is placed on hold. The Remote site then sends a hold confirmation tone (four through six 50-ms bursts of 440-Hz tone) to the attendant, who then releases the RLT by operating the release (RLS) key. The Remote site recognizes the disconnect signal and releases the RLT.

A recall occurs after the recall timer has elapsed. An idle RLT is seized and the held call is presented to the CAS attendant. When the attendant answers, the Remote site receives answer supervision, transmits an information tone (four through six 50-ms bursts of 440-Hz tone) to the attendant, and removes the hold condition from the CO trunk. The attendant can then complete the call.

The CAS attendant can also hold the RLT at the console by operating the HOLD key. This differs from silent hold in that the CO trunk is held at the Main site (over the RLT), rather than at the Remote end.

Station Category Indication

When CAS is active, calls from a Remote telephone to the ATDN appear on the Remote ICI key lamp at the CAS Main regardless of SCI.

Timed reminder recall

If the Remote site is programmed to recall the attendant on “no answer” calls, after the prescribed timeout (and the telephone has not answered or the CO trunk has not disconnected) an idle RLT is seized and the call is presented to the CAS attendant. This time a different attendant may answer the call; however, an RLT X ICI indication is still received.

When the CAS attendant answers the call, the Remote site detects answer supervision over the RLT, sends **ringback** tone for two seconds to the attendant, and then connects the call. The ICI and the **ringback** tone prompt the attendant to answer in the appropriate manner. During answer, the CAS attendant and calling party talk over the **ringback** of the called telephone. The attendant can press RLS DEST to stop the ringback.

If the calling party wishes to continue waiting, the CAS attendant at the Main location releases. Disconnect is detected at the Remote site and the RLT connection is removed. Further timed recalls cause the above process to be repeated until either the called telephone answers or the calling party disconnects.

When the Remote location is arranged for Direct Inward Dialing (DID) and the called telephone is arranged to forward calls to the attendant on no answer, the call is treated as in the first two examples of “timed reminder recall.”

Transfer to attendant

The CAS attendant can be recalled by a telephone so that the attendant can transfer a trunk to another telephone. The call is presented to the CAS attendant in the same manner as a dial “0” call. The CAS attendant transfers the call by operating the release destination (RLS DEST) key followed by the procedure for an LDN call. The RLS DEST key sends a timed flash over the RLT, which drops the initial telephone. This procedure applies to all calls intercepted to the CAS attendant.

The CAS attendant can be recalled by flashing the switchhook on a 500 or 2500 telephone and dialing “0” or by operating an attendant recall key.

Trunk group busy indication

This is a local application, and does not reflect trunk activity at any other CAS location (Main or Remote).

Equipment specification and operation

Tone and digit switch cards

A Remote site which is arranged for the CAS feature requires the QPC251 Tone and Digit Switch (TDS) card, QPC609 TDS card, or NT8D17 Conference/TDS card. At the Remote site, TDS cards must all be the same type, they cannot be mixed. The TDS cards can be mixed at the Main CAS location.

Table 1
Meridian 1 precise tones with CAS

Tone	Frequency (Hz)	Level (dB)
Dial tone	350 + 440	16*
Busy tone, over-flow tone	480 + 620	23*
Audible ringback	440 + 480	18*
Miscellaneous tone	440	16

*per tone combined is 3 dB higher

Table 2
Meridian 1 tone interruptions with CAS

Tone	Cadence
Listed Directory Number	100 ms of 480 Hz 100 ms of 440 Hz 100 ms of 480 Hz
Camp-on	100 ms on/off
Dial "0" recall	100 ms on/100 ms off 100 ms on
No answer recall	300 ms on/off
Busy	0.5 s on/0.5 s off
Overflow	0.25 s on/0.25 s off
Hold confirmation, recall	0.05 s on/0.05 s off
Standard ringing	2 s on/4 s off

The maximum delay on application of any of the CAS tones, subsequent to detecting answer supervision from the Main CAS location, is 150 ms. A break in the middle of a tone cycle is inhibited so that a complete tone is always heard by the CAS attendant.

Flexible Tones and Cadences (FTC) adds many options for tones. See *Flexible Tone and Digit Switch cards description (553-2711-180)* for complete information.

Release Link Trunk

Various trunk types can be used to interface a Remote site to the Main site when the CAS feature is required. One configuration of an RLT circuit is to have either a %-wire (QPC71) or 4-wire (QPC237) tie trunk at both the Remote and Main locations with a repeater facility between the two. Another configuration is to have an NT8D15 E&M Trunk Card at the local location and a QPC237 at the Remote location.

Alternately, the Remote location can be equipped with a QPC250 RLT Card to interface with a QPC70 CO Trunk Card, QPC450 CO/FX/WATS Trunk Card, or NT8D14 Universal Trunk Card at the Main location. This application is limited to a maximum loop resistance of 1400 ohms.

An RLT circuit consists of a trunk circuit at a Remote private branch exchange (site) to be served by a CAS attendant, and an interfacing trunk circuit at the Main site where the CAS attendant is located. The type of circuit pack that can be used at either the Remote site or Main site depends on the distance between the Remote site and the Main site.

QPC250 Release Link Trunk specifications

A QPC250 RLT card contains two identical trunk circuits and common circuitry mounted on a printed circuit board. The card can be inserted into any Peripheral Equipment (PE) shelf slot. Each circuit on a QPC250 RLT card at a Remote site interfaces with a CO trunk circuit at the Main site to allow access to the CAS attendant. Each circuit on the QPC250 RLT card has the following specifications.

Impedance	900 ohms
Loop limit	1400 ohms at nominal -48 V
Leakage resistance	30 000 ohms
Ring trip	During silent or ringing intervals
Ringing voltage	85-V rms, 20 Hz superimposed on -48 V dc
Signaling	Ground start
Supervision	Normal battery conditions are applied (-48 V to ring, ground to tip) when the interfacing CO trunk circuit is to be seized
Power input from shelf	± 10 V dc, ± 6 V dc, -48 V dc, 85-V rms, 20 Hz, superimposed on -48 V dc
Effective loss	0.5 dB at 1020 Hz (pads in), -1.5 dB (pads out)
Insertion loss	1 dB
Answer supervision	Does not reverse battery when the terminating end answers
Disconnect supervision	Does not momentarily open-circuit the tip and ring leads on disconnect.

Operation at the Remote site

Idle state

The RLT at the Remote site is connected to a CO trunk circuit at the Main site by tip and ring leads. The RLT circuit provides open tip and ring leads during the idle state.

Outgoing seizure

Upon seizure of the RLT by the Remote site, the RLT provides ground on the tip lead, battery on the ring lead, and waits 256 ms.

If the DC resistance across the tip and ring leads is greater than 20 K ohms, the site provides steady ringing superimposed with -48 V battery through up to 220-ohms of resistance on the ring lead.

If the DC resistance across the tip and ring leads is less than 1300 ohms, then the CO trunk at the Main site has not released from a previous call, and the RLT is locked out until the Main site removes the loop. A trunk error message (TRK 241) is printed and another RLT circuit is used.

The ringing supply at the Remote site should generate AC ringing voltage between 75- and 100-V rms at a frequency of 20 Hz (± 3 Hz).

Detecting answer supervision

The RLT detects a decrease in DC resistance across the tip and ring leads from at least 20 K ohms to 1300 ohms or less, as an off-hook signal from the Main site equipment. If the off-hook signal persists for at least 256 ms, the signal is an answer supervision. The RLT trips ringing within 100 ms when it detects the answer signal. Ringing can be tripped during both the silent and ringing intervals.

Talking state

After answer, and until disconnect, the RLT provides ground through up to 425 ohms of resistance on the tip lead, and -48 V battery through up to 425 ohms of resistance on the ring lead.

Flash signal

The CAS attendant at the Main controls the RLT by the console signal Remote (SIG REM) key, or release destination (RLS DEST) key. The operation of this key sends a timed flash signal to the RLT. The RLT functions the CAS attendant is required to control by flashing to request for a **DIGITONE** receiver for the calling party, and cancellation of a prior attendant request (release destination)

The RLT recognizes an increase in the DC resistance across the tip and ring leads from 1300 ohms or less to 20 K ohms or more as an on-hook signal. The on-hook signal should be timed for 200 ms to 1 .0 second. If the conductor loop resistance changes back to low resistance (off-hook) in this interval, the RLT interprets that as a flash signal from the CAS attendant.

When the RLT has been seized for an incoming CO call, dial "O", intercept call, or a hold recall after the CAS attendant has talked to the calling party, the detection of the first flash signal prompts the connection of a **Digitone** receiver to the RLT, and splits the calling party away from the RLT.

Dial tone is sent to the CAS attendant when the **Digitone** receiver is available to receive address signals. Dial tone is removed within 50 ms of the start of dialing the first address character. If the RLT detects a subsequent flash signal while connected to a receiver; i.e., attendant flash to clear the receiver, it disconnects the receiver and returns to its initial state; i.e., connected to the calling party.

When the receiver has translated the dialed address characters, different confirmation tones are sent to the CAS attendant, depending on the status of the called telephone.

Disconnect

The RLT recognizes and times an increase in the DC resistance across the tip and ring leads from 1300 ohms of less to 20 K ohms or more as an on-hook from the CAS attendant. If the on-hook lasts longer than flash timer the RLT interprets the change as a disconnect.

After interpreting disconnect from the attendant, the RLT opens the tip and ring leads to the interfacing CO trunk at the Main site, sending a disconnect signal to the Main site. To prevent the RLT from being seized from a new call before the CO trunk at the Main site has released, the RLT provides a busy guard timer.

Operation at the Main site

Idle state

There is a resistance greater than 20 K ohms across the tip and ring leads at the CO trunk interface during the idle state.

Incoming seizure

The CO trunk at the Main site detects seizure by an RLT at a Remote site when the RLT provides simultaneously:

- a ground through 1.2 K ohms of resistance or less on the tip lead, and
- ringing with superimposed -48 V battery on the ring lead through a resistance of 1.2 K ohms, or less

The maximum delay of ringing must be less than 5 seconds after ground and battery detection, and the ringing must last more than 640 ms. If any one of the above conditions is not satisfied, the call is not presented to the CAS attendant.

Disconnect before the attendant answers

Before the attendant answers the call, tone ringing should be 2 seconds on and 4 seconds off. If there is no ringing for longer than a programmable timer, the call is withdrawn from presentation to the attendant.

CAS attendant answers

When the CAS attendant answers, a resistance of 800 ohms or less is applied across the tip and ring conductors at the CO trunk. A 2-way transmission path between the RLT and the CAS attendant is established within 160 ms to avoid clipping initial speech. The circuit maintains the low resistance across the tip and ring leads until the RLT is flashed or disconnected by the attendant.

Flash signal

When the CAS attendant presses the signal Remote (SIG REM) key on the console, a timed flash (on-hook) signal is sent to the Remote site. The flash signal changes the resistance across the tip and ring leads from low (**off-hook**) to high (on-hook resistance for a timed interval. The flash signal should be 600 ms (± 200 ms) with the preferred signal being 512 ms.

After the CAS attendant has pressed the SIG REM key, a **Digitone** receiver at the Remote end is connected to the RLT and dial tone is sent to the attendant as confirmation that an idle receiver has been connected. Digits dialed after receiving dial tone are outpulsed as soon as an outpulsor is available.

When the CAS attendant wishes to release from a prior request; i.e., a call extended to a busy telephone, the release destination (RLS DEST) key on the console is pressed. Operation of this key sends a timed flash to the Remote site, and connects the attendant to the original calling party.

Disconnect

The CO trunk at the Main site interprets removal of ground from the tip lead and -48 V battery from the ring lead that persists for more than 1 second, as a disconnect signal from the RLT. After interpreting disconnect from the Remote site, the CO trunk disconnects from the CAS attendant, and removes the loop across the tip and ring leads which acts as a disconnect supervision.

When the CAS attendant disconnects, the resistance of 800 ohms or less applied to the tip and ring leads at the CO trunk changes to 20 K ohms or more which is an on-hook signal to the RLT at the Remote site.

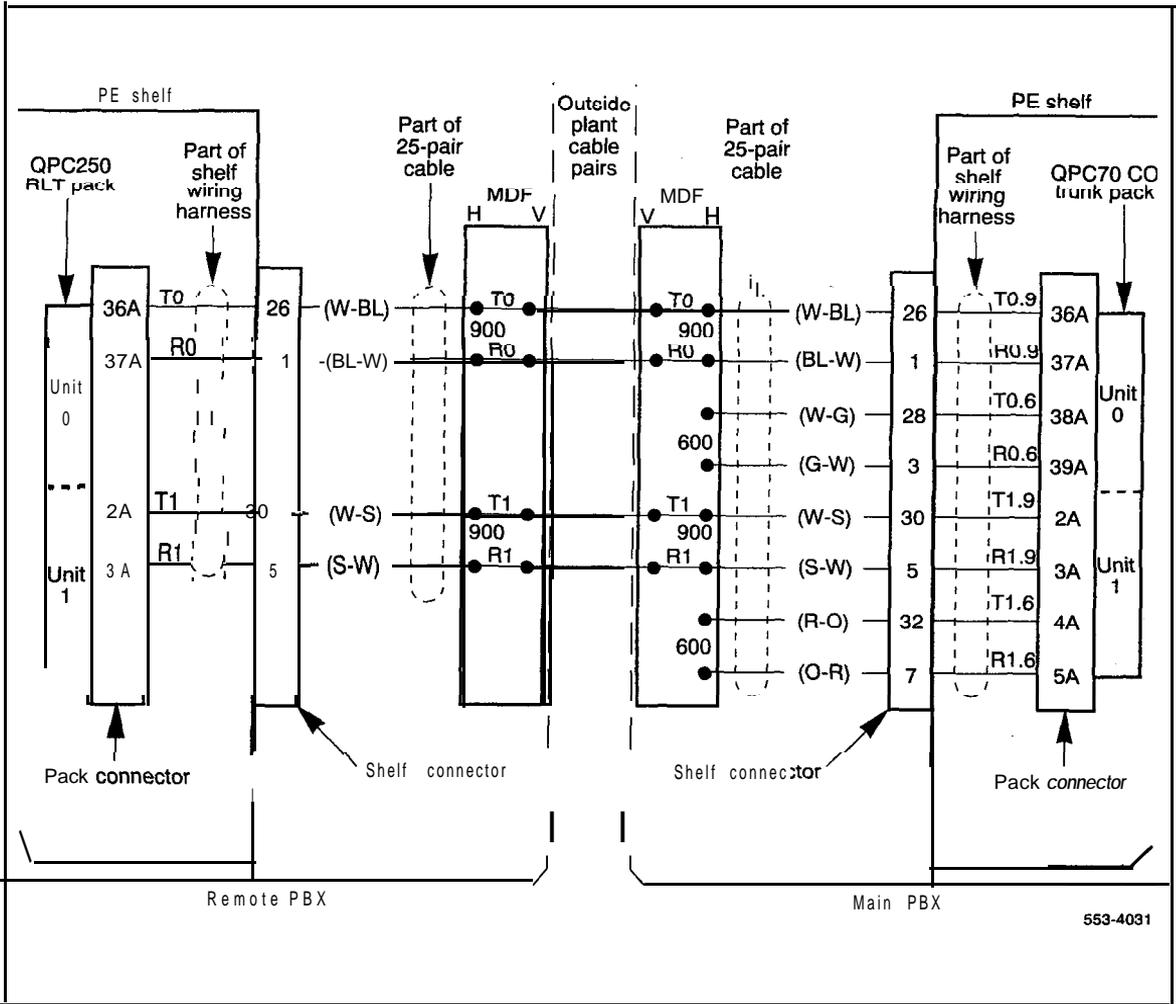
Installation and connections

The QPC250 RLT circuit pack can be inserted into any trunk pack position on a PE shelf. The circuit pack handling precautions must be observed when installing trunk packs in PE shelves. Installation procedures for trunk circuit packs are provided in *System installation options 21, 51, 61, 71 (553-3001-210)*.

When telephone lines connected to the trunk circuit are exposed to foreign voltages by direct contact or induction; i.e., power line crosses or lightning, protection devices must be installed at the customer's premises. These devices must be capable of providing a path to ground from the tip and ring leads for foreign voltages that exceed a 600 V peak.

Typical cross-connections between a QPC250 RLT trunk at a Remote site and a QPC70 CO trunk at the Main site are shown in Figure 2.

Figure 2
QPC250 RLT cross-connections to QPC70 CO trunk



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Engineering information

Memory and real time requirements

The impact of the CAS feature on memory and real time requirements of a particular system can be calculated using *X11 memory calculations* (553-3001-149).

Traffic measurements

Traffic measurements are provided separately for each location. To coordinate the accumulation of traffic data on a network basis, the system clocks and traffic schedules for each location should be set and Maintained in reasonable synchronization. *See Traffic measurement* (553-2001-450) for details concerning traffic schedule outputs

Trunks (TFC002)

At each Remote location, **RLTs** are considered an outgoing trunk route. Outgoing usage and peg counts are accumulated for **traffic** schedule TFCO02. All other fields in this traffic schedule are zeroed.

At the Main location, **RLTs** are considered an incoming trunk route for each Remote location. Usage, peg counts, failure to match, and all **trunks** busy measurements are recorded for each RLT route in traffic schedule TFCO02.

Queue (TFC003)

If the CAS feature is not active, queue measurements are recorded at the Main and Remote locations in the normal manner. When the CAS feature is active, calls that originate at the Remote site and are handled over an RLT by the CAS attendant at the Main location are measured and recorded in TFC003 at the Remote site. For these measurements, the Remote site interprets the RLT as a local attendant. Calls dialed *specifically* to the local attendant at the Remote site are also reflected in TFC003, when the CAS feature is active. TFC003 measurements are recorded in the normal manner at the Main site.

TFC003 definitions should be interpreted as follows for measurements at the Remote site when CAS is active. See Figure 3.

Average attendant response

The average time between a call being presented to an attendant console and the CAS attendant answering it.

Average time in queue

The time that calls spend in the attendant queue averaged over all calls that are placed into that queue.

Average speed of answer

The time that a call waits for its request to terminate at an attendant is recognized by the system and before it is answered.

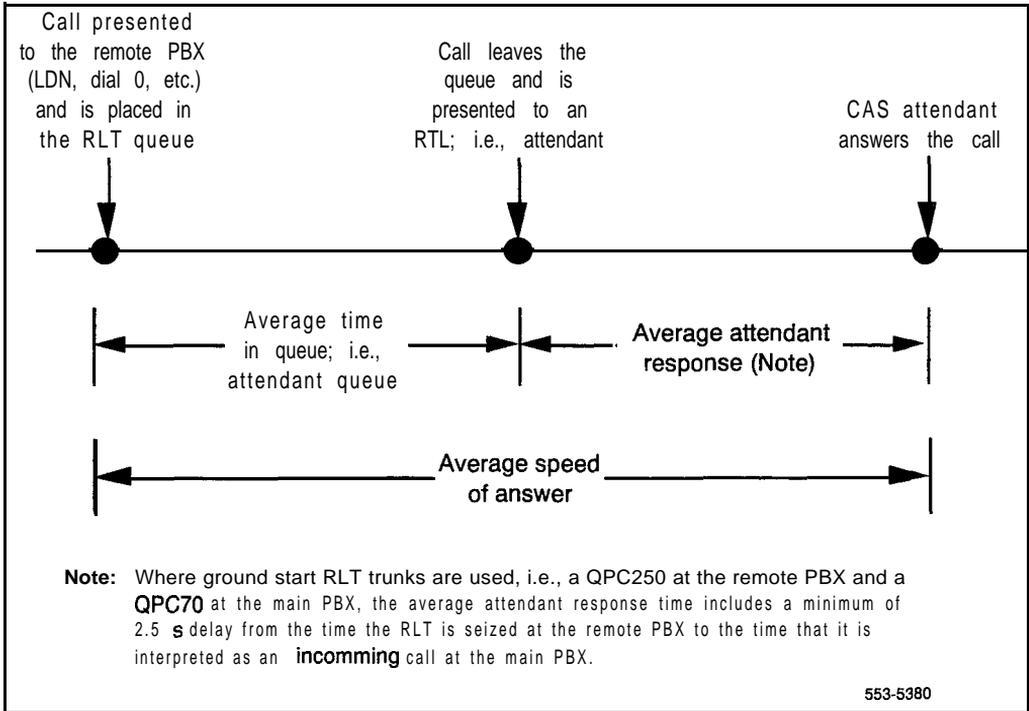
Peg count of calls delayed

This count is incremented whenever a call is removed from the attendant.

Peg count of abandoned calls

Incremented whenever a call abandons before being answered by the CAS attendant.

Figure 3
TFC003 measurements at a Remote site when a call waits for a RLT to become idle



Console (TFC004)

When the CAS feature is not active, the local attendant at the Remote site handles all calls which require attendant services. These calls are measured and recorded in TFC004 at the Remote site. When the CAS feature is active, TFC004 measurements only reflect calls dialed specifically to the local attendant—all other calls requiring attendant assistance are directed to the CAS attendant at the Main location.

At the Main site, TFC004 measurements are recorded in the normal manner. When the CAS feature is active, calls originating from the Remote site are treated as incoming trunk calls at the Main site.

Calculating the number of RLT circuits

To calculate the number of RLT circuits required between a particular Remote site, and the Main site, the following grades of service must be specified. Tables 3 through 20 calculate the RLT requirements.

Average speed of answer

The average time in seconds a call from the Remote site, which requires an attendant, waits at the *Main* site for an attendant to answer.

Average RLT delay

The average time in seconds a call from the Remote site, which requires an attendant, waits at the *Remote* site for an RLT to become idle under Average Busy-Season Busy-Hour (ABSBH) traffic.

Note 1: Where ground start signaling is used for RLT circuits (for example, with a QPC250 RLT trunk card at the Main site and a QPC70 CO trunk card at the Main site), **add** a minimum of 2.5 seconds to the average RLT delay. There is a minimum average delay of 2.5 seconds from the time the RLT is seized at the Remote site to the time that it is interpreted as an incoming call at the Main site.

Note 2: RLT 20% Overload Delay-This delay is fixed at 10.0 seconds and is reflected in the values shown in Tables 3 through 20.

Furthermore, the calculation of the number of RLT circuits required between a Remote site and the Main site requires the following information.

- the number of calls per hour in the Remote site which require an attendant
- the Attendant Work Time (**AWT**). This is the average time in seconds taken by an attendant at the Main site to service a call

The engineering procedure follows.

- 1 Calculate the attendant traffic (**Ta**) generated at the Remote site by using this formula: $Ta = \tau \times AWT/100$ CCS.

τ = the number of calls per hour in the Remote site which require an attendant

AWT = Attendant Work Time
- 2 Select the appropriate table (Tables 3 through 20) according to the specified grade of service.
- 3 Select the appropriate column in the table according to the attendant work time.
- 4 Select a number (**T**) in the column chosen which is greater than or equal to the value Ta determined in step 1.

Example

Average speed of answer	= 2 s grade of service
Average RLT delay	= 2 s
Attendant work time (AWT)	= 20 s
Attendant calls/hours in the Remote site (E)	= 500

Then

$$Ta = 500 \times 20/100 \text{ CCS}$$

$$Ta = 100 \text{ CCS}$$

Table 3 is chosen because it meets the given grade of service values. From this table, in the AWT 16-20 column, the value T of 120 CCS is selected ($T \text{ CCS} \geq Ta \text{ CCS}$). For the value $T = 120 \text{ CCS}$, the table shows that six RLT circuits are required for this particular application.

Calculating the number of CAS attendants

To calculate the number of attendants required at the Main site serving multiple Remote sites, the Average Speed of Answer grade of service must be specified. This delay constitutes the average time in seconds a call from either a Remote site or the Main site, which requires an attendant, waits at the site for an attendant to answer. Tables 21 through 26 calculate the CAS attendant requirements.

Furthermore, the following information is required.

- the attendant traffic (T_a) generated at the Main site
- the attendant traffic (T_a) generated at each Remote site

The engineering procedure follows.

- 1 Calculate the attendant traffic (T_a) generated at the Remote site by using this formula: $T_a = \tau \times \text{AWT}/100 \text{ CCS}$
 - τ = the number of calls per hour in a Remote site or the Main site which require an attendant.
 - AWT = the attendant work time. This is the average time in seconds taken by an attendant at the Main site to service a call.
- 2 Calculate the total attendant traffic (T_t) by adding the attendant traffic (T_a) from each Remote site to the attendant traffic (T_a) at the Main site.
- 3 Select the appropriate table (Tables 21 through 26).
- 4 Select the appropriate column in the table according to the attendant work time (AWT).
- 5 The number of attendants required corresponds to a value $T \text{ CCS}$ in the column chosen, where $T \text{ CCS} \geq T_t \text{ CCS}$.

Note: The values shown in Tables 21 through 26 reflect a 5 percent attendant overload delay (10.0 second), and a 92 percent attendant occupancy.

Example

Average speed of answer	= 2 s grade of service
Attendant work time (AWT)	= 20 s
Attendant traffic (Ta) at Main site	= 170 ccs
Attendant traffic (Ta) at Remote site #1	= 100 ccs
Attendant traffic (Ta) at Remote site #2	= 120 ccs

Then

$$T_t = 170 + 100 + 120 \text{ CCS}$$

$$T_t = 390 \text{ CCS}$$

Table 21 is chosen because it meets the given grade of service value. From the table, in the AWT 16-20 column, the value T of 395 CCS is selected ($T \text{ CCS} \geq T_t \text{ CCS}$). For the value $T = 395 \text{ CCS}$ the table shows that 14 attendants are required at the Main site to handle this particular application.

Table 3

Release Link Trunk requirementsAverage speed of answer ≤ 2.00 seconds -Average RLT delay ≤ 2.00 seconds

RLT circuits needed	Attendant work time (AWT) in seconds											
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60
	Attendant traffic (T) in CCS											
1	5	4	3	2	2	1	1	1	1	1	1	1
2	24	22	20	18	17	16	15	14	13	13	12	12
3	45	45	43	41	39	37	36	34	33	32	31	31
4	68	70	68	66	63	61	60	58	56	55	54	53
5	92	96	95	92	90	87	85	83	82	80	79	77
6	116	123	122	120	117	115	112	110	108	107	105	104
7	138	150	150	148	145	143	140	138	138	134	132	131
8	159	178	179	177	174	171	169	167	164	162	160	158

Table 4

Release Link Trunk requirementsAverage speed of answer ≤ 2.00 seconds — Average RLT delay ≤ 4.00 seconds

RLT circuits needed	Attendant work time (AWT) in seconds											
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60
	Attendant traffic (T) in CCS											
1	9	7	6	5	4	3	3	2	2	2	2	2
2	31	29	27	25	23	22	21	20	19	18	17	17
3	53	55	53	51	49	47	45	43	42	41	40	39
4	74	81	81	78	76	74	72	70	68	67	65	64
5	95	105	106	105	104	102	100	98	96	94	92	91
6	117	130	132	131	130	128	126	125	123	121	120	118
7	138	154	158	158	156	155	153	151	149	148	146	145
8	159	179	183	184	183	182	180	178	176	174	173	171

Table 5

Release Link Trunk requirementsAverage speed of answer ≤ 2.00 seconds — Average RLT delay ≤ 6.00 seconds

RLT circuits needed	Attendant work time (AWT) in seconds											
	1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	31 - 35	36 - 40	41 - 45	46 - 50	51 - 55	56 - 60
	Attendant traffic (T) in CCS											
1	11	9	8	7	6	5	4	4	3	3	3	3
2	32	33	32	30	28	26	25	24	23	22	21	20
3	53	57	56	54	53	51	49	48	47	45	44	43
4	74	81	81	80	78	76	74	73	71	70	69	67
5	95	105	106	105	104	102	100	98	97	95	94	93
6	117	130	132	131	130	128	126	125	123	121	120	118
7	138	154	158	158	156	155	153	151	149	148	146	145
8	159	179	183	184	183	182	180	178	176	174	173	171

Table 6

Release Link Trunk requirementsAverage speed of answer ≤ 4.00 seconds -Average RLT delay ≤ 2.00 seconds

RLT circuits needed	Attendant work time (AWT) in seconds											
	1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	31 - 35	36 - 40	41 - 45	46 - 50	51 - 55	56 - 60
	Attendant traffic (T) in CCS											
1	3	3	2	2	2	1	1	1	1	1	1	1
2	17	18	17	16	15	14	14	13	13	12	12	11
3	33	37	37	36	35	34	33	32	31	31	30	29
4	50	58	59	59	58	57	56	55	54	53	52	51
5	68	80	83	83	82	81	80	79	78	77	75	74
6	86	102	107	108	108	107	105	104	103	102	101	100
7	105	125	132	134	134	133	132	131	131	129	127	126
8	122	149	157	160	160	160	159	158	156	155	154	153

Table 7

Release **Link Trunk requirements**

Average speed of answer ≤ 4.00 seconds — Average RLT delay ≤ 4.00 seconds

RLT circuits needed	Attendant work time (AWT) in seconds											
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-66	56-60
	Attendant traffic (T) in CCS											
1	6	5	4	4	3	3	3	2	2	2	2	1
2	22	24	23	22	21	20	19	18	18	17	16	16
3	39	45	46	45	44	43	42	41	40	39	38	37
4	56	68	70	70	69	68	67	66	65	63	62	61
5	72	88	94	95	95	95	94	92	91	90	89	87
6	89	109	116	119	120	119	119	118	117	116	115	114
7	105	130	139	143	144	144	144	143	142	141	140	139
8	122	151	162	167	169	170	169	169	188	167	166	165

Table 8

Release **Link Trunk requirements**

Average speed of answer ≤ 4.00 seconds — Average RLT delay ≤ 6.00 seconds

RLT circuits needed	Attendant work time (AWT) in seconds											
	1-5	6-10	11-15	16-20	21-25	26-30	31-36	36-40	41-45	46-50	51-66	56-60
	Attendant traffic (T) in CCS											
1	7	7	6	5	5	4	4	3	3	3	3	2
2	22	24	27	27	26	25	24	23	22	21	21	19
3	40	47	49	49	48	47	46	45	44	43	42	42
4	56	68	71	72	71	71	70	69	68	67	66	65
5	72	88	94	95	95	95	94	93	92	91	90	89
6	89	109	116	119	120	119	119	118	117	116	115	114
7	105	130	139	143	144	144	144	143	142	141	140	139
8	122	151	162	167	169	170	169	169	168	167	166	165

Table 9
Release Link Trunk requirements
Average speed of answer ≤ 4.00 seconds — Average RLT delay ≤ 2.00 seconds

RLT circuits needed	Attendant work time (AWT) in seconds											
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	61-55	56-60
	Attendant traffic (T) in CCS											
1	2	2	2	1	1	1	1	1	1	1	1	0
2	12	14	15	14	14	13	13	12	12	11	11	11
3	25	31	32	33	32	32	31	30	30	29	29	28
4	39	49	52	53	53	53	52	52	51	50	49	49
5	53	68	73	75	76	76	75	75	74	73	72	72
6	68	87	95	98	99	99	99	99	98	97	97	96
7	83	107	117	121	123	124	124	124	123	123	122	121
8	98	128	140	145	148	149	150	150	149	149	148	147

Table 10
Release Link Trunk requirements
Average speed of answer ≤ 6.00 seconds — Average RLT delay ≤ 4.00 seconds

RLT circuits needed	Attendant work time (AWT) in seconds											
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60
	Attendant traffic (T) in CCS											
1	4	4	4	3	3	2	2	2	2	2	1	1
2	16	20	20	20	19	18	18	17	17	16	16	15
3	31	38	40	41	40	40	39	38	38	37	36	36
4	44	58	62	64	64	63	63	62	61	61	60	59
5	58	76	83	87	88	88	88	87	87	86	85	84
6	71	94	104	108	111	112	112	112	112	111	111	110
7	85	112	124	130	134	135	136	136	136	136	135	134
8	98	131	145	153	157	159	160	160	160	160	160	159

Table 11
Release Link Trunk requirements
Average speed of answers 6.00 seconds -Average RLT delay ≤ 6.00 seconds

RLT circuits needed	Attendant work time (AWT) in seconds											
	1 - 5	6- 10	11- 16	16. 20	21- 26	26- 30	31- 36	36- 40	41 - 45	46 - 50	61- 66	66- N
	Attendant traffic (T) in CCS											
1	5	6	5	5	4	4	3	3	3	3	2	2
2	18	23	24	23	23	22	21	21	20	19	19	18
3	31	40	43	44	44	44	43	43	42	41	41	40
4	44	58	83	65	68	68	66	65	64	64	63	82
5	58	78	83	87	88	89	89	88	88	87	88	88
6	71	94	104	108	111	112	112	112	112	111	111	110
7	85	112	124	130	134	135	138	136	136	136	135	134
8	98	131	145	153	157	159	160	160	160	180	160	159

Table 12
Release Link Trunk requirements
Average speed of answers 6.00 seconds — Average RLT delay ≤ 2.00 seconds

RLT circuits needed	Attendant work time (AWT) in seconds											
	1 - 5	6- 10	11- 16	16- 20	21- 26	26- 30	31- 35	36. 40	41 - 45	46- 50	51 - 55	56 - 60
	Attendant traffic (T) in CCS											
1	2	2	2	2	1	1	1	1	1	1	1	0
2	14	16	16	15	14	14	13	13	12	12	11	11
3	28	34	35	34	34	33	32	31	31	30	29	29
4	44	53	55	56	55	55	54	53	52	51	51	50
5	60	73	78	79	79	78	77	77	76	75	74	73
6	76	94	101	103	103	103	102	101	101	100	99	98
7	93	116	124	127	128	128	128	127	126	125	124	123
8	109	137	148	152	154	154	154	154	153	152	151	150

Table 13

Release Link Trunk requirements

Average speed of answer ≤ 5.00 seconds - Average RLT delay ≤ 4.00 seconds

RLT circuits needed	Attendant work time (AWT) in seconds											
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-66	56-W
	Attendant traffic (T) in CCS											
1	5 ⁺	5	4	3	3	3	2	2	2	2	2	1
2	19	22	22	21	20	19	18	18	17	17	16	16
3	35	41	43	43	42	41	40	40	39	38	37	36
4	50	62	66	67	66	66	65	64	63	62	61	60
5	64	82	88	91	92	91	91	90	89	88	87	86
6	79	101	110	113	115	116	115	115	114	114	113	112
7	94	121	131	136	139	140	140	140	139	138	138	137
8	109	140	153	160	163	164	165	165	164	164	163	162

Table 14

Release Link Trunk requirements

Average speed of answer ≤ 5.00 seconds — Average RLT delay ≤ 6.00 seconds

RLT circuits needed	Attendant work time (AWT) in seconds											
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-64
	Attendant traffic (T) in CCS											
1	6	6	6	5	4	4	4	3	3	3	2	2
2	21	25	25	25	24	23	22	21	21	20	19	19
3	35	43	46	46	46	45	45	44	43	42	41	41
4	50	62	67	68	69	68	68	67	66	65	64	64
5	64	82	88	91	92	92	91	91	90	89	88	87
6	79	101	110	113	115	116	115	115	114	114	113	112
7	94	121	131	136	139	140	140	140	139	138	138	137
8	109	140	153	160	163	164	165	165	164	164	163	162

Table 15

Release Link Trunk requirements

Average speed of answer ≤ 6.00 seconds — Average RLT delay ≤ 2.00 seconds

RLT circuits needed	Attendant work time (AWT) in seconds											
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60
	Attendant traffic (T) in CCS											
1	1	1	1	1	1	1	1	1	1	1	0	0
23	20 10	26 12	29 13	29 13	30 13	29 12	29 12	29 11	28 11	28 11	27 11	27 10
4	32	42	46	48	49	49	49	49	48	48	47	47
5	43	59	65	69	70	71	71	71	70	70	70	69
6	56	76	85	90	92	93	94	94	94	93	93	93
7	68	93	105	111	115	116	117	118	116	118	117	117
8	81	111	126	133	138	140	142	142	143	143	143	142

Table 16

Release Link Trunk requirements

Average speed of answer ≤ 8.00 seconds -Average RLT delay ≤ 4.00 seconds

RLT circuits needed	Attendant work time (AWT) in seconds											
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60
	Attendant traffic (T) in CCS											
1	3	3	3	3	2	2	2	2	2	2	1	1
2	13	17	18	18	17	17	17	16	18	15	15	14
3	25	33	36	37	37	37	37	36	38	35	35	34
4	37	50	55	58	59	59	59	59	58	58	57	57
5	48	68	75	79	82	83	83	83	83	82	82	81
6	59	82	94	100	103	105	106	107	107	107	108	106
7	70	98	112	120	124	127	129	130	130	130	130	130
8	82	115	131	140	146	149	152	153	154	154	154	154

Table 17

Release Link Trunk requirements

Average speed of answer ≤ 8.00 seconds — Average RLT delay ≤ 6.00 seconds

RLT circuits needed	Attendant work time (AWT) in seconds											
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60
	Attendant traffic (T) in CCS											
1	4	4	4	4	4	3	3	3	3	2	2	2
2	15	19	21	21	21	20	20	19	19	19	18	18
3	26	35	38	40	41	41	41	40	40	39	39	38
4	37	50	56	59	61	62	62	62	61	61	61	60
5	48	66	75	79	82	83	84	84	84	84	83	83
6	59	82	94	100	103	105	106	107	107	107	108	106
7	70	98	112	120	124	127	129	130	130	130	130	130
8	82	115	131	140	146	149	152	153	154	154	154	154

Table 18

Release Link Trunk requirements

Average speed of answer ≤ 8.00 seconds — Average RLT delay ≤ 2.00 seconds

RLT circuits needed	Attendant work time (AWT) in seconds											
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60
	Attendant traffic (T) in CCS											
1	1	1	1	1	1	1	1	1	1	0	0	0
2	8	10	11	11	11	11	11	11	11	10	10	10
3	17	23	26	27	27	27	27	27	27	26	26	26
4	26	37	42	44	46	46	46	46	46	46	46	45
5	36	52	59	63	65	66	67	67	67	67	67	67
6	47	67	77	82	86	88	89	89	90	90	90	89
7	58	83	95	103	107	110	111	112	113	113	113	113
8	68	98	114	123	129	132	134	136	137	137	137	137

Table 19

Release Link Trunk requirements

Average speed of answer ≤ 10.00 seconds — Average RLT delay ≤ 4.00 seconds

RLT circuits needed	Attendant work time (AWT) in seconds											
	1-5	6-10	11-15	16-20	21-26	26-36	31-36	36-40	41-45	46-50	51-55	56-M
	Attendant traffic (T) in CCS											
1	2	2	2	2	2	2	2	2	1	1	1	1
2	11	14	16	16	16	16	15	15	15	14	14	14
3	20	26	32	34	34	35	35	34	34	34	33	33
4	31	44	50	53	55	55	56	56	56	55	55	55
5	41	59	66	73	76	78	78	79	79	79	79	78
6	50	73	85	92	96	99	101	102	102	102	102	102
7	60	87	102	111	116	120	122	124	125	125	125	125
8	70	102	120	130	137	141	144	146	147	148	149	149

Table 20

Release Link Trunk requirements

Average speed of answer ≤ 10.00 seconds -Average RLT delay ≤ 6.00 seconds

RLT circuits needed	Attendant work time (AWT) in seconds											
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60
	Attendant traffic (T) in CCS											
1	3	4	4	3	3	3	3	3	2	2	2	2
2	12	17	19	19	19	19	19	18	18	18	17	17
3	21	30	35	37	38	38	38	38	38	38	37	37
4	31	44	51	55	57	58	58	59	59	58	58	58
5	41	59	68	73	76	78	79	80	80	80	60	80
6	50	73	85	92	96	99	101	102	102	102	102	102
7	60	87	102	111	116	120	122	124	125	125	125	125
8	70	102	120	130	137	141	144	146	147	148	149	149

Table 21
 CAS attendant requirements
 Average speed of answers 2.00 seconds

CAS attendants needed	Attendant work time (AWT) in seconds											
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60
	Attendant traffic (T) in CCS											
1	10	5	4	3	2	2	1	1	1	1	1	1
2	38	29	24	21	19	17	16	15	14	14	13	12
3	70	57	51	46	43	40	38	37	35	34	33	32
4	103	88	80	74	70	67	64	62	60	58	58	55
5	136	120	110	104	99	95	91	89	88	84	82	81
6	170	153	142	134	129	124	120	117	114	112	110	108
7	205	186	174	166	159	154	150	146	143	140	138	136
8	240	219	206	197	190	185	180	176	173	170	167	165
9	274	253	239	230	222	216	211	207	203	200	197	194
10	309	287	272	262	254	248	243	238	234	230	227	224
11	344	321	306	295	287	280	274	269	265	261	258	255
12	380	355	340	328	319	312	306	301	297	293	289	286
13	415	390	373	362	352	345	339	333	328	324	320	317
14	450	424	407	395	385	378	371	365	360	356	352	348
15	485	459	441	429	419	411	404	398	393	388	384	380

Table 22

CAS attendant requirementsAverage speed of answer ≤ 4.00 seconds

CAS attendants needed	Attendant work time (AWT) in seconds											
	i-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60
	Attendant traffic (T) in CCS											
1	15	10	7	5	4	4	3	3	2	2	2	2
2	47	38	33	29	26	24	23	21	20	19	18	17
3	81	70	62	57	54	51	48	46	45	43	42	40
4	116	103	94	88	84	80	77	74	72	70	68	67
5	151	136	127	120	115	110	107	104	101	99	97	95
6	186	170	160	153	147	142	138	134	131	129	126	124
7	221	205	194	186	179	174	169	166	162	159	156	154
8	257	240	228	219	212	206	202	197	194	190	188	185
9	292	274	262	253	245	239	234	230	226	222	219	216
10	328	309	296	287	279	272	267	262	258	254	251	248
11	362	344	331	321	313	306	300	295	291	287	283	280
12	396	380	366	355	347	340	334	328	324	319	316	312
13	430	415	401	390	381	373	367	362	357	352	348	345
14	463	450	435	424	415	407	401	395	390	385	381	378
15	496	485	470	459	449	441	435	429	423	419	415	411

Table 23
CAS attendant requirements
 Average speed of answers 5.00 seconds

CAS attendants needed	Attendant work time (AWT) in seconds											
	i - 5	6 - 10	11 - 15	16 - 20	21-25	26 - 30	31-35	36-40	41 - 45	46-50	51 - 55	56 - 60
	Attendant traffic (T) in CCS											
1	17	11	8	7	5	5	4	3	3	3	2	2
2	50	41	35	32	29	27	25	23	22	21	20	19
3	85	74	66	61	57	54	52	50	46	46	45	44
4	120	107	99	93	66	64	61	79	76	74	72	71
5	155	141	132	125	120	116	112	109	106	104	102	100
6	190	176	166	156	153	146	144	140	137	134	132	130
7	225	211	200	192	166	160	176	172	169	166	163	160
6	259	246	234	226	219	213	209	204	201	197	194	192
9	294	261	269	260	253	247	242	237	233	230	226	224
10	326	316	304	294	267	280	275	270	266	262	259	256
11	362	351	339	329	321	314	308	304	299	295	292	288
12	396	385	373	363	355	348	342	337	332	328	324	321
13	430	419	409	398	390	382	376	371	366	362	358	354
14	463	453	443	433	424	417	410	405	400	395	391	387
15	496	487	477	468	459	451	444	439	433	429	424	421

Table 24
CAS attendant requirements
 Average speed of answer ≤ 6.00 seconds

CAS attendants needed	Attendant work time (AWT) in seconds											
	1- 5	6- 10	11-15	16. 20	21- 25	26-30	31-35	36 - 40	41- 45	46- 50	51- 55	56 - 60
	Attendant traffic (T) in CCS											
1	19	13	10	8	6	5	5	4	4	3	3	3
2	53	44	36	34	31	29	27	26	24	23	22	21
3	87	77	70	65	61	57	55	53	51	49	48	46
4	123	111	103	97	92	88	85	82	80	78	76	74
5	157	145	136	130	124	120	116	113	110	108	106	104
6	191	180	170	163	157	153	148	145	142	139	136	134
7	225	215	205	197	191	186	181	177	174	171	168	166
8	259	249	240	231	225	219	214	210	206	203	200	197
9	294	283	274	266	259	253	248	243	239	236	233	230
10	328	317	308	300	293	287	281	277	272	269	265	262
11	362	351	342	334	327	321	315	310	306	302	298	295
12	396	385	376	368	361	355	349	344	340	335	332	328
13	430	419	410	402	395	389	384	378	373	369	365	362
14	463	453	443	435	429	423	417	412	407	403	399	395
15	496	487	477	469	462	456	451	446	441	437	433	429

Table 25
 CAS attendant requirements
 Average speed of answer ≤ 8.00 seconds

CAS attendants needed	Attendant work time (AWT) in seconds											
	1 - 5	6 - 10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	61-55	56 - 60
	Attendant traffic (T) in CCS											
1	22	15	12	10	8	7	6	5	5	4	4	4
2	55	47	42	38	35	33	31	29	27	26	25	24
3	89	81	75	70	66	62	60	57	55	54	52	51
4	123	114	107	102	98	94	91	88	86	84	82	80
5	157	148	140	135	130	126	122	119	117	114	112	110
6	191	181	174	167	162	158	154	151	148	145	143	141
7	225	215	207	201	195	190	186	183	180	177	174	172
8	259	249	241	234	228	223	219	215	212	209	206	203
9	294	283	274	267	261	256	252	248	244	241	238	235
10	328	317	308	301	295	289	284	280	276	273	270	267
11	362	351	342	334	328	322	317	313	309	306	302	299
12	396	385	376	368	361	356	351	346	342	338	335	332
13	430	419	410	402	395	389	384	379	375	371	367	364
14	463	453	443	435	429	423	417	412	408	404	400	397
15	496	487	477	469	462	456	451	446	441	437	433	430

Table 26

CAS attendant requirementsAverage speed of answer ≤ 10.00 seconds

CAS attendants needed	Attendant work time (AWT) in seconds											
	1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	31 - 35	36 - 40	41 - 45	46 - 50	51 - 55	56 - 60
	Attendant traffic (T) in CCS											
1	22	17	13	11	9	8	7	6	6	5	5	4
2	55	48	43	39	36	34	32	30	29	27	26	25
3	89	81	75	70	66	63	61	58	56	55	53	52
4	123	114	107	102	98	94	91	88	86	84	82	80
5	157	148	140	135	130	126	122	119	117	114	112	110
6	191	181	174	167	162	158	154	151	148	145	143	141
7	225	215	207	201	195	190	186	183	180	177	174	172
8	259	249	241	234	228	223	219	215	212	209	208	203
9	294	283	274	267	261	256	252	248	244	241	238	235
10	328	317	308	301	295	289	284	280	276	273	270	287
11	362	351	342	334	328	322	317	313	309	306	302	299
12	396	385	376	368	361	356	351	346	342	338	335	332
13	430	419	410	402	395	389	384	379	375	371	367	364
14	463	453	443	435	429	423	417	412	408	404	400	397
15	496	487	477	469	462	458	451	446	441	437	433	430

Implementation and operation

Feature implementation

CAS Main

To configure CAS Main, respond to the prompts in the following overlays.

LD15 – Add or change CAS Main for a customer

REQ	NEW, CHG	Add or change the CAS Main
TYPE	CDB	Customer datablock
CUST	o-99	Customer number
ATDN	nnnn	DN that must be dialed by local telephones to reach the CAS Main attendant (default is 0)
CAS	Yes, (No)	CAS is (not) enabled for this customer
MAIN	Yes	This is the CAS Main location
ICI	0-19 Rnnnn	Assign Release Link Main trunk routes to Incoming Call Indicators, as required

Note 1: When the CAS feature is defined, a Signal Remote key is assigned automatically to the key above **LPK5** on all CAS Main attendant consoles.

Note 2: For the M1250 and M2250 attendant consoles, the C/H key acts as the CAS key.

LD16 -- Add or change a trunk route at a CAS Main location

REQ	NEW, CHG	Add or change the CAS Main
TYPE	RDB	Route data block
CUST	o-99	Customer number
ROUT	o-511	Route number
TKTP	RLM	Release Link Main trunk type
ICOG	ICT	Incoming trunk route
ACOD	nnnn	Trunk access DN. This DN and the route member number display at the CAS attendant console. This DN cannot be dial accessed.
TIMR	FLH O-(512)-32000	CAS flash timer in ms. Recommended setting is 768 ms or greater. The flash timer must be at least 256 ms shorter than the outgoing flash timer (OGF) at the Remote end.
	ICF O-(512)-32640	Incoming flash timer
	OGF O-(512)-32640	Outgoing flash timer
	ODT 256-(4096)-16128	Outgoing end of dialing timer for Digitone trunks
NEDC	ORG, ETH	Near end disconnect control ORG = Originating (recommended) ETH = Either end
FEDC	ETH, FEC, JNT, ORG	Fare end disconnect control ETH = Either end FEC = Far end JNT = Joint control ORG = Originating end (recommended)

LD14 – Add or change a Release Link Main trunk

REQ	NEW, CHG	Add or change the CAS Main
TYPE	RLM	Release Link Main trunk
TN	l s c u	Terminal number
CUST	o-99	Customer number
RTMB	rr mmm	Route and member numbers (O-511 O-256)
SIGL	GRD EM4	Ground start signalling arrangement Digital trunk
STRO	OWK	Outgoing wink start when SIGL = EM4
CLS	DTN	Digitone Class of Service

CAS Remote

To configure CAS Remote, respond to the prompts in the following overlays.

LD15 -Add or change CAS Remote for a customer

REQ	NEW, CHG	Add or change the CAS Main
TYPE	CDB	Customer datablock
CUST	o-99	Customer number
ATDN	n n n n	DN that must be dialed by local telephones to reach the CAS Main attendant (default is 0)
CAS	Yes, (No)	Change CAS options
MAIN	No	This is a CAS Remote location
DFLT	Yes, (No)	System to recover in the active mode after sysload
LDNT	Yes, (No)	Special tone to be given to the CAS Main attendant on presentation of LDN calls
LADN	n n n n	Local attendant DN (must be different from the DN entered for ATDN)
RLA	n n n	Route number for the Release Link Remote trunks
CHDN	n n n n	DN to be dialed by the CAS attendant to place a call on silent hold
HRCL	0-512	Time, in units of 2 seconds, that a call remains on silent hold before being recalled to the attendant

Note **1**: When the CAS feature is defined, a Signal Remote key is assigned automatically to the key above **LPK5** on all CAS Main attendant consoles.

Note 2: For the M1250 and M2250 attendant consoles, the **C/H** key acts as the CAS key.

LD11 -Add or change a CAS key to multi-line telephones at CAS Remote (if required)

REQ	NEW, CHG	Add or change CAS key assignment
TYPE	aaa	Telephone type
TN	l s c u	Terminal number
KEY	nn CAS	Add a CAS key

LD16 -Add or change a Release Link Remote trunk route

REQ	NEW, CHG	Add or change
TYPE	RDB	Route data block
CUST	0-99	Customer number
ROUT	0-511	Route number
TKTP	RLR	Release Link Remote trunk type
ICOG	OGT	Outgoing trunk route
CNTL	Yes, (No)	Change timer controls
TIMR	GRD 0-(512)-32640 GRD 0-(768)-32640	Guard timer for Analog trunks in ms Guard timer for Digital trunks in ms Recommended setting is 768 ms or greater.
	OGF (640)-32640	Outgoing flash timer in ms. This timer must be at least 256 ms longer than the flash timer at the Main.
	ICF 0-(512)-32640	Incoming flash timer
	ODT 256-(4096)-16128	Outgoing end of dialing timer for Digitone trunks
NEDC	ORG, ETH	Near end disconnect control ORG = Originating (recommended) ETH = Either end
FEDC	ETH, FEC, JNT, ORG	Fare end disconnect control ETH = Either end FEC = Far end JN'T = Joint control ORG = Originating end (recommended)

LD14 -Add or change a Release Link Remote trunk

REQ	NEW, CHG	Add or change
TYPE	RLR	Release Link Remote trunk type
TN	l s c u	Terminal number
CUST	o-99	Customer number
RTMB	rrr mmm	Route and member numbers (O-51 1 O-256)
RLDN	xxx . . . x	DN to be dialed to access the trunk directly
SIGL	GRD EM4	Ground start signalling arrangement Digital trunk
STRO	OWK	Outgoing wink start when SIGL = EM4
CLS	DTN	Digitone Class of Service

Operation

Main operation

To answer CAS calls, press the ICI or loop key.

To extend calls to a CAS Remote site:

- 1 Press the Signal Remote key.
- 2 When you hear the special dial tone, dial the Remote DN.
- 3 Press **RLS**.

Remote operation

To activate CAS, press the CAS key. The CAS lamp lights steadily, and remains lit as long as CAS is in use.

To deactivate CAS, press the CAS key again. The lamp goes off.

Testing

The tests in Procedure 1 are conducted when the CAS feature is installed at a Remote site to be served by a CAS attendant. These procedures can also be used as a guide to locating a fault in the feature.

Procedure 2 to 7 describes tests which verify that the CAS attendant can receive and handle calls from any site arranged for the CAS feature.

Procedure 1 Testing the CAS feature at a Remote location

Procedure 2 Testing the CAS feature at the CAS attendant location

Procedure 3 Answering an incoming call from a Remote location

Procedure 4 Extending a call to an idle telephone at a Remote location

Procedure 5 Extending a call to a busy telephone with camp-on

Procedure 6 Placing a call on silent hold

Procedure 7 Transferring a call to a second Remote telephone

Procedure 1
Testing the CAS feature at a Remote site

- 1** Verify that all CAS data is correct. See feature implementation.
- 2** Verify the Release Link Trunks (RLT) are installed and enabled.
- 3** Verify that the Tone and Digit Switches (TDS) are installed and enabled.
- 4** From any telephone, dial the DN of an RLT. If the RLT is busy, busy tone is heard. If the RLT is idle:
 - **ringback** tone is heard
 - when the CAS attendant answers, **ringback** tone stops and a voice path is established.Verify that a 2-way conversation can be carried out. Release the call.
- 5** Repeat Step 4 for each RLT.
- 6** From any telephone, dial the DN for the local attendant. This call is presented to the local attendant as a normal dial "0" call.
- 7** From any telephone, dial the DN assigned for the CAS attendant. This call is presented to the local attendant as a normal dial "0" call. If this location is in night service, calls dialed to either the local attendant or the CAS attendant are presented to the night number, or Trunk Answer From Any Station (TAFAS) at this location, as applicable.
- 8** Verify that the CAS key (above the LPK 5 key) on the local attendant console is so designated. If a console is not equipped, this key can be assigned on up to ten multi-line telephones.
- 9** Press the CAS key. The associated LED lights to indicate that the CAS feature has been activated. All calls normally presented to the local attendant are now directed to the CAS attendant except as in Step 10.
- 10** From any telephone, dial the DN assigned for the local attendant. This call is presented to the local attendant as a normal dial "0" call. See Step 7.

-- continued --

Procedure 1 (continued)**Testing the CAS feature at a Remote location**

- 11 From any telephone, dial the DN assigned for the CAS attendant. This call is presented to the CAS attendant, preceded by an identifying tone (two, 100-ms bursts of 440-Hz tone).
- 12 From any telephone, dial the access code for an outside line. When the second dial tone is heard (depends on the tie route and may not be provided), dial the LDN for your location. This call is directed to the CAS attendant.
- 13 When the CAS attendant answers, request that your call be placed on silent hold. When the specified timeout period has elapsed, your call is directed back to the CAS attendant.
- 14 Request the CAS attendant to extend your call to a busy telephone at your location.
 - If another call is not already camped-on to the busy telephone, your call is automatically camped-on. When the busy telephone becomes idle, your call is presented automatically to that telephone.
 - If the busy telephone does not become idle within the specified timeout period, your call is presented to the CAS attendant again.
- 15 If in Step 14 your call was completed to a telephone that was busy, request that telephone user to transfer your call to the attendant. This directs your call to the CAS attendant. Proceed to Step 17.
- 16 If in Step 14 the timeout period elapsed, and your call was directed back to the CAS attendant, proceed to Step 17.
- 17 Release the call.
- 18 Momentarily press the RLS key on the local attendant console (or multi-line). The associated LED goes out, and all calls requiring attendant assistance are presented to the local attendant.
- 19 Proceed to the CAS Main attendant location and conduct the tests of Procedure 2.

Procedure 2

Testing the CAS feature at the CAS Main attendant

- 1 Verify that all CAS data is correct. See feature implementation.
- 2 Verify the Release Link Trunks (RLT) are installed and enabled.
- 3 Verify that the TDS cards are installed and enabled.
- 4 Ensure that the CAS attendant console is equipped with:
 - an RLT X ICI key for each group of RLT from Remote locations, where X designates a particular Remote location
 - a SIGNAL REMOTE (SIG REM) key (above the LPK 5 key) a C/H key on the M1250 and M2250 consoles
 - a RELEASE DESTINATION (RLS DEST) key
- 5 From any telephone, dial the access code for a tie trunk to a Remote location. When the second dial tone (optional, depends on tie route) is heard, dial the DN for an RLT. This call is presented to the CAS attendant. Ensure that the call is presented on the correct ICI key and the correct access code and route member number of the RLT is displayed. When the CAS attendant answers, two 100-ms bursts of 440-Hz tone are heard by the attendant (if defined in customer LD15) prior to voice path being established.

Calls active on a CAS attendant console presented to a Remote telephone (via RLT) are considered as incoming external calls rather than attendant calls for purposes of digit display. This is done because:

- the identity of the CAS attendant cannot be determined from the Remote end, and
 - the display of the RLT identification is sufficient to indicate that the call is connected to an attendant. It also enables the user to identify the specific RLT used, in case of a fault.
- 6 Repeat step 4 for each RLT at each Remote location.
 - 7 Call the attendant at a Remote location by dialing the access code for an outside line, then the LDN for the Remote location. Request the attendant at the Remote location to activate the CAS feature by momentarily pressing the CAS key.
 - 8 Occupy a CAS attendant position, and direct all CAS related calls as described in Procedures 3 through 7.

Procedure 3**Answering an incoming call from a Remote site, while at the CAS Main**

- 1 Initial condition: console is idle.
- 2 Place a call to console from a Remote site.
 - ICI key is lit
 - SRC key flashes at 60 ipm
 - ringing tone is heard
 - digit display shows access code and trunk member number of RLT
- 3 Press LPK key.
 - ICI, SRC and LPK keys are steadily lit
 - two 100 ms bursts of 440 Hz before talk path is connected is heard

Procedure 4**Extending a call to an idle telephone at a Remote site**

- 1 Initial condition: 2-way conversation with attendant and calling party.
 - ICI, SRC and LPK keys are steadily lit
- 2 Press SIG REMOTE key.
 - dial tone is heard
 - calling party is excluded
- 3 Dial DN of a Remote telephone.
 - DEST key flashes at 60 ipm (QCW 4)
 - ringback tone is heard
- 4 Called telephone answers.
- 5 Press the RLS key.
 - 2-way conversation is established between calling and called parties.

Note: If the attendant releases before the telephone answers, the calling party hears **ringback** and is recalled to the attendant after 30 seconds (the slow answer timer default).

Procedure 5

Extending a call to a busy telephone with camp-on

- 1 Initial condition: 2-way conversation with attendant and calling party.
ICI, SRC and LPK keys are lit
- 2 Press SIG REMOTE key.
dial tone is heard
calling party is excluded
- 3 Dial DN of a busy Remote telephone.
DEST key flashes at 60 ipm (QCW4)
camp-on tone is heard
dialed number is displayed
calling party is camped on to the busy telephone

Note: If the Remote telephone does not answer after 30 seconds the call is recalled to the attendant (the slow answer timer default).

Procedure 6

Placing a call on silent hold

- 1 Initial condition: 2-way conversation with attendant and calling party.
ICI, SRC and LPK keys are lit
- 2 Press SIG REMOTE key.
SIG REMOTE key is lit
dial tone is heard
calling party is excluded
- 3 Dial silent hold DN.
hold confirmation tone is heard
- 4 Press the RLS key.

Note: Attendant is recalled when the hold timer expires.

Procedure 7**Transferring a call to a second Remote telephone**

- 1 Initial condition: 2-way conversation with attendant and calling party.
ICI, SRC and LPK keys are lit
- 2 Press SIG REMOTE key.
dial tone is heard
calling party is excluded
- 3 Dial DN of a Remote telephone.
ringback tone is heard
- 4 Called telephone answers.
- 5 Press the RLS DEST key.
called party is disconnected
- 6 Dial the DN of a second Remote telephone.
- 7 Press SIG REMOTE key.
dial tone is heard
calling party is excluded
- 8** Called telephone answers.

SL-1

Centralized Attendant Service

Description and engineering

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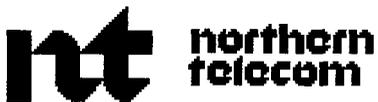
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Flexible Tone and Digit Switch cards

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About this document

The Tone and Digit Switch (TDS) is used in the Meridian 1 to provide ringing, DTMF tones, dial tone, and call status tones, such call waiting. The manufacturer programs the Flexible TDS cards to provide the required tones and cadences for the customer's environment.

Flexible Tones and Cadences (FTC) is an optional feature that allows tone and cadence modification using LD.56 and the tone and cadence tables provided in this document.

This document supports both North America and International capabilities. The p1 to p7 notation in the "Alphabetical list of prompts" on page 28 identifies LD56 international prompts.

Flexible Tones and Cadences (FTC)

Flexible Tones and Cadences (FTC) is an option that customizes telephone system tones. FTC is primarily intended for international markets that require tones different from those in North America.

Program 56 is used to modify the tones and cadences. If the FTC feature (package 125) is not equipped, North American tones and cadences are used.

What are tones and cadences?

Tones provide call status to telephone users. A tone is defined by the frequency and volume of the sound.

A tone's cadence repeats on/off phases. For example, the default cadence for normal ringing is 2 seconds on, 4 seconds off, 2 seconds on, 4 seconds off, and so on.

Flexible Tone and Cadence (FTC) Tables

As many as FTC tables can be created to define the tones and cadences for various calling features. Associate a table with one or more customers and trunk routes by entering the table number in response to prompt TTBL in LD15 and LD16.

Master Cadence Table (MCAD)

The Master Cadence Table (MCAD) contains up to 256 software-controlled cadences, each with as many as ten on/off phases. Entry 0 is reserved for continuous tone and cannot be changed. Entries 1-15 are reserved for ringing cadences.

Most of the software cadences repeat continuously, although prompts ACBT, AOBT, INTU and OVRD cadences repeat only their last 8 phases, permitting a special initial tone burst. To repeat the first cycle for these prompts, the first and last cycles should be identical. Prompts AHRC and HCAD do not repeat.

Define a cadence at the CDNC prompt by entering the time for each on and off phase. The time depends on the settings for the TMRK prompt in LD17 which sets the software cadence increments to 96 or 128 ms. For each phase, enter the closest multiple of 5 ms equal to the multiple of 96 or 128 ms that gives a time equal to or greater than the time required.

For example, to establish a repeating two seconds on/four seconds off cadence with the LD17 TMRK set to 128 ms:

- 1 Determine the ON phase (2 seconds = 2000 ms)

 $2000/128 = 15.625 = 16$ (always round up)

 $128 \times 16 = 2048$ ms

 multiple of 5 closest to 2048 ms = 2050

 Entry for prompt CDNC = $2050/5 = 0410$
- 2 Determine the OFF phase (4 seconds = 4000 ms). By using the same calculation, the entry for prompt CDNC = 0820.
- 3 To define the cadence, respond to the prompts as follows:

REQ	NEW, CHG
TYPE	MCAD
WCAD	1-255
CDNC	0410 0820

To define the cadence: 2 s on, 4 s off, 4 s on, 2 s off, repeat cycle 1 and 2, enter
 CDNC0410082008200410

To define the cadence: 2 s on, then steady off, enter

CDNC 0410, or
 CDNC 0410 0000

If an odd number of **nonzero** phases are entered, software ends the tone after the last ON phase. A carriage return at any phase results in zero for the remaining phases.

Once the cadence is defined, it can be entered in response to the CDNC prompt for a given feature. For example, CDNC is output after the Call Waiting Tone prompt.

Firmware Cadence Table (FCAD)

The Firmware Cadence Table (FCAD) defines cadences controlled by an NT8D17 Conference/TDS card.

The FCAD can have 256 entries (O-259, each with up to ten on/off phases. Entry 0 is reserved for continuous tone and cannot be changed. Entries 1-15 are reserved for ringing cadences. Each phase is in multiples of 5 ms.

FCAD cadences have the following capabilities:

- Each cadence may be defined to end at the “on” phase, the “off” phase, or to repeat after a single pass through the defined on/off cycles. Any or all of the five cycles can be repeated.
- Unique tones can be defined for each “on” phase and stored in the Conference/TDS firmware.

To have the same ringing cadences on 500/2500/digital telephones and Meridian 1 telephones, the MCAD and FCAD entries O-15 are identical. Changes to MCAD entries 1-15 automatically change FCAD entries 1-15. The FCAD entries 1-15 can only be changed by changing the MCAD entries 1-15.

The **Conference/TDS** card must be disabled and then re-enabled to download changed firmware cadences. Examples of creating firmware cadences:

- 1 For a cadence of 2 s on, 4 s off, repeat

```
REQ      NEW, CHG, PRT
TYPE     FCAD
WCAD     1-255
CDNC     0410 0820
```

```
END REPT
CYCS 1 (on/off cycles to be repeated)
WTON NO (use default tone for this cadence)
```

- 2 For a cadence of 2 s on, 4 s off, 3 s on, 5 s off, repeat

```
REQ      NEW, CHG, PRT
TYPE     FCAD
WCAD     1-255
CDNC     0410082006140998
```

```
END      REPT
CYCS     1 2 (on/off cycles to be repeated)
WTON     NO (use default tone for this cadence)
```

- 3 For a cadence of:

```
0.1 s on at 950 Hz, 19 dB below overload A-law, 0.1 off
0.1 s on at 1400 Hz, 20 dB below overload A-law, 0.1 off
0.1 s on at 1800 Hz, 20 dB below overload A-law, steady off
```

```
REQ      NEW, CHG, PRT
TYPE     FCAD
WCAD     1-255
CDNC     00200020002000200020
```

```
END      OFF
WTON     YES (define tones for this cadence)
TONES    134 135 136 (See NT8D17 Conference/TDS tone table)
```

TDS and NT8D17 Conference/TDS/MFS cards

There are two types of cards providing tones and cadences:

- Tone and Digit Switch (TDS) cards
- NT8D17 Conference, TDS card

There are a variety of TDS cards. Each card provides a different set of tones and cadences. When a TDS card is used for Meridian 1 sets, a hexadecimal code identifies each tone and cadence. Enter the decimal equivalents for hex codes at the TDSH prompt for each calling feature.

Refer to the *Flexible Tone and Digit Switch cards description* (553-2711-180) for the appropriate codes.

When the NT8D17 Conference/TDS cards are used, the tones and cadences are defined by the following prompts:

XCAD = O-255 – entry in the Firmware Cadence Table (FCAD)

XTON = O-255 – tone stored in the card firmware

CDNC = O-255 – entry in Master Cadence Table (MCAD)

Note: The ringing cadences for all telephones use the Master Cadence Table (MCAD). MCAD entries 1-15 are downloaded to the Peripheral Controller to provide ringing.

Time interval for Call Forward

In Call Forward No Answer (CFNA), the time interval before a call is forwarded is measured by the time interval for one ring cycle (defined at NCAD prompt) times the number of ring cycles (defined by the CFNO, CFN1, and CFN2 prompts in LD15).

All other types of ringing forward a call after this same time interval regardless of cadence. For example, those with a faster cadence will forward after more rings, those with a slower cadence after fewer rings.

Installing FTC

These steps outline the process to install the FTC feature and change the default tones and cadences for one or more calling features.

Note: To assist in fault clearing, it is recommended that you keep a record of all changes.

- 1 Load program 56.
- 2 Define new MCAD cadences.
- 3 Define new FCAD tones and cadences.
- 4 Create one or more FTC tables (one for each trunk route requiring different tones and cadences).
- 5 Define the non-default tones and cadences for each FTC table.
- 6 Enter the FTC table number for each trunk route (LD16 prompt **TTBL**).
- 7 If a Conference/TDS card is equipped, then follow these steps:
 - a set options in LD97
 - b initialize the system (**INIT**)
 - c disable and enable each Conf/TDS/MFS card (LD34)
 - d disable and enable each Controller (LD32)

Create, change or print FTC Table

An FTC table number can be entered for each trunk route at prompt **TTBL** in LD16. Table 0 is the default for all trunk routes and contains the defaults for North America.

REQ	NEW, CHG, PRT	Create, change or print
TYPE	FTC	Flexible Tones and Cadences
TABL	O-31	FTC table number
USER	Yes, (No)	Print customer and route users of the table(s)
DFLT	O-31	Default FTC table. Use a copy this table to create and modify a new one

FTC Ring Table Entries

For systems with NT8D17 Conference/TDS cards, all telephones share the same ringing cadence. Meridian 1 telephones require an NT8D17 tone (XTON).

REQ	NEW, CHG	Create or change
TYPE	FTC	Flexible Tones and Cadences
TABL	0-31	FTC table number
DFLT	0-31	Default FTC table. Use a copy this table to create and modify a new one
RING	Yes	Modify the Ringing feature definitions
NCAD	(1)-255	500/2500/Digital set normal ringing MCAD index number
NBCS		Normal cadence for Meridian 1 set ringing
_TDSH	0032	TDS external, burst, cadence and tone
_XTON	002	NT8D17 TDS Tone code
DCAD	0-(2)-15	500/2500/Digital set distinctive ringing MCAD table index
DBCS		Distinctive cadence for Meridian 1 set ringing
_TDSH	0082	TDS external, burst, cadence and tone
_XTON	002	NT8D17 TDS Tone code
ICAD	0-(5)-15	500/2500/Digital Dial Intercom distinctive ringing MCAD table index
IBCS		Meridian 1 set distinctive Dial Intercom ringing TDS code
_TDSH	0012	TDS external, burst, cadence and tone
_XTON	002	NT8D17 TDS Tone code
NDR1 PBX	0-255	First DRNG cadence MCAD entry
NDR1 BCS i bb cc tt		First DRNG TDS tones and cadences
NDR2 PBX	0-255	Second DRNG cadence MCAD entry
NDR2 BCS i bb cc tt		Second DRNG TDS tones and cadences
NDR3 PBX	0-255	Third DRNG cadence MCAD entry

NDR3	BCS	i bb cc tt	Third DRNG TDS tones and cadences
NDR4	PBX	O-255	Forth DRNG MCAD cadence
NDR4	BCS	i bb cc tt	Forth DRNG TDS tones and cadences
RCAD		O-(1)-255	500/2500/Digital Call Park Recall ringing MCAD table index
RBCS			Meridian 1 Call Park Recall Ring Cadence
_TDSH		0032	TDS external, burst, cadence and tone
_XTON		002	NT8D17 TDS Tone code
GCAD		O-(1)-255	500/2500/Digital set Group Call ringing MCAD table index
GBCS			Meridian 1 Group Call Ring Cadence
_TDSH		0082	TDS external, burst, cadence and tone
_XTON		002	NT8D17 TDS Tone code
HCAD		O-(3)-255	500/2500/Digital set Held Call reminder MCAD table index
HBCS			Meridian 1 Held Call Reminder ring cadence
_TDSH		0002	TDS external, burst, cadence and tone
_XTON		002	NT8D17 TDS Tone code
PCAD		O-(1)-255	500/2500/digital set ringing on recall or misoperation MCAD cadence
PBCS		i bb cc tt	Meridian 1 set ringing on recall or misoperation TDS cadence
_TDSH		0032	TDS external, burst, cadence and tone
_XTON		000	NT8D17 TDS Tone code
_XCAD		000	NT8D17 cadence code for FCAD

FTC Hardware Controlled Cadences

For systems with NT8D17 Conference/TDS cards, each feature requires a firmware cadence (XCAD) and tone (XTON). For other TDS cards, the ton and cadence is defined by prompt TDSH. See the alphabetical list of **prompt** for the default values.

REQ	NEW, CHG	Create or change
TYPE	FTC	Flexible Tones and Cadences
TABL	o-31	FTC table number
DFLT	o-31	Default FTC table. Use a copy this table to create and modify a new one
RING	<cr>	
HCCT	Yes	Change the TDS card controlled cadence tones
DIAL		Dial Tone
_TDSH	0004	TDS external, burst, cadence and tone
_XTON	004	NT8D17 TDS Tone code
_XCAD	000	NT8D17 cadence code for FCAD
SPCL		Special Dial Tone
_TDSH	0004	TDS external, burst, cadence and tone
_XTON	004	NT8D17 TDS Tone code
_XCAD	000	NT8D17 cadence code for FCAD
CDT		Control dial tone
_TDSH	0004	TDS external, burst, cadence and tone
_XTON	004	NT8D17 TDS Tone code
_XCAD	000	NT8D17 cadence code for FCAD
CFDT		Call Forward dial tone
TDSH	0004	TDS external, burst, cadence and tone
_XTON	0004	NT8D17 TDS Tone code
_XCAD	000	NT8D17 cadence code for FCAD
MWDT		Message Waiting Tone
_TDSH	0024	TDS external, burst, cadence and tone
_XTON	004	NT8D17 TDS Tone code
_XCAD	017	NT8D17 cadence code for FCAD

CFMW	Call Forward Message Waiting tone
_TDSH 0024	TDS external, burst, cadence and tone
_XTON 004	NT8D17 TDS Tone code
_XCAD 017	NT8D17 cadence code for FCAD
ACTN	Active feature dial tone
_TDSH 0024	TDS external, burst, cadence and tone
_XTON 004	NT8D17 TDS Tone code
_XCAD 000	NT8D17 cadence code for FCAD
BUSY	Busy tone
_TDSH 0017	TDS external, burst, cadence and tone
_XTON 007	NT8D17 TDS Tone code
_XCAD 016	NT8D17 cadence code for FCAD
RGBK	Ringback Tone
_TDSH 0035	TDS external, burst, cadence and tone
_XTON 005	NT8D17 TDS Tone code
_XCAD 031	NT8D17 cadence code for FCAD
ARBK	ACD Ring Again ringback tone
_TDSH 008D	TDS external, burst, cadence and tone
_XTON 011	NT8D17 TDS Tone code
_XCAD 002	NT8D17 cadence code for FCAD
FFCT	FFC Confirmation tone cadence
_TDSH 0004	TDS external, burst, cadence and tone
_XTON 004	NT8D17 TDS Tone code
_XCAD 000	NT8D17 cadence code for FCAD
LIMIT	ACD Log In Mode Tone for 500/2500 telephone sets
_TDSH i bb cc tt	TDS external, burst, cadence and tone
_XTON O-255	NT8D17 TDS Tone code
_XCAD O-255	NT8D17 cadence code for FCAD
NRMT	ACD Not Ready (NRDY) Mode Tones
_TDSH i bb cc tt	TDS external, burst, cadence and tone
_XTON O-255	NT8D17 TDS Tone code

_XCAD 0-255	NT8D17 cadence code for FCAD
AWUT	Automatic Wake-Up special error tone
_TDSH 0027	TDS external, burst, cadence and tone
_XTON 007	NT8D17 TDS Tone code
_XCAD 017	NT8D17 cadence code for FCAD
OVFL	Overflow Tone
_TDSH 0027	TDS external, burst, cadence and tone
_XTON 007	NT8D17 TDS Tone code
_XCAD 017	NT8D17 cadence code for FCAD
TEST	Test Tone
_TDSH 0008	TDS external, burst, cadence and tone
_XTON 007	NT8D17 TDS Tone code
_XCAD 017	NT8D17 cadence code for FCAD
HOWL 0027	Howler tone (default is overflow tone)
ERWT	Expensive Route Warning Tone
_TDSH 0003	TDS external, burst, cadence and tone
_XTON 003	NT8D17 TDS Tone code
_XCAD 000	NT8D17 cadence code for FCAD
ACFT	ACD call force tone
_TDSH 0003	TDS external, burst, cadence and tone
_XTON 003	NT8D17 TDS Tone code
_XCAD 000	NT8D17 cadence code for FCAD
TLP	Tone to last party
_TDSH 0003	TDS external, burst, cadence and tone
_XTON 007	NT8D17 TDS Tone code
_XCAD 000	NT8D17 cadence code for FCAD
TLPT (0)-30	Tone to last party timer in seconds. No tone = 0

Centralized Attendant Service Cadences

Systems with NT8D17 Conference/TDS cards require a firmware cadence (XCAD), a software cadence (CNDN) and tone (XTON) for each feature. Due to the finer resolution of the firmware cadence (5 ms) compared to the software (96/128 ms), the software cadence should be long enough to cover the full duration of the XCAD.

For example, to define a cadence of 0.1 s on, 0.1 s off, 0.1 s on, steady **off**

```
CDNC0020002000200000
END OFF
SPCL
```

The software cadence is then 0.3 s (600 ms). If the software precision is 128 ms, the software cadence is calculated as follows:

$$600 \text{ ms} / 128 = 4.6 = 5 \text{ (rounded up)}$$

$$128 \times 5 = 640$$

Entry to on phase = $640 / 5 = 0128$, and to define the cadence enter 0128 to prompt CDNC.

REQ	NEW, CHG	Create or change
TYPE	FTC	Flexible Tones and Cadences
TABL	o-31	FTC table number
DFLT	o-31	Default FTC table. Use a copy this table to create and modify a new one
RING	<cr>	
HCCT	<cr>	
CAST	Yes	Change Centralized Attendant Service tones
LDN		Listed Directory Number Tone
_TDSH	0346	TDS external, burst, cadence and tone
_XTON	000	NT8D17 TDS Tone code
_XCAD	024	NT8D17 cadence code for FCAD
_CDNC	016	MCAD table entry for this cadence
DIO		Dial "0" Recall Tone

_TDSH 0283	TDS external, burst, cadence and tone
_XTON 003	NT8D17 TDS Tone code
_XCAD 022	NT8D17 cadence code for FCAD
_CDNC 016	MCAD table entry for this cadence
HLDC	Hold Confirmation Tone
_TDSH 0346	TDS external, burst, cadence and tone
_XTON 000	NT8D17 TDS Tone code
_XCAD 024	NT8D17 cadence code for FCAD
_CDNC 016	MCAD table entry for this cadence
CPNC	Camp-on confirmation tone
_TDSH 0243	TDS external, burst, cadence and tone
_XTON 003	NT8D17 TDS Tone code
_XCAD 021	NT8D17 cadence code for FCAD
_CDNC 017	MCAD table entry for this cadence

Software Controlled Cadences

Systems with NT8D17 Conference/TDS cards require a firmware cadence (XCAD) and tone number (XTON). Refer to the **Conference/TDS** tone table.

REQ	NEW, CHG	Create or change
TYPE	FTC	Flexible Tones and Cadences
TABL	0-31	FTC table number
DFLT	0-31	Default FTC table. Use a copy this table to create and modify a new one
RING	<cr>	
HCCT	<cr>	
CAST	<cr>	
SCCT	Yes.	Change software controlled cadence tone definitions
CAMP		Camp-on tone
_TDSH 0003		TDS external, burst, cadence and tone
_XTON 003		NT8D17 TDS Tone code

<u>_XCAD</u> 000	NT8D17 cadence code for FCAD
<u>_CDNC</u> 017	MCAD table entry for this cadence
RPAW i bb cc tt	Radio paging warning tone
CLN 1-31	Length of camp-on tone burst in 96 or 128 ms increments
AOBT	Agent observe tone
<u>_TDSH</u> 0003	TDS external, burst, cadence and tone
<u>_XTON</u> 003	NT8D17 TDS Tone code
<u>_XCAD</u> 000	NT8D17 cadence code for FCAD
<u>_CDNC</u> 018	MCAD table entry for this cadence
INTU	Intrusion Tone
<u>_TDSH</u> 0003	TDS external, burst, cadence and tone
<u>_XTON</u> 003	NT8D17 TDS Tone code
<u>_XCAD</u> 000	NT8D17 cadence code for FCAD
<u>_CDNC</u> 019	MCAD table entry for this cadence
CWT	Call Waiting tone
<u>_TDSH</u> 0003	TDS external, burst, cadence and tone
<u>_XTON</u> 003	NT8D17 TDS Tone code
<u>_XCAD</u> 000	NT8D17 cadence code for FCAD
<u>_CDNC</u> 020	MCAD table entry for this cadence
OBKT	Observe Blocking Tone
<u>_TDSH</u> 0003	TDS external, burst, cadence and tone
<u>_XTON</u> 003	NT8D17 TDS Tone code
<u>_XCAD</u> 000	NT8D17 cadence code for FCAD
<u>_CDNC</u> 017	MCAD table entry for this cadence
OVRD	Override Tone
<u>_TDSH</u> 0003	TDS external, burst, cadence and tone
<u>_XTON</u> 003	NT8D17 TDS Tone code
<u>_XCAD</u> 000	NT8D17 cadence code for FCAD
<u>_CDNC</u> 018	MCAD table entry for this cadence

OHQ	Off Hook Queuing Tone
_ TDSH 0003	TDS external, burst, cadence and tone
_ XTON 003	NT8D17 TDS Tone code
_ XCAD 000	NT8D17 cadence code for FCAD
_ CDNC 003	MCAD table entry for this cadence
SRT	Automatic Set Relocation Tone
_ TDSH 0003	TDS external, burst, cadence and tone
_ XTON 003	NT8D17 TDS Tone code
_ XCAD 000	NT8D17 cadence code for FCAD
_ CDNC 021	MCAD table entry for this cadence
TMAT	Telephone Messaging Alert Tone
_ TDSH 0003	TDS external, burst, cadence and tone
_ XTON 003	NT8D17 TDS Tone code
_ XCAD 000	NT8D17 cadence code for FCAD
_ CDNC 022	MCAD table entry for this cadence
TMOT	Telephone Messaging OK Tone
_ TDSH 0003	TDS external, burst, cadence and tone
_ XTON 003	NT8D17 TDS Tone code
_ XCAD 000	NT8D17 cadence code for FCAD
_ CDNC 023	MCAD table entry for this cadence
TSUT	Tel Status Update Tone
_ TDSH 0003	TDS external, burst, cadence and tone
_ XTON 003	NT8D17 TDS Tone code
_ XCAD 000	NT8D17 cadence code for FCAD
_ CDNC 023	MCAD table entry for this cadence

Intercept Treatment Cadences (International)

Eight intercept source tones can be defined. These tones are entered in LD15 in response to the various intercept treatment prompts.

REQ	NEW, CHG, PRT	Create, change or print
TYPE	FTC	Flexible Tones and Cadences
TABL	O - 3 1	FTC table number
DFLT	o-31	Default FTC table. Use a copy this table to create and modify a new one
RING	<cr>	
H C C T	<cr>	
CAST	<cr>	
SCCT	<cr>	
SRC	Yes	Change Source Tones (SRC1-SRC8)
SRC1		Source Tone 1
_TDSH	0000	TDS external, burst, cadence and tone
_XTON	000	NT8D17 TDS Tone code
_XCAD	000	NT8D17 cadence code for FCAD
SRC2		Source Tone 2
_TDSH	0000	TDS external, burst, cadence and tone
_XTON	000	NT8D17 TDS Tone code
_XCAD	000	NT8D17 cadence code for FCAD
SRC3		Source Tone 3
_TDSH	0000	TDS external, burst, cadence and tone
_XTON	000	NT8D17 TDS Tone code
_XCAD	000	NT8D17 cadence code for FCAD
SRC4		Source Tone 4
_TDSH	0000	TDS external, burst, cadence and tone
_XTON	000	NT8D17 TDS Tone code
_XCAD	000	NT8D17 cadence code for FCAD
SRC5		Source Tone 5

_TDSH 0000	TDS external, burst, cadence and tone
_XTON 000	NT8D17 TDS Tone code
_XCAD 000	NT8D17 cadence code for FCAD
SRC6	Source Tone 6
_TDSH 0000	TDS external, burst, cadence and tone
_XTON 000	NT8D17 TDS Tone code
_XCAD 000	NT8D17 cadence code for FCAD
SRC7	Source Tone 7
_TDSH 0000	TDS external, burst, cadence and tone
_XTON 000	NT8D17 TDS Tone code
_XCAD 000	NT8D17 cadence code for FCAD
SRC8	Source Tone 8
_TDSH 0000	TDS external, burst, cadence and tone
_XTON 000	NT8D17 TDS Tone code
_XCAD 000	NT8D17 cadence code for FCAD
CFSN	Call forward all calls MCAD and tone code
_TDSH 0000	TDS external, burst, cadence and tone
_XTON 004	NT8D17 TDS Tone code
_XCAD 000	NT8D17 cadence code for FCAD
CPOQ	Call park or off-hook queueing MCAD and tone code
_TDSH 0000	TDS external, burst, cadence and tone
_XTON 003	NT8D17 TDS Tone code
_XCAD 000	NT8D17 cadence code for FCAD
RGAR	Ring again applied by another telephone MCAD and tone code
_TDSH 0000	TDS external, burst, cadence and tone
_XTON 004	NT8D17 TDS Tone code
_XCAD 000	NT8D17 cadence code for FCAD

RPCT	Confirmation tone replaced by announcement MCAD and tone code
_TDSH 0000	TDS external, burst, cadence and tone
_XTON 004	NT8D17 TDS Tone code
_XCAD 000	NT8D17 cadence code for FCAD
RGAB	Call to busy station, ring again allowed MCAD and tone code
_TDSH 0000	TDS external, burst, cadence and tone
_XTON 004	NT8D17 TDS Tone code
_XCAD 000	NT8D17 cadence code for FCAD
MWAN O-255 O-255	Message waiting MCAD and tone code
_TDSH 0000	TDS external, burst, cadence and tone
_XTON 004	NT8D17 TDS Tone code
_XCAD 000	NT8D17 cadence code for FCAD
DNDA	Do not disturb MCAD and tone code
_TDSH 0000	TDS external, burst, cadence and tone
_XTON 004	NT8D17 TDS Tone code
_XCAD 000	NT8D17 cadence code for FCAD
SSLK	Set status lockout MCAD and tone code
_TDSH 0000	TDS external, burst, cadence and tone
_XTON 004	NT8D17 TDS Tone code
_XCAD 000	NT8D17 cadence code for FCAD

Flexible Pulse Timers

REQ	NEW, CHG, PRT	Create, change or print
TYPE	FTC	Flexible Tones and Cadences
TABL	o-31	FTC table number
DFLT	o-31	Default FTC table. Use a copy this table to create and modify a new one
RING	<cr>	
HCCT	<cr>	
CAST	<cr>	
SCCT	<cr>	
SRC	<cr>	
PULS	<cr>	
P10	Yes	Codes for make/break ratio for 10 pps
ID1	256-(768)-1024	P10 interdigital pause in ms
ID2	256-(512)-1024	P20 interdigital pause in ms
IDD	256-(384/512)1024	DTMF interdigital pause in ms
RVDL	m-2	Reverse dial format, 0 = disabled

Flexible Dial Tone Detection data (International)

REQ	NEW, CHG, PRT	Create, change or print
TYPE	FTFD	Flexible Dial Tone Detection data
TABL	O-31	FTC table number
ACNO	1-4	Outgoing Access Code to be used (4 codes per table)
OACn	xxxx	Outgoing Access Code (1 to 4 digits)
DTPn	(Yes), No	Dial tone detector is reconnected immediately after outgoing access
CNT	(O) - 15	Number of digits outpulsed before dial tone detector reconnection
DGTS	xxxx	Outgoing Access Code digits (1-4)

Trunk barring access restrictions (International)

REQ	NEW, CHG, PRT	Create, change or print
TYPE	FTTD	Trunk barring access restrictions
TABL	O-31	FTC table number
ART	1-63	Access restriction table
DENY	xxx xxx ... ALL	Access restriction digits denied to Originating Trunk Connection (OTC)

Route access restrictions (International)

REQ	NEW, CHG, PRT	Create, change or print
TYPE	FTTD	Route access restrictions
TABL	O-31	FTC table number
CUST	(0)-99	Customer number
ROUT	(0)-511	Route number
ART	1-63	Access restriction table
DENY	xxx xxx ... ALL	Access restriction digits denied to Originating Trunk Connection (OTC)

Route category default table (International)

REQ	CHG, PRT	Change or print
TYPE	FTTD	Route category default table
TABL	O-31	FTC table number
COT	(0)-63	ART table number for COT, FX and WATS routes
DID	(0)-63	ART table number for DID routes
TIE	(0)-63	ART table number for ATVN, CAA, CAM, CSA and TIE routes
OTH	(0)-63	ART table number for ADM, DIC, MDM, PAGA and RCD routes

Default FCAD table

REQ	PRT	Print
TYPE	FCAD	Firmware Cadence Table
WCAD	000	Cadence number in the Master Cadence table (MCAD)
	CDNC =	00
	END =	off
	SPCL =	no
WCAD	001	Cadence number in the Master Cadence table (MCAD)
	CDNC =	0410080000000000000000000000000000000000
	END =	rept
	CYCS =	1
	SPCL =	no
WCAD	002	Cadence number in the Master Cadence table (MCAD)
	CDNC =	0308007603080076000000000000000000000000
	END =	rept
	CYCS =	1 2
	SPCL =	no
WCAD	003	Cadence number in the Master Cadence table (MCAD)
	CDNC =	0205000000000000000000000000000000000000
	END =	off
	SPCL =	no
WCAD	004	Cadence number in the Master Cadence table (MCAD)
	CDNC =	0102010202050819000000000000000000000000
	END =	rept
	CYCS =	1 2
	SPCL =	no

WCAD 005 Cadence number in the Master Cadence table (MCAD)
CDNC = 010001000
END = rept
CYCS = 1
SPCL = no

WCAD 016 Cadence number in the Master Cadence table (MCAD)
CDNC = 010001000
END = rept
CYCS = 1
SPCL = no

WCAD 017 Cadence number in the Master Cadence table (MCAD)
CDNC = 005000500
END = rept
CYCS = 1
SPCL = no

WCAD 018 Cadence number in the Master Cadence table (MCAD)
CDNC = 001000100
END = rept
CYCS = 1
SPCL = no

WCAD 019 Cadence number in the Master Cadence table (MCAD)
CDNC = 004000600
END = rept
CYCS = 1
SPCL = no

WCAD 020 Cadence number in the Master Cadence table (MCAD)
CDNC = 0015000
END = off
SPCL = no

WCAD 021 Cadence number in the Master Cadence table (MCAD)
 CDNC = 002000
 END = off
 SPCL = no

WCAD 022 Cadence number in the Master Cadence table (MCAD)
 CDNC = 00200020002000
 END = off
 SPCL = no

WCAD 023 Cadence number in the Master Cadence table (MCAD)
 CDNC = 006000
 END = off
 SPCL = no

WCAD 024 Cadence number in the Master Cadence table (MCAD)
 CDNC = 0020000000200000002000
 END = off
 SPCL = yes

WCAD 025 Cadence number in the Master Cadence table (MCAD)
 CDNC = 0200
 END = off
 SPCL = no

WCAD 026 Cadence number in the Master Cadence table (MCAD)
 CDNC = 005000
 END = off
 SPCL = no

WCAD 027 Cadence number in the Master Cadence table (MCAD)
 CDNC = 0400
 END = off
 SPCL = no

Alphabetical list of prompts

ACFT — ACD call force tone. ftc-13

When defining the hex codes for this tone, only the code for the frequency/level is required as the cadence is provided by software. Enter zero for the other values (e.g., TDSH = 0 0 0 xx, XTON = xxx, XCAD = 000).

Defaults:

TDSH = 0003

XTON = 003

XCAD = 000

ACNO 1-4 — Outgoing Access Code to be used (4 codes per table). ftc-p4

ACTN — Active feature dial tone. ftc-p4

Defaults

TDSH = 0024

XTON = 004

XCAD = 000

AOBT — Agent observe tone. ftc-13

Defaults:

TDSH = 0003

XTON = 003

XCAD = 000

CDNC = 018

This cadence repeats the last 8 on/off phases to allow for a special tone burst on the first cycle. For example, a cadence is defined as 3 s on, 3 s off, 1 s on, 3 s off. After the initial burst, the tone repeats in a 1 s on, 3 s off pattern. In order to repeat the initial 3 s burst, it must be entered as the first and last cycle because the first cycle is not repeated. In this case the cadence is defined as: 3 s on, 3 s off, 1 s on, 3 s off, 3 s on 3 s off.

ARBK — ACD Ring Again ringback tone. ftc-13

Defaults:

TDSH = 008D

XTON = 011

XCAD = 002

ART	1-63 — Access restriction table.	ftc-p2
AWUT	— Automatic Wake-Up special error tone.	mlwu-
	Defaults:	16
	TDSH = 0027	
	XTON = 007	
	XCAD = 017	
BUSY	— Busy tone.	ftc-13
	Defaults:	
	TDSH = 0017	
	XTON = 007	
	XCAD = 016	
CAMP	— Camp-on tone.	ftc-13
	Defaults:	
	TDSH = 0003	
	XTON = 003	
	XCAD = 000	
	CDNC = 017	
CAST	Yes, (No) — Change Centralized Attendant Service tones.	ftc-13
CDNC	O-255 — MCAD table entry for this cadence.	ftc-14
	This prompt occurs when defining a cadence in the Master Cadence Table (MCAD) and when defining specific cadences.	
	To define a cadence in MCAD see the description of the Master Cadence Table (MCAD) in this section.	
CDT	— Control dial tone.	ftc-13
	Defaults:	
	TDSH = 0004	
	XTON = 004	
	XCAD = 000	

CFDT	↔ Call Forward dial tone.	ftc-13
	Defaults: TDSH = 0014 XTON = 004 XCAD = 016	
CFMW	↔ Call Forward Message Waiting tone.	ftc-13
	Defaults: TDSH = 0024 XTON = 004 XCAD = 017	
CFSN	↔ Call forward all calls MCAD and tone code.	ftc-p6
	Defaults: TDSH = 0000 XTON = 004 XCAD = 000	
CLN	1-31 Length of camp-on tone burst in 96 or 128 ms increments. See prompt TMRK in LD17.	ftc-p1
CNT	(0)-15 ↔ Number of digits outpulsed before dial tone detector reconnection. Use “0” if digit counting is not required.	ftc-p4
COT	(O)-63 ↔ ART table number for COT, FX and WATS routes.	ftc-p2
CPNC	↔ Camp-on confirmation tone.	ftc-13
	Defaults: TDSH = 0243 XTON = 003 XCAD = 021 CDNC = 017	
CPOQ	↔ Call park or off-hook queuing MCAD and tone code.	ftc-p6
	Defaults: TDSH = 0000 XTON = 003 XCAD = 000	

CUST	(O)-99 – Customer number.	ftc-p2
CWT	– Call Waiting tone.	ftc-13
	Defaults:	
	TDSH = 0003	
	XTON = 003	
	XCAD = 000	
	CDNC = 020	
CYCS	x x x x x – On-off cycles (1 to 5) to be repeated.	ftc-14
	Only prompted is END = REPT. Default is no repeats.	
DBCS	– Distinctive cadence for Meridian 1 set ringing.	ftc-13
	Defaults:	
	TDSH = 0082	
	XTON = 002	
DCAD	0-(2)-15 – 500/2500/Digital set distinctive ringing MCAD table index.	ftc-13
	Enter the MCAD table index number for 500/2500 and digital sets. It is also used for Meridian 1 sets in systems with NT8D17 Conference/TDS cards.	
DENY	xxxx., ALL – Access restriction digits denied to Originating Trunk Connection (OTC).	ftc-p2
	Precede with “X” to remove (XALL, Xxxx).	
DFLT	O-31 – Default FTC table. Use a copy this table to create and modify a new one.	ftc-13
	Prompted for REQ = NEW only. Enter the FTC table number from which the new FTC table will be copied.	
DGTS	xxx – Outgoing Access Code digits (1-4).	ftc-p4
	The system waits for dial tone after these additional digits. This prompt repeats until <cr> is entered. Precede with “X” to remove.	

DIO	<p>→ Dial “0” Recall Tone.</p> <p>Defaults:</p> <p style="padding-left: 40px;">TDSH = 0283</p> <p style="padding-left: 40px;">XTON = 003</p> <p style="padding-left: 40px;">XCAD = 022</p> <p style="padding-left: 40px;">CDNC = 016</p>	ftc-13
DIAL	<p>→ Dial Tone.</p> <p>Defaults:</p> <p style="padding-left: 40px;">TDSH = 0004</p> <p style="padding-left: 40px;">XTON = 004</p> <p style="padding-left: 40px;">XCAD = 000</p>	ftc-13
DID	<p>(O)-63 → ART table number for DID routes.</p>	ftc-p2
DNDA	<p>→ Do not disturb MCAD and tone code.</p> <p>Defaults:</p> <p style="padding-left: 40px;">TDSH = 0000</p> <p style="padding-left: 40px;">XTON = 004</p> <p style="padding-left: 40px;">XCAD = 000</p>	ftc-p6
DTPn	<p>(Yes), No Dial tone detector is reconnected immediately after outgoing access.</p>	ftc-p4
END	<p>REPT, ON, OFF → End treatment for cadence (repeat, on or off).</p> <p>REPT = repeating cycles (defined by CYCS prompt)</p> <p>ON = end cadence on the “on” phase</p> <p>OFF = end cadence on the “off” phase</p>	ftc-14
ERWT	<p>→ Expensive Route Warning Tone.</p> <p>When defining the hex codes for this tone, only the code for the frequency/level is required as the cadence is provided by software. Enter zero for the other values (e.g., TDSH = 0 0 0 xx, XTON = xxx, XCAD = 000).</p> <p>Defaults:</p> <p style="padding-left: 40px;">TDSH = 0003</p> <p style="padding-left: 40px;">XTON = 003</p> <p style="padding-left: 40px;">XCAD = 000</p>	ftc-13

FFCT	– FFC Confirmation tone cadence.	ffc-15
	Defaults:	
	TDSH = 0004	
	XTON = 0004	
	XCAD = 0	
GBCS	– Meridian 1 Group Call Ring Cadence.	grp-13
	Defaults:	
	TDSH = 0082	
	XTON = 002	
GCAD	O-(1)-255 – 500/2500/Digital set Group Call ringing MCAD table index. Enter the MCAD table index number for 500/2500 and digital sets. It is also used for Meridian 1 sets in systems with NT8D17 Conference/TDS cards.	grp-14
HBCS	– Meridian 1 Held Call Reminder ring cadence.	ftc-13
	Defaults:	
	TDSH = 0002	
	XTON = 002	
HCAD	O-(3)-255 – 500/2500/Digital set Held Call reminder MCAD table index. Enter the MCAD table index number for 500/2500 and digital sets. It is also used for Meridian 1 sets in systems with NT8D17 Conference/TDS cards.	ftc-13
HCCT	Yes, (No) Change the TDS card controlled cadence tones.	ftc-13
HLDC	– Hold Confirmation Tone.	ftc-13
	Defaults:	
	TDSH = 0346	
	XTON = 000	
	XCAD = 024	
	CDNC = 016	
HOWL	i bb cc tt – Howler tone (default is overflow tone).	ftc-p4

IBCS	– Meridian 1 set distinctive Dial Intercom ringing TDS code.	ftc-13
	Defaults:	
	TDSH = 0012	
	XTON = 002	
ICAD	0-(5)-15 – 500/2500/Digital Dial Intercom distinctive ringing MCAD table index.	ftc-13
	Enter the MCAD table index number for 500/2500 and Digital sets. It is also used for Meridian 1 sets in systems with NT8D17 Conference/TDS cards.	
ID1	256-(768)-1024 – P10 interdigital pause in ms.	ftc-13
ID2	256-(512)-1024 – P20 interdigital pause in ms.	ftc-13
IDD	256-(384/512)1024 DTMF interdigital pause in ms.	ftc-13
	Default is 512 if 100 is the response to prompt DTRB in LD17. Otherwise, the default is 384.	
INTU	– Intrusion Tone.	ftc-13
	Defaults:	
	TDSH = 0003	
	XTON = 003	
	XCAD = 000	
	CDNC = 019	
	This cadence repeats the last 8 on/off phases to allow for a special tone burst on the first cycle. For example, a cadence is defined as 3 s on, 3 s off, 1 s on, 3 s off. After the initial burst, the tone repeats in a 1 s on, 3 s off pattern. In order to repeat the initial 3 s burst, it must entered as the first and last cycle because the first cycle is not repeated. In this case the cadence is defined as: 3 s on, 3 s off, 1 s on, 3 s off, 3 s on 3 s off.	
LDN	– Listed Directory Number Tone.	ftc-13
	Defaults:	
	TDSH = 0346	
	XTON = 000	
	XCAD = 024	
	CDNC = 016	

LIMIT	– ACD Log In Mode Tone for 500/2500 telephone sets. This is the tone setting for ACD services to 500/2500 agent sets.	bacd-16
MWAN	O-255 O-255 – Message waiting MCAD and tone code. Defaults: TDSH = 0000 XTON = 004 XCAD = 000	ftc-p6
MWDT	– Message Waiting Tone. Defaults: TDSH = 0024 XTON = 004 XCAD = 017	ftc-13
NBCS	– Normal cadence for Meridian 1 set ringing. Defaults: TDSH = 0032 XTON = 002	ftc-13
NCAD	(1)-255 – 500/2500/Digital set normal ringing MCAD index number. Enter the MCAD table index number for 500/2500 and digital sets. It is also used for Meridian 1 sets in systems with NT8D17 Conference/TDS cards.	ftc-13
NDR1 BCS	i bb cc tt – First DRNG TDS tones and cadences.	ftc-p7
NDR1 PBX	O-255 First DRNG cadence MCAD entry.	ftc-p7
NDR2 BCS	i bb cc tt – Second DRNG TDS tones and cadences.	ftc-p7
NDR2 PBX	O-255 – Second DRNG cadence MCAD entry.	ftc-p7
NDR3 BCS	i bb cc tt – Third DRNG TDS tones and cadences.	ftc-p7
NDR3 PBX	O-255 – Third DRNG cadence MCAD entry.	ftc-p7

NDR4 BCS	i bb cc tt – Forth DRNG TDS tones and cadences.	ftc-p7
NDR4 PBX	O-255 – Forth DRNG MCAD cadence.	ftc-p7
NRMT	– ACD Not Ready (NRDY) Mode Tones. This is the tone setting for the NRDY function within ACD services to 500/2500 agent sets. You must have Flexible Tones and Cadences supported for this feature to function properly.	bacd-16
OACn	xxxx – Outgoing Access Code (1 to 4 digits). Where, n = ACNO response. Precede with “X” to remove.	ftc-p4
OBKT	– Observe Blocking Tone. Defaults: TDSH = 0003 XTON = 003 XCAD = 000 CDNC = 017	ftc-13
OHQ	– Off Hook Queuing Tone. Defaults: TDSH = 0003 XTON = 003 XCAD = 000 CDNC = 003	ftc-13
OTH	(O)-63 ART table number for ADM, DIC, MDM, PAGA and RCD routes.	ftc-p2
OVFL	– Overflow Tone. Defaults: TDSH = 0027 XTON = 007 XCAD = 017	ftc-13

OVRD	– Override Tone.	ftc-13
	Defaults:	
	TDSH = 0003	
	XTON = 003	
	XCAD = 000	
	CDNC = 018	
	This cadence repeats the last 8 on/off phases to allow for a special tone burst on the first cycle. For example, a cadence is defined as 3 s on, 3 s off, 1 s on, 3 s off. After the initial burst, the tone repeats in a 1 s on, 3 s off pattern. In order to repeat the initial 3 s burst, it must be entered as the first and last cycle because the first cycle is not repeated. In this case the cadence is defined as: 3 s on, 3 s off, 1 s on, 3 s off, 3 s on 3 s off.	
P10	4, (8) – Codes for make/break ratio for 10 pps. 8 = North American make/break ratio (prompt S10P in LD97) 4 = other make/break ratio (prompt S10P in LD97) See also CLS P10 in LD14	ftc-13
PBCS	i bb cc tt – Meridian 1 set ringing on recall or misoperation TDS cadence.	ftc-p4
	Defaults	
	TDSH = 0032	
	XTON = 004	
	XCAD = 000	
PCAD	O-(1)-255 – 500/2500/digital set ringing on recall or misoperation MCAD cadence.	ftc-p4
PULS	Yes, (No) – Change Pulse Timers.	ftc-13
RBCS	– Meridian 1 Call Park Recall Ring Cadence.	ftc-14
	Defaults:	
	TDSH = 0032	
	XTON = 002	
RCAD	O-(1)-255 – 500/2500/Digital Call Park Recall ringing MCAD table index. It is also used for Meridian 1 sets in systems with NT8D17 Conference/TDS cards.	ftc-14

REQ	aaa – Action request. NEW = add new data to the system CHG = modify existing data PRT = print data OUT = remove data block END = terminate program activity	ftc-13
RGAB	– Call to busy station, ring again allowed MCAD and tone code. Defaults: TDSH = 0000 XTON = 007 XCAD = 000	ftc-p6
RGAR	– Ring again applied by another telephone MCAD and tone code. Defaults: TDSH = 0000 XTON = 004 XCAD = 000	ftc-p6
RGBK	– Ringback Tone. Defaults: TDSH = 0035 XTON = 005 XCAD = 031	ftc-13
RING	Yes, (No) – Modify the Ringing feature definitions.	ftc-13
ROUT	(0)-511 – Route number.	ftc-p2
RPAW	i bb cc tt – Radio paging warning tone.	ftc-p6
RPCT	– Confirmation tone replaced by announcement MCAD and tone code. Defaults: TDSH = 0000 XTON = 004 XCAD = 000	ftc-p6
RVDL	(O)-2 – Reverse dial format, 0 = disabled.	ftc-p2
SCCT	Yes, (No) – Change software controlled cadence tone definitions.	ftc-13

SPCL	– Special Dial Tone.	ftc-13
	When defining the hex codes for this tone, only the code for the frequency/ level is required as the cadence is provided by software. Enter zero for the other values (e.g., TDSH = 0 0 0 xx, XTON = xxx, XCAD = 000).	
	Defaults:	
	TDSH = 0004	
	XTON = 004	
	XCAD = 000	
SRC	Yes, (No) – Change Source Tones (SRC1-SRC8).	ftc-13
SRC1	– Source Tone 1.	ftc-13
	Defaults:	
	TDSH = 0000	
	XTON = 000	
	XCAD = 000	
SRC2	– Source Tone 2.	ftc-13
	Defaults:	
	TDSH = 0000	
	XTON = 000	
	XCAD = 000	
SRC3	Source Tone 3.	ftc-13
	Defaults:	
	TDSH = 0000	
	XTON = 000	
	XCAD = 000	
SRC4	– Source Tone 4.	ftc-13
	Defaults:	
	TDSH = 0000	
	XTON = 000	
	XCAD = 000	

SRC5	— Source Tone 5.	ftc-13
	Defaults:	
	TDSH = 0000	
	XTON = 000	
	XCAD = 000	
SRC6	— Source Tone 6.	ftc-13
	Defaults:	
	TDSH = 0000	
	XTON = 000	
	XCAD = 000	
SRC7	— Source Tone 7.	ftc-13
	Defaults:	
	TDSH = 0000	
	XTON = 000	
	XCAD = 000	
SRC8	— Source Tone 8.	ftc-13
	Defaults:	
	TDSH = 0000	
	XTON = 000	
	XCAD = 000	
SRT	— Automatic Set Relocation Tone.	ftc-13
	Defaults:	
	TDSH = 0003	
	XTON = 003	
	XCAD = 000	
	CDNC = 022	
SSLK	— Set status lockout MCAD and tone code.	ftc-p6
	Defaults:	
	TDSH = 0000	
	XTON = 004	
	XCAD = 000	

TABL	O-31 – FTC table number.	ftc-13
	FTC tables define the tones and cadences used on a specific trunk route. To associate a FTC table with a trunk route, enter the table number in response to prompt TTBL in LD16.	
TDSH	i bb cc tt – TDS external, burst, cadence and tone.	ftc-14
	Only prompted for systems equipped with Tone, and Digit cards.	
	<ul style="list-style-type: none"> i = internal (0) or external (1) source bb = burst cc = cadence tt = frequency/level 	
	Prompts with the response x xx xx xx define the burst, cadence and frequency/level respectively. Enter the decimal equivalent of the TDS Hex code defined in the Flexible TDS chapter.	
	The first field is usually 0. If an external source is used, the entry is 1 and the fourth field is 0-7 for the specified channel.	
	Note: The decimal equivalent of the HEX are entered with spaces between each digit. However, when printing the TDSH values, the equivalent HEX values are output without spaces.	
TEST	– Test Tone.	ftc-13
	When defining the TDS hex codes for this tone, only the code for the frequency/level is required as the cadence is provided by software. Enter zero for the other values (e.g., 0 0 0 xx).	
	Defaults:	
	<ul style="list-style-type: none"> TDSH = 0008 XTON = 008 XCAD = 000 	
TIE	(O)-63 – ART table number for ATVN, CAA, CAM, CSA and TIE routes.	ftc-p2
TLP	– Tone to last party.	ftc-p5
	Defaults:	
	<ul style="list-style-type: none"> TDSH = 003 XTON = 007 XCAD = 000 	
TLPT	(O)-30 – Tone to last party timer in seconds. No tone = 0.	ftc-p5

TMAT	-- Telephone Messaging Alert Tone.	ftc-13
	Defaults:	
	TDSH = 0003	
	XTON = 003	
	XCAD = 000	
	CDNC = 022	
TMOT	-- Telephone Messaging OK Tone.	ftc-13
	Defaults:	
	TDSH = 0003	
	XTON = 003	
	XCAD = 000	
	CDNC = 023	
TONES	ttt ttt -- NT8D17 tones (0-255) to be used with each phase of the cadence.	ftc-14
	The default is no tones (0 0 0 0 0).	
TSUT	-- Tel Status Update Tone.	ftc-13
	Defaults:	
	TDSH = 0003	
	XTON = 003	
	XCAD = 000	
	CDNC = 023	
TYPE	aaa -- Type of data.	ftc-13
TYPE	FCAD -- Firmware cadence table.	ftc-15
TYPE	FTC -- Flexible tone and cadences.	ftc-13
TYPE	MCAD -- Master cadence table.	ftc-14
USER	Yes, (No) -- Print customer and route users of the table(s).	ftc-13
WCAD	O-255 -- Cadence number in the Master Cadence table (MCAD).	ftc-14
	Cadence table 0 can be printed, but it can not be changed, here. Please consult with your Northern Telecom representative.	
WTON	Yes, (No) -- Define tones associated with the cadence.	ftc-14
	Only prompted for systems equipped with Conference/TDS/MF Sender cards.	

XCAD O-255 – NT8D17 cadence code for FCAD. **ftc-14**

Enter the FCAD table entry number.

XTON O-255 NT8D17 TDS Tone code. **ftc-14**

Enter the tone table index number. These tones are defined in firmware.

Flexible TDS cards

The flexible TDS cards provide 3 1 outputting tones (one in each time slot except zero) and can generate:

- cadences with 25 or 50 ms resolution
 - multi-tones per single request
- DTMF (DIGITONE) as 100 ms bursts or steady (for all TDSs) plus 50/50 ms (QPC609), 60/90 ms (QPC608) and 70/70 ms (QPC605, QPC606, QPC607, NTD9770)
- outputting control at 10 and 20 pps
- Meridian 1 tone ringing with standard or distinctive cadence
- test tone, where permitted, at 1020 Hz coded at 16 dB below overload.

The following Flexible TDS cards are available:

- QPC251/QPC609 (p-law) basic Flexible TDS, with tones for CAS
- QPC252 (p-law) Singapore, Malaysia, and Philippines
- QPC253/QPC606 (p-law) UK, Denmark, Middle East and Latin America
- QPC254/QPC605 (A-law) UK, Denmark, Norway and Finland
- QPC255 (p-law) Hong Kong with ACD
- QPC606 (y-law) CCITT for UK, Denmark, Norway and Finland
- QPC605 (A-law) CCITT for UK, Denmark, Norway and Finland
- QPC258 (p-law) Korea
- QPC259 (p-law) Hong Kong
- QPC607 (A-law) Switzerland
- QPC608 (A-law) Australia
- QPC611 (A-Law) with tones for CAS in Australia
- QPC262 (p-law) Japan
- NTD9770 (A-law) CCITT for Sweden

Note: When using the Announcement feature, all TDS cards must be QPC605 to QPC611, or NTD9770.

Enable/disable switch

The TDS card has an enable/disable switch on its faceplate. Prior to disabling and after enabling the card with the switch, use LD34 to disable or enable the card in software. The switch should always be set to the DIS position before inserting or removing the card from the network shelf.

Light Emitting Diode

An illuminated Light Emitting Diode (LED) on the faceplate of the TDS card indicates that the card is either faulty or disabled. Extinguish the LED by using LD34 when the enable/disable switch is set to ENB and there is no fault present.

Maintenance diagnostic

The TDS maintenance diagnostic (LD34) allows **TDSs** to be tested manually or automatically by the system. When the program is invoked manually, a complete test or certain parts of the test may be performed as required. LD34 is also used to enable and disable TDS cards in software See XI *Input/output guide* (553-3001-400).

CCITT TDS

The CCITT Tone and Digit Switch (QPC605, QPC606, NTD9770) provides an Interdigital Pause (IDP) of 70 ms between **Digitone** multi-frequency bursts (DTMF). The pause is controlled by a 32-digit buffer. The TDS also provides information tone as specified by the **CCITT**.

The CCITT TDS cards (QPC606 μ -Law, QPC605 A-Law, QPC611, and NTD9770 A-law) are backwards compatible, providing the same features as the QPC253/254 TDS. (However, they cannot be intermixed.)

Software data

LD17, Configuration Record, contains a prompt for fast DTMF Outpulsing Option (TDSO). The user responds YES to the prompt TDSO if the CCITT TDS is required (default is NO).

Compatibility

The fast DTMF outpulsing option requires the **CCITT** TDS cards (QPC605, QPC606, QPC611, NTD9770). If the fast DTMF outpulsing option is not required, then the QPC253/QPC254 (or QPC605/QPC606/NTD9770) or the QPC256/QPC257 (or CCITT QPC605/QPC606/NTD9770) TDS cards may be used.

Calculating tone and cadence hexadecimal codes

The following tables show the specific tones and cadences that can be generated by a TDS card. TDS cards can be preprogrammed with tones and cadences suitable for a particular country or group of countries. Partial Hexadecimal (HEX) codes are provided for each of the four available functions (tone, ringing, cadence and burst). One partial HEX code for tone must be combined with one for ringing, cadence or burst to produce a complete HEX code. The decimal equivalent of the HEX code is then entered at prompt TSDH in LD56.

Note: To convert a HEX number to its decimal equivalent, the HEX digits 0-9 remain unchanged and the HEX digits A-F are replaced with the decimal numbers 10-15.

Example

For a specific application of busy tone, a suitable tone is provided by the partial HEX code XXXD, and a suitable cadence for busy tone is provided by the partial HEX code 002X. The partial HEX codes combine to produce HEX code 0 0 2 13 which is entered in software.

Note: The system prints out the value in HEX. In the above example the print out is "002D".

Cadences

Some tones have software controlled cadence (intrusion tone, call-waiting tone, override tone), identified in the Data Administration NTP for the applicable generic and release. In these cases the actual cadence is entered in software as a whole number which represents multiples of 96 ms. The cadences given in the table for these tones represent the default values for a particular tone on a particular TDS.

Tone levels

To estimate the absolute level of tones on lines or trunks, the dB below overload level must be compared to the overload level of the line or trunk card used. The overload level for the line or trunk card is obtained from the descriptive NTP for that card.

Example

500/2500 line cards description and operation (553-2201-183) lists the overload level of a line card as +2 dBm. A tone with a level of 16 dB below overload leaves the card at -14 dBm.

Notes about the tables

The following notes apply to all the tables that follow, except where indicated.

Note 1: Levels are given in dB below overload.

Note 2: Actual programmed frequencies vs. nominal frequencies are $F(\text{programmed}) = F(\text{nom}) \times (4001399)$.

NTS9770C tones and cadences (Part 1 of 2)

Partial HEX code	Frequency in Hz	Level	Remarks
xxx0		—	No tone
xxx1	Info. tone	29	Number unobtainable
xxx2	553-667	14.5	10 Hz Meridian 1 warble, standard cadence, distinctive
xxx3	1400	29	Warning tone for paging, override, call waiting for PBX telephones (Burst)
xxx4	1400	23	Intrusion
xxx5	420	13	Dial tone and special dial tone, camp on, control dial tone, call forward dial tone, ringback, busy, congestion tone
xxx7	420	19	Busy, ringback
xxxA	1020	13	Test tone
xxxD	350+440	16	Message waiting, call forward, message waiting

NTS9770C tones and cadences (Part 2 of 2)

Partial HEX code	Cadence in ms (On-Off-On-Off.. .)	Function
000x	Steady	Dial tone, special dial tone, override, warning tone for paging, test tone, no tone
001x	250-250	Busy
002x	250-750	Congestion tone
003x	1100-4900	Ringback; 10 Hz Meridian 1 warble (standard cadence)
004x	350-25	Call forward: dial tone, CF message waiting
005x	550-50	Control dial tone
020x	200-550-200 [1 5000]	Call waiting for PBX telephones (burst), camp on
024x	100-[1 500]	Intrusion (Barge-in)
02Cx	350-25-350-25-350-1 150	Number unobtainable
038x	350-250-350-4950	Distinctive ringing (10 Hz)

QPC251/QPC609 tones and cadences (Part 1 of 2)

Partial HEX code	Frequency in Hz	Level	Remarks
xxx0	---	—	No Tone
xxx1	350+440	23	Dial Tone #1 (low)
xxx2	533/666@10Hz	23	10 Hz Meridian 1 warble
xxx3	440	23	Misc. Tone#1
xxx4	350+440	19	Dial Tone #1 (standard)
xxx5	440+480	25	Audible Ringback #1
xxx6	480	23	High Tone #1
xxx7	480+620	30	Low Tone #1
xxx8	1020	16	Test Tone
xxxA	600	23	Dial Tone #2 (low)
xxxC	600	16	Dial Tone #2 (standard)
xxxD	480+440	22	Audible Ringback #2
xxxE	480+350	23	High Tone #2
xxxF	440+620	24	Low Tone #2

QPC251/QPC609 tones and cadences (Part 2 of 2)

Partial HEX code	Cadence in ms (On-Off-On-Off...)	Function
003x		Ringling Req., Phase 5
008x	1650-350	AUTOVON ringing req.
00cx	500-500-1000-4000	Distinct ringing req. (QPC609D only)
000x	Steady ON	Cadences
001x	500-500	
002x	250-250	
004x	50-50	
005x	200-300	
020x	750 ON then OFF	Burst #1
024x	100 ON then OFF	Burst #2
028x	100-1 00 x 3 then ON	Burst #3
02Cx	300 ON then OFF	Burst #4
0346	100@480, 100@440, 100@480 then OFF	Burst #5

QPC252A tones and cadences

Partial HEX code	Frequency in Hz	Level	Remarks
xxx0			No Tone
xxx1	350+440	19	
xxx2	533/666@10 Hz	23	10 Hz Meridian 1 warble
xxx3	400	25	
xxx4	400	19	
xxx5	400	14	
xxx6	400+450	14	
xxx7	350+440	16	
xxx8	1020	16	Test tone
xxx9	533/666@20Hz	23	20 Hz Meridian 1 warble
xxxA	440+480	25	
xxxB	480+620	30	
xxxc	440	23	
xxxD	480	23	
Partial HEX code	Cadence in ms (On-Off-On-Off...)	Function	
003x	400-200-400-2000	Ringing	
008x	2000-4000		
000x	Steady ON	Cadences	
001x	2800-200		
002x	500-500		
004x	400-350-225-525		
005x	250-250		
006x	750-750		
020x	250-l 25-250 then OFF	Bursts	
028x	125-l 25 x 3 then ON		

QPC252B tones and cadences

Partial HEX code	Frequency in Hz	Level	Remarks
xxx0	---	—	No tone
xxx1	350+440	19	
xxx2	553/666@10 Hz	23	10 Hz Meridian 1 warble
xxx3	400	25	
xxx4	400	19	
xxx5	400	14	
xxx6	400+450	14	
xxx7	400	11	
xxx8	1020	16	Test tone
xxx9	533/666@20Hz	23	20 Hz Meridian 1 warble
xxxA	440+480	25	
xxxB	480+620	30	
xxxC	440	23	
xxxD	400@50Hz	14	Modulated at 50 Hz

Partial HEX code	Cadence in ms (On-Off-On-Off...)	Function
003x	400-200-400-2000	Ringing
008x	2000-4000	
000x	Steady ON	Cadences
001x	2500-500	
002x	500-500	
004x	400-350-225-525	
005x	250-250	
006x	750-750	
020x	250-l 25-250 then OFF	Bursts
028x	125-l 25 x 3 then ON	

QPC253-254 tones and cadences

Partial HEX code	Frequency in Hz	Level	Remarks
xxx0	—		No tone
xxx1	350+440	17	
xxx2	553/666@10 Hz	23	Meridian 10 Hz warble
xxx3	400	17	
xxx4	1400	26	
xxx5	440	23	
xxx6	400+450	17	
xxx7	420	9	
xxx8			Not used
xxx9	533/666@20Hz	23	Meridian 20 Hz warble
Partial HEX code	Cadence in ms (On-Off-On-Off...)		Function
003x	425-225-425-2125		Ringing
038x	950-3850		
000x	Steady ON		Cadences
001x	350-350		
002x	250-250		
004x	600-50		
005x	500-500		
033x	200-300-200-300-200-800		
037x	425-375-250-550		
03Fx	300-300		
020x	250-l 25-250 then OFF		Bursts
024x	25 then OFF		
028x	125-l 25 x 3 then ON		

QPC255 tones and cadences

Partial HEX code	Frequency in Hz	Level	Remarks
xx3	400	19	Dial Tone
xx4	350+400	15	Dial Tone
xx5	440+480	15	Audible Ringback #2
xx7	480+620	15	Audible Ringback #1
xx8	1020	16	Test tone
xxxA	440+480	25	Audible Ringback #3
xxxB	480+620	30	Low tone #2
xxxc	440	23	Misc. Tone #2
xxxD	400@50Hz	14	Ringback #4 (50Hz)
Partial HEX code	Cadence in ms (On-Off-On-Off...)	Function	
008x	425-225-425-2125	Ringing: USA, Phases A-C	
038x	950-3850	BPO-Hong Kong, Phases a-e	
000x	Steady ON	Bursts	
001x	500-500		
080x	1 00ms. Digitone		
090x	50 ms. Digitone		
084x	500-500		

QPC255C tones and cadences

Partial HEX code	Frequency in Hz	Level	Remarks
xx3	400	19	Dial tone
xx4	350+440	15	Dial tone
xx5	440+480	19	Audible ringback #2
xx6	480	19	Miscellaneous tone
xx7	480+620	19	Audible ringback #1
xx8	1020	16	Test tone

Partial HEX code	Cadence in ms (On-Off-On-Off...)	Function
000x	Steady ON	Bursts
001x	500-500	Tone interruption
002x	Steady ON	
003x	400-200-400-3000	BPO for Hong Kong, Phases a-e
004x	50-50	
005x	250-250	
006x	750-750	
008x	2000-4000	North America, Phases A-C
024x	100 then OFF	Burst #1
028x	100-l 00-l 00 then OFF	Burst #2
02Cx	300 then OFF	Burst #3
0346	100@480, 100@440, 100@480 then OFF	Burst #4

QPC258 tones and cadences

Partial HEX code	Frequency in Hz	Level	Remarks
xxx1	390	17	intrusion tones
xxx2	553/666@10Hz	23	10 Hz Meridian 1 warble
xxx3	490	17	
xxx4	350+440	17	Dial Tone
xxx5	440+480	17	Ringback
xxx6	590	17	
xxx7	480+620	17	Busy/Overflow/Unobtainable
xxx8	820	7	Test tone
xxxA	553/666@20Hz	23	20 Hz Meridian 1 warble
xxxC	440	23	Miscellaneous

Partial HEX code	Cadence in ms (On-Off-On-Off.. .)	Function
		Ringing
008x	1000-2000	Std, phase A-C
003x	400-200-400-200	Distinct ph a-e
		Bursts
341 x	500-500-1500 then OFF	Intrusion warning
028x	150-l 50 x 3 then ON	Special dial tone
080x	100	Digitone
090x	50	Digitone
088x	1 Opps, 67% break	Dial pulsing
084x	10pps, 61% break	Dial pulsing
08Cx	20pps, 67% break	Dial pulsing
		Interruptions:
005x	1000-250	Dial tone
002x	500-500	Busy tone
001x	300-200	Overflow tone
004x	150-250-l 50-1 600	Number unobtainable

QPC259 tones and cadences

Partial HEX code	Frequency in Hz	Level	Remarks
xxx0	—	—	Silence
xxx1	350+440	15	Dial tone
xxx2	5331666	23	Standard ringing
xxx3	400	25	intrusion tone
xxx4	400	19	Call waiting tone
xxx5	480+620	15	Busy/unobtainable tone
xxx6	440+480	15	Ringback tone
xxx8	1020	16	Test tone
Partial HEX code	Cadence in ms (On-Off-On-Off...)	Function	
000x	—	Steady tone	
002x	500-500	Busy	
003x	400-200-400-3000	Ringback	
008x	2000-4000	Distinctive BCS ringing	
028x	500-500 x 3 then ON	Special dial tone	

QPC262 tones and cadences

Partial HEX code	Frequency	Level	Remarks
xx2	553/666@10Hz	23	10 Hz Meridian 1 warble
xx4	440	19	Dial tone
xx5	400@20Hz, 85%		Ringback tone
xx8	1020	18	Test tone
xxxc	440	21	Miscellaneous tone
Partial HEX code	Cadence in ms (On-Off-On-Off...)	Function	
001x	500-250	Overflow tone	
002x	500-500	Busy tone	
003x	400-200-400-2000	Distinctive ringing	
005x	1000-500	Spare	
006x	250-250	Dial tone	
008x	1000-2000	Ringing	
028x	125-l 25 x 3 then ON	Special dial tone	
080x	100 ms burst	Digitone	
084x	10 pps, 67% break	Dial pulse	
088x	10 pps, 67% break	Dial pulse	
08Cx	20 pps, 67% break	Dial pulse	
090x	50 ms burst	Dioitone	

QPC605-606 tones and cadences

Values for cadences are the same as for the QPC253-54. **Digitone** duration may be 70ms or 100ms.

Partial HEX sode	Frequency in Hz	Level	Remarks
xxxC	350+440	17	Dial tone, UK
xxxA	400+450	17	Audible ringback, UK
xxxD	400	17	Busy tone, UK
xxx4	1400	26	Special tone, UK
xxx5	440	23	Miscellaneous tone 1, UK
xxxE	420	9	Miscellaneous tone 2, Denmark, Norway, Finland
xxx2	553/666@10Hz	21	10 Hz Meridian 1 warble, all
xxxF	553/666@20Hz	21	20 Hz Meridian 1 warble, all
xxx1	950	12	Information tone
xxx3	1400	12	Information tone
xxx6	1800	12	Information tone

QPC607 tones and cadences (Part 1 of 2)

Partial HEX code	Frequency in Hz	Level	Remarks
xxx5	420	8	Dial tone, equipment busy, special dial, ringing tone, busy tone, confirmation
xxx2	553/666@10Hz	23	10 Hz Meridian 1 warble
xxxF	533/666@20Hz	23	20 Hz Meridian 1 warble
xxx3	490	17	
xxxD	380	8	Special dial tone
xxx1	950	13	Information tones
xxx3	1400	13	
xxx6	1800	13	
xxx4	1400	32	Warning tone, intrusion tone
xxxC	440	23	Misc. tone
xxxA	820	7	Test tone
xxx7	850	8	Confirmation tone
xxxE	420	32	Call waiting

QPC607 tones and cadences (Part 2 of 2)

Partial HEX code	Cadence in ms (On-Off-On-Off...)	Function
002x	500-500	Interruptions: Busy tone
009x	200-200	Equipment busy
		Bursts:
020x	300-300-300-1100	Information
0245	200-200-200-200	Confirmation
080x	100	Digitone
090x	50	Digitone
088x	1 Opps, 49% break	Dial pulsing
084x	1 Opps, 61.6% break	Dial pulsing
08Cx	20pps, 61.8% break	Dial pulsing
028x	750-750	Special dial tone
008x	1050-3750	Internal ringing
003x	350-350-350-3750	External ringing

QPC608 tones and cadences

Partial HEX code	Frequency in Hz	Level	Remarks
xxx1	420@25 Hz	12	Ringback tone
xx2	553/666@10Hz	16.5	10 Hz Meridian 1 warble
xx3	420	22	Congestion tone
xx4	350+440	15	Dial tone
xx5	1400	19	Recording tone
xx6	420	12	Busy, overflow, unobtainable
xxxA	820	14	Test tone
xxxc	420	25	Intrusion tone
xxxD	400	19	Override tone
xxxE	400	12	Miscellaneous
xxxF	533/666@20Hz	16.5	20 Hz Meridian 1 warble
Partial HEX code	Cadence in ms (On-Off-On-Off...)	Function	
001 x	400-400	Tone interrupt #1	
002x	250-250 & 250-275	Tone interrupt #2	
003x	425-225-425-2125	UK ring	
004x	2650-550	Tone interrupt #3	
005x	500-500 & 475-475	Tone interrupt #4	
020x	250-l 25-l 50 then OFF	Burst #1	
024x	375-375	Burst #2	
028x	125-l 25 x 3 then ON	Burst #3	
033x	200-275-200-275-200-775	Tone interrupt #5	
038x	950-3850	Denmark/Norway/Finland Ringing	
03Fx	300-300	Tone interrupt #7	

QPC611 tones and cadences (Part 1 of 2)

Partial HEX code	Frequency in Hz	Level	Remarks
000	—	—	No tone
001	420 x 25	12	Ringback tone
002	(553+666) x 10	16.5	10 Hz Meridian 1 Ringing
00F	(553+666) x 20	16.5	20 Hz Meridian 1 Ringing
003	1400	19	Recording tone
004	480	22	Centralized Attendant Service (cas) tone
005	420	22	Congestion tone
006	420	25	Intrusion warning tone
007	350+440	15	Dial tone
OOA	820	14	Test tone
ooc	420	12	Busy, over-flow, number unobtainable tone
00D	400	19	Override tone
00E	400	12	Miscellaneous tone

Digitone keypad key tones			
Designation	Frequency	Designation	Frequency
Key 1	700+1210	Key 9	850+1480
Key 2	700+1340	Key 0	940+1340
Key 3	700+1480	Key *	940+1210
Key 4	770+1210	Key #	940+1480
Key 5	770+1340	Key A	700+1630
Key 6	770+1480	Key B	770+1630
Key 7	850+1210	Key C	850+1630
Key 8	850+1340	Key D	940+1630

Level of low group DTMF tones (700, 770, 850, 940 Hz) are 17 db below overload.
 Level of high group DTMF tones (1210, 1340, 1480, 1630 Hz) are 15 db below overload.
 Actual programmed frequencies are: F (programmed) = F (nominal x 400/399)

QPC611 tones and cadences (Part 2 of 2)

Partial HEX code	Cadence in ms (On-Off-On-Off...)	Function
01x	400-400	Tone interrupt #1
02x	50-50	CAS
03x	475-225-425-2125	UK ring
04x	2650-550	Tone interrupt #3
05x	500-500 & 475-475	Tone interrupt #4
30c	375-375	Burst #1
	60 or 100 (optional)	Digitone burst
	10 pps, 67% break, State 4	Dial pulsing
	10 pps, 67% break, State 8	Dial pulsing
	20 pps, 67% break, State C	Dial pulsing
38x	95-3850	Denmark, Norway, Finland, (phases a-e) ring
24x	—	CAS burst; 0.1 sec ON-steady OFF
28x	—	CAS burst; 0.1 sec ON-0.1 sec OFF-0.1 sec
344	480-420-480-22	CAS burst; 0.1 sec 480 Hz— 0.1 sec 420 Hz -0.1 sec 480 Hz-steady OFF
2cx		CAS burst; 0.3 sec ON then steady OFF

NT8D17 Conference/TDS tone tables

This chapter lists the NT8D 17 Conference/TDS tones. The first table provides the complete list of tones. Other tables describe tones provided by other TDS cards and the equivalent NT8D17 tones.

Note 1: Overload level = +3.17 dBm0 p-law, +3.14 dBm0 A-law.

Note 2: Define the tone by entering the tone number from Table 15 in response to the prompt XTON in LD56. XTON 1 to 104 are p-law tones, XTON 105 and higher are A-law tones.

Note 3: When translating level below overload into dBm at the PE interface:

“x” dB below overload + overload level - D/A loss of PE = “y” dBm.

For example: XTON 3: 440 Hz @ -23 dB below overload results in • 22.33 dBm at the North American NT8D09 Analog Message Waiting Line Card. Since D/A = +2.5 dB loss; then $-23 + 3.17 - 2.5 \approx -22.33$ dBm.

NT8D17 Conference/TDS tones (Part 1 of 6)

Tone (XTON)	Tone frequency	Level dB below overload	Comments
0	No tone (silent)		
1	3501440	-23/-23	
2	(533+566) x 10	-23	10 Hz Meridian 1 warble
3	440	-23	
4	3501440	-19/-19	
5	440/480	-25/-25	
6	480	-23	
7	4801620	-30	
8	1020	-16	
9	600	-23	
10	600	-16	
11	4401480	-22/-22	
12	3501480	-23/-23	
13	440/620	-24/-24	
14	940/1 630	-12/-10	DTMF digit D
15	700/1210	-12/-10	DTMF digit 1
16	700/1340	-12/-10	DTMF digit 2
17	700/1 480	-12/-10	DTMF digit 3
18	770/1210	-12/-10	DTMF digit 4
19	77011340	-12/-10	DTMF digit 5
20	770/1 480	-12/-10	DTMF digit 6
21	850/1 210	-12/-10	DTMF digit 7
22	850/1 340	-12/-10	DTMF digit 8
23	850/1 480	-12/-10	DTMF digit 9
24	940/1 340	-12/-10	DTMF digit 0
25	940/1210	-12/-10	DTMF digit *

NT8D17 Conference/TDS tones (Part 2 of 6)

Tone (XTON)	Tone frequency	Level dB below overload	Comments
26	940/1 480	-12/-10	DTMF digit #
27	700/1 630	-12/-10	DTMF digit A
28	770/1 630	-12/-10	DTMF digit B
29	850/1 630	-12/-10	DTMF digit C
30	10 pps dialpulse, 56.25% break		
31	10 pps dialpulse, 62.25% break		
32	20 pps dialpulse, 62.5% break		
33	400	-19	
34	[400 * (20@85%)]	-19	
35-50	same as tones 14-29	-17/-15	
51	10 pps dialpulse, 67.5% break		
52	20 pps dialpulse, 68.5% break		
53	1300/1 500	-13/-13	MF digit 0
54	700/900	-13/-13	MF digit 1
55	700/1 100	-13/-13	MF digit 2
56	900/1 100	-13/-13	MF digit 3
57	700/1 300	-13/-13	MF digit 4
58	900/1 300	-13/-13	MF digit 5
59	1100/1 300	-13/-13	MF digit 6
60	700/1 500	-13/-13	MF digit 7
61	900/1 500	-13/-13	MF digit 8
62	1100/1500	-13/-13	MF digit 9
63	700/1 700	-13/-13	MF digit A
64	900/1 700	-13/-13	MF digit B
65	1100/1 700	-13/-13	MF digit C
66	1300/1 700	-13/-13	MF digit D

NT8D17 Conference/TDS tones (Part 3 of 6)

Tone (XTON)	Tone frequency	Level dB below overload	Comments
67	1500/1 700	-13/-13	MF digit E
68	400	-11	
69	400	-14	
70	400x50	-14	
71	(533+666) x 20	-23	20 Hz Meridian 1 warble
72	20 pp, dialpulse, 52% break		
73	3501440	-15/-15	
74	480/620	-15/-15	
75	4401480	-15/-15	
76	400	-25	
77	4001450	-14/-14	
78	4801620	-19/-19	
79	4401480	-19/-19	
80	480	-19	
81	420	-9	
82	440	-29	
83	10 pps dialpulse, 61% break		
84	3501440	-17/-17	
85	4001450	-17/-17	
86	400	-17	
87	1400	-26	
88	950	-12	
89	1400	-12	
90	1800	-12	
91	470	0	
92	940	0	

NT8D17 Conference/TDS tones (Part 4 of 6)

Tone (XTON)	Tone frequency	Level dB below overload	Comments
93	1300	0	
94	1.500	0	
95	1880	0	
96-1 00	TBD		
101	600	-19	
102	800	-19	
103	1400	-23	
104	820	-7	
105	350/440	-17/-17	
106	400/1450	-17/-17	
107	1400	-26	
108	440	-23	
109	420	-9	
110	950	-12	
111	1400	-12	
112	1800	-12	
11 3-128	same frequencies as 14-29	-12/-10	DTMF digits
129	350/1440	-22/-22	
130	400	-19	
131	400	-25	
132	400/1450	-22/-22	
133	1400	-15	
134	950	-19	
135	1400	-20	
136	1800	-20	
137	420	-19	

NTSD17 Conference/TDS tones (Part 5 of 6)

Tone (XTON)	Tone frequency	Level dB below overload	Comments
138-l 53	same frequencies as 14-29	-18/-17	DTMF digits
154	(533+666) x 10	-23	10 Hz Meridian 1 warble
155	(533+666) x 20	-23	20 Hz Meridian 1 warble
156	400	-12	
157	820	-14	
158	420	-12	
159	420	-25	
160	420 x 25	-12	
161	(533+666) x 10	-16.5	10 Hz Meridian 1 warble
162	(533+666) x 20	-16.5	20 Hz Meridian 1 warble
163	420	-22	
164	480	-22	
165	330	-11	
166	3301440	-11/-14	
167	1700	-19	
168	440	-14	
169	380	-8	
170	1400	-32	
171	820	-7	
172	850	-8	
173	420	-32	
174	10 pps dialpulse, 50% break		
175	420	-6	
176	420	-2	
177	1020	-13	
178	1800	-17	

NTSD17 Conference/TDS tones (Part 6 of 6)

Tone (XTON)	Tone frequency	Level dB below overload	Comments
179	1400	-23	
180	950	-29	
181	1400	-22	
182	1800	-29	
183	950	-22	
184	470	0	
185	940	0	
186	1880	0	
187	400	-22	
188	420 x 25	-17	
189	950	-16	
190	950	-25	
191-206	same frequencies as 14-29	-9/-7	DTMF digits
207	420	-10	
208	420	-8	
209	420	-4	
210	1400	-18	
211	1400	-9	
212	350/420	-9/-9	
213	420	-14	
214	450	-12	
215	450	-22	
216	820	-16	
217	350/420	-14/-14	
218-233	same frequencies as 14-29	-14/-12	DTMF digits

Australia

These tones are based on QPC611, QPC608 and QPC261 A-law and are the same as the QPC611 without the CAS tone.

Purpose	NT8D17 tone (XTON)
Dial, special dial tone	105
10 Hz Meridian 1 warble	161
20 Hz Meridian 1 warble	162
Busy, congestion, number unobtainable, overflow tones	158
Intrusion, (warning, busy verify, barge-in)	159
Override	130
Ringback	160
Camp-on, call waiting	156
Test tone	157
Congestion	163
Recording	135
CAS tone	164
DTMF tones	138-153
Dial pulsing	51, 72

Belgium (based on NTD9521B A-law)

Purpose	NT8D17 tone (XTON)
Dial tone	105
Audible ringback	106
Override (congestion) tone	130
Intrusion (warning, busy verify), call waiting tones	133
Misc. tone #1	168
Dial, special dial, busy (overflow), number unobtainable, ringback tones	109
10 Hz Meridian 1 warble	154
20 Hz Meridian 1 warble	155
Test tone	157
Special information tones	110-112
DTMF tones	138-153
Dial pulsing	83, 51, 72

Belgium A-law (new)

Purpose	NT8D17 tone (XTON)
Ringback, immediate ringback, busy	158
Ringback, immediate ringback, busy	207
Ringback, immediate ringback, busy	208
Ringback, immediate ringback, busy	209
Ringback, immediate ringback, busy	176
Barge-in #1 , replace receiver #1	111
Barge-in #2, replace receiver #2	210
Barge-in #3, replace receiver #3	211
DTMF tones	191-206
Dial pulsing	51

Brazil (based on NTD9520B A-law)

Purpose	NT8D17 tone (XTON)
Dial tone	105
Audible ringback	106
Busy tone	130
Special dial tone	107
Misc. tone #1	168
Dial, busy, number unobtainable (overflow), ringback, intrusion (barge-in, busy verify), distinctive ringback, call waiting, camp-on, override tones	109
10 Hz Meridian 1 warble	154
20 Hz Meridian 1 warble	155
Test tone	157
DTM F tones	138-i 53
Dial pulsing	83, 51, 72

CCITT A-law (based on QPC605 A-law)

This is used in Italy, United Kingdom, Norway and Finland replacing the QPC254 and QPC257; includes **NTD9870**.

Purpose	NT8D17 tone (XTON)
Dial, special dial tone	105
Ringback	106
Busy (OVFL), number unobtainable, override, congestion tones	130
intrusion, (warning, busy verify, barge-in) tone	107
Call waiting, camp-on, override tones	108
Dial, special dial, busy (OVFL), number unobtainable, ringback tones	109
10 Hz Meridian 1 warble	154
20 Hz Meridian 1 warble	155
Special information tones	110,111, 112
DTMF tones	138-153 *
Dial pulsing	83, 51, 72

CCITT Announcement TDS (based on QPC606 y-law)

The QPC606 card replaces QPC253 and QPC256.

Purpose	NT8D17 tone (XTON)
Dial, special dial tone	84
Ringback	85
Busy (OVFL), number unobtainable, override, congestion tones	86
Intrusion (warning, busy verify, barge-in) tones	87
Call waiting, camp-on, override tones	3
Dial, special dial, busy (OVFL), number unobtainable, ringback	81
10 Hz Meridian 1 warble	2
20 Hz Meridian 1 warble	71
Information tone	88, 89, 90
DTMF tones	35-50
Dial pulsing	83, 51, 72

China (based on QPC610 A-law)

Purpose	NT8D17 tone (XTON)
Dial, conference dial, special dial tone, busy, ringback, vacant number, override, overflow congestion tones	214
Call waiting, camp-on, toll announcement tones	215
Intrusion (warning, busy verify), acknowledgment tones	183
Howler tones	184-1 86
Dial, conference dial, special dial tone, busy, ringback, vacant number, override, overflow congestion tones	156
Call waiting, camp-on, toll announcement tones	187
10 Hz Meridian 1 warble	154
20 Hz Meridian 1 warble	155
Test tone	216
Misc. tone	105
Reminding tone	179
DTMF tones	113-128
Dial pulsing	31, 72

Finland A-law

Purpose	NT8D17 tone (XTON)
Dial, special dial tone, busy, ringback tones	109
Busy, ringback	168
Intrusion tone #1	137
Intrusion tone #2	108
Special information tones #1	110-112
Special information tones #2	189, 178, 133
Waiting #1	134,135
Recording warning #1	135
Waiting #2	190,107
Recording warning #2	107
DTMF tones	191-206
Dial pulsing	83

France (based on ST/PAA/TPA/CRE, Edition 4, A-Law)

Purpose	NT8D17 tone (XTON)
Dial tone	165
10 Hz Meridian 1 warble	161
20 Hz Meridian 1 warble	162
Special dial, number unobtainable (overflow)	166
Transfer tone	167
Misc. tone #1	158
Camp-on	156
Misc. tone #2	130
Test tone	157
Call on hold, special dial, number unobtainable (overflow) tones	168
DTMF tones	191-206
Dial pulsing	51, 72

Germany (based on NTD9879B A-law)

Purpose	NT8D17 tone (XTON)
Dial, special dial tone	105
Ringback	106
Busy, overflow, number unobtainable, ringback, special dial tones	175
Misc. tone	107
Intrusion, override, camp-on tones	108
Busy, overflow, number unobtainable	176
10 Hz Meridian 1 warble	154
20 Hz Meridian 1 warble	155
Information tones	110, 111, 112
DTMF tones	113-128
Dial pulsing	83, 51, 72

Holland (based on NTD9707 A-law)

Purpose	NT8D17 tone (XTON)
Dial, special dial tone	105
Ringback	106
Misc. tone #1	130
Misc. tone #2	107
Test tone	177
Dial busy, congestion, number unobtainable (OVFL), ringback, warning tones	109
10 Hz Meridian 1 warble	154
20 Hz Meridian 1 warble	155
Information tones	133, 134, 178
DTMF tones	218-233
Dial pulsing	51, 72

Hong Kong (based on QPC259 μ -law)

Purpose	NT8D17 ton@ (XTON)
Dial, special dial tone	73
Busy, number unobtainable (OVFL) tones	74
Ringback	75
10 Hz Meridian 1 warble	2
20 Hz Meridian 1 warble	71
Intrusion (bargе-in) tone	76
Call waiting, override, camp-on tones	33
Test tone	8
DTMF tones	14-29
Dial pulsing	31, 51, 72

Hong Kong/Malaysia/Philippines (based on QPC252 p-law)

Purpose	NT8D17 tone (XTON)
Dial, special dial tone	4
Call waiting, camp-on, override tones	33
Intrusion (barg-in) tone	76
Busy, number unobtainable (NU), special dial, busy, intrusion (barg-in, busy verify), call waiting, camp-on, override tones	69
Ringback	77
Dial tone	68
Ringback	5
Busy, number unobtainable (OVFL) tones	7
Barg-in (busy verify, intrusion), call waiting, camp-on, override tones	3
Ringback	70
Test tone	8
DTMF tones	14-29
Dial pulsing	31, 51, 72

Hong Kong (based on QPC255 p-law)

Purpose	NT8D17 tone (XTON)
Dial, special dial tone	73
Intrusion call waiting, camp-on, override tones	33
Busy, number unobtainable (OVFL) tones	78
Ringback	79
Misc. tone	80
Test tone	8
DTMF tones	35-50
Dial pulsing	31, 51, 72

Italy (based on NTD9517B p-law)

Same as QPC606B except there is one cadence different,

Italy (NTD9221)

This card is identical to the QPC253A p-law card except that it can **output** pulse 1 to 30 pulses.

Italy (Olivetti ACD, based on NTD9237 p-law)

Purpose	NT8D17 tone (XTON)
Dial, busy, overflow, audible ringback, special dial tones	81
10 Hz Meridian 1warble	2
20 Hz Meridian 1warble	71
Camp-on, call waiting, override, intrusion (barge-in, busy verify) tones	82
DTMF tones	14-29
Dial pulsing	83, 51, 32

Italy A-law (new)

Purpose	NT8D17 tone (XTON)
Dial tone #1	212
Dial tone #2	217
Ringback #1, congestion #1, busy #1, overflow #1, camp-on #1, confirmation #1	109
Ringback #2, congestion #2, busy #2, over-flow #2, camp-on #2, confirmation #2, intrusion #1, conference #1, call waiting #1	213
Intrusion #2, conference #2, call waiting #2	137
DTMF set #1	191-206
DTMF set #2	218-233
Dial pulsing	83,174

Japan tones (based on QPC646A p-law)

Purpose	NT8D17 tone (XTON)
Dial tone #1 (low)	1
10 Hz Meridian 1 warble	2
Misc. tone#1	3
Dial tone	33
Audible ringback tone	34
High tone #1	6
Test tone	8
Dial tone #1 (standard)	4
Dial tone #2 (low)	9
Audible ringback #1 (low)	5
Dial tone #2 (standard)	10
High tone #2	12
Low tone #2	13
DTM F tones	35-50
Dial pulsing	30, 51, 52
MF, ANI	53-67

Japan p-law

Purpose	NT8D17 tone (XTON)
Howler tone (low)	91-95
Howler tone (high)	96-100

Korea (based on QPC632 p-law)

Purpose	NT8D17 tone (XTON)
Dial, special dial, call waiting tones	84
10 Hz Meridian 1 warble	2
20 Hz Meridian 1 warble	71
Busy, overflow, number unobtainable tones	74
Intrusion warning tone	86, 80, 10
Ringback	75
Misc. tone	3
Test tone	104
DTMF tones	35-50
Dial pulsing	83, 51, 52

Malaysia

Purpose	NT8D17 tone (XTON)
10 Hz Meridian 1 warble	154
20 Hz Meridian 1 warble	155
Dial, special dial, control dial, call forward dial, test, camp-on, call waiting tones	159
Ringback	188
Overflow, busy, intrusion warning, override	31, 72

Malaysia (based on NTD9251 ACD μ -law and QPC252 A or B)

Purpose	NT8D17 tone (XTON)
Dial, special dial tone	68
Busy, number unobtainable (OVFL), intrusion, barge-in, busy verify, call waiting, camp-on, override tones	69
Ringback	70
10 Hz Meridian 1 warble	2
20 Hz Meridian 1 warble	71
Test tone	8
DTM F tones	14-29
Dial pulsing	31, 51, 72

Malaysia/Singapore A-law (CAS)

Purpose	NT8D17 tone (XTON)
LDN	164
LDN, camp-on, dial "0" recall, hold configuration	108
DTMF tones	218-233
Dial pulsing	51, 72

North America (based on QPC609 p-law)

Purpose	NT8D17 tone (XTON)
Dial tone #1 (low)	1
10 Hz Meridian 1 warble	2
Misc. tone#1	3
Dial tone #1 (standard)	4
Audible ringback #1	5
High tone #1	6
Low tone #1	7
Test tone	8
Dial tone #2 (low)	9
Dial tone #2 (standard)	10
Audible ringback #2 (high)	11
High tone #2	12
Low tone #2	13
DTMF tones	14-29
Dial pulsing	30, 31, 32

QPC631 p-law

Purpose	NT8D17 tone (XTON)
Dial tone (standard)	4
Dial tone (low)	1
Audible ringback	5
Music tone #1	3
High tone	6
Low tone	7
Test tone	8
DTMF tones	14-29
Dial pulsing	30, 31, 32

QPC632 μ -law

Purpose	NT8D17 tone (XTON)
Dial tone #1 (low)	1
10 Hz Meridian 1 warble	2
Misc. tone #1	3
Dial tone #1 (standard)	4
Audible ringback #1 (low)	5
High tone #1	6
Low tone #1	7
Test tone	8
Dial tone #2 (low)	9
Dial tone #2 (standard)	10
Audible ringback #2 (high)	11
High tone #2	12
Low tone #2	13
DTMF tones	14-29
Dial pulsing	30, 31, 32

Singapore

Purpose	NT8D17 tone (XTON)
Dial, acceptance (confirmation), call waiting tones	137
Ringback	160
Busy, number unobtainable, congestion tones	158
Intrusion tone	163

Spain A-law (new)

Purpose	NT8D17 tone (XTON)
DTMF tones	191-206
Dial pulsing	51

Sweden (based on NTD9770D A-law)

Purpose	NT8D17 tone (XTON)
Dial, special dial tone, call forward, control dial, busy, ringback, congestion, camp-tin	158
Busy, ringback tones	137
Message waiting, call forward message waiting tones	105
Intrusion tone (barge-in)	179
Test tone	177
Number unobtainable tone	180
Call waiting, override, warning tone for paging	181-182
10 Hz Meridian 1 warble	161
20 Hz Meridian 1 warble	162
DTMF tones	138-I 53
Dial pulsing	31, 72

Switzerland (based on QPC607, QPC260 A-law)

Purpose	NT8D17 tone (XTON)
Dial tone, busy, ringback, equipment busy, confirmation tones	109
10 Hz Meridian 1 warble	154
20 Hz Meridian 1 warble	155
Special dial tone	169
Information tone	110, 111, 112
Warning, intrusion tones	170
override, camp-on tones	108
Test tone	171
Confirmation tone	172
Call waiting tone	173
DTMF tones	218-233
Dial pulsing	31, 174, 32

United Kingdom A-law

Purpose	NT8D17 tone (XTON)
Dial tone	129
Busy, short congestion, number unobtainable tones	130
Long congestion tone	131
Ringback	132
Intrusion tone	133
Information tone	134, 135, 136
Camp-on tone	137
DTMF tones	138-153
10 Hz Meridian 1 warble	154
20 Hz Meridian 1 warble	155
Dial pulsing	51

USSR A-law (new)

Purpose	NT8D17 tone (XTON)
Call waiting	213
Dial, ringback, busy, congestion, supervision of call waiting	158
Special information tones	110-112
Misc. tone #1	137
Misc. tone #2	210
DTMF tones	218-233

SL-1

Flexible Tone and Digit Switch cards

Description

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Standard

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SL-1

Office Data Administration System

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Description

Office Data Administration System (ODAS) is an optional software package. This feature assists in record keeping for information regarding Meridian 1 telephones and attendant consoles.

Office Data Administration System (ODAS) provides the following features.

- assign a 1 to 6 digit alphanumeric station line designator
- insert the date of all service change activity on TN
- print individual items on individual pages, including system and customer numbers, and a title for each page
- list or count all stations by telephone type, feature type, or both
list multiple appearance DNs
- list hunting patterns for individual DNs
- list telephones in alphanumerical order according to station line designators
- enter or change station line designators at an accelerated rate

Station line designator

The station line designator (DES) is a unique 1 to 6 digit alphanumeric designator assigned to each individual telephone through overlay programs. The DES identifies each telephone and provides telephone data block printouts without entering the TN or the DN.

Service activity date

The service activity (ACT) date indicates the last date a service change was performed on a particular TN. The system automatically enters and updates the ACT date whenever a service change is made. When requested, the system updates the ACT date of all TNs to the present system date. Print programs can be requested to print information according to a particular ACT date.

Selectable page control

Selectable page control permits individual printouts on a “per page” basis on standard 11 inch (280 mm) fanfold paper. Each page contains information about the individual item. The printout includes the system and customer numbers as well as the printout title. The customer number appears when requested at the CUST prompt.

Features print program (LD81)

The features print program provides a list or count of the number of telephones in your system. The system may be prompted to supply the information based on one or more of the following.

- telephone type
- feature type
- telephone and feature type
- a single customer, or a range of customers
- a predetermined ACT date
- station line designator

Selectable page control and ACT date resetting capabilities are also included with this program.

Multiple appearance and hunt chain print (LD82)

The multiple appearance and hunt chain print program -provides a printout of stations with multiple appearance DNs, single appearance DNs appearing on telephones with multiple appearance DN, and hunting patterns. The system may be prompted to supply the information based on one or more of the following.

- a single DN, or a range of DNs
- a single customer, or a range of customers
- a predetermined ACT date
- station line designator

Selectable page control and ACT date resetting capabilities are also included with this program.

Designator sort print (LD83)

The designator sort print program produces a printout of TNs in station line designator order. The system may be prompted to supply the information based on the following.

- single line listing of TNs in DES order, or a detailed TN print in DES order
- a single customer, or a range of customers

Selectable page control and ACT date resetting capabilities are also included with this program.

Designator entry program (LD84 and LD85)

The designator entry program permits entering or changing a DES on 500/2500 telephones (LD84) and SL-1 and Meridian digital telephones (LD85) at an accelerated rate. These programs perform an easy change similar to those in LDs 10 and 11. See XII *input/output guide* (553-3001-400) for complete information.

Enhancements to existing programs

The ACT date is automatically updated to the present system date in the 500/2500 telephones (LD10), SL-1 and Meridian digital telephones (LD11), attendant consoles (LD12), Digitone receivers (LD13), and trunks (LD14) datablocks whenever a service change is made to the individual TN. It is also updated whenever the ACT date is reset to the present system date through a print program. LD20 includes prompts for station DES, ACT DATE, and PAGE control. LD22 includes prompts for ACT date, PAGE control and to reset ACT date. LD10 and LD11 include the insertion of a station DES. See *X11 input/output guide* (553-3001-400) for complete information.

ODAS programs

Table 1
Features print program (LD81)

Prompts	Responses	Comments
REQ	LST, CNT	List or count stations with features.
CUST	xx (xx), <cr>	Single customer or a range of customers (0-99) <cr> lists all customers
DATE	ACT dd mmm yyyy <cr>	TN service changes on or after the ACT date Print from selected date Ignore service change date
PAGE	YES, <cr>	Page control <cr> indicates no page control
DES	xxxxx x+ <cr>	Print information regarding this DES Print all DES starting with x Ignore all DES
FEAT	ALL xxxx <cr>	Prints all features Print the specified feature (see 553-3001-400) When DATE or DES is answered, carriage return past FEAT.
NACT	YES <cr> END	Resets ACT date to present system date Return to REQ, does not reset date Exit program. NACT appears after printout is completed

10 ODAS programs

Table 2

Typical list printout (LD81)

Feat	Cust	DN	LSNO	TN	Type	Key	DES	Act date
SCC	00	2000	0000	TN 00 0 01 0	500		ABCD A	1 JAN1 979
SCC	00	2001	0001	TN 00 0 01 1	500		ABCD B	1 JAN1979
SCC	00	2002	0000	TN 00 0 01 2	500		DEEE	10 APR1979
SCC	00	2003	0000	TN 00 0 01 3	2500		ABCDD	10 APR1979
SCC	00	3000	0002	TN 00 0 04 0	SL1		HIB	10 APR1979

Table 3

Typical count printout (LD81)

Feature	Customer	Count	Total	SL1	500	2006
ADL	00	CNT	1	1	0	0
AD3	00	CNT	1	1	0	0
A06	00	CNT	2	2	0	3
ARC	00	CNT	2	2	1	0
PUA	ALL	CNT	3	2	1	0
PUD	ALL	CNT	0	0	0	0

Multiple appearance and hunt chain program (LD82)

Prompts and responses for LD82 are shown in Table 4 and typical printout formats are shown in Tables 5 and 6.

Table 4
Prompts and responses (LD82)

Prompts	Responses	Comments
REQ	MAP MAG HNT	List multiple appearance DN and associated TN. Print a list showing the inter-relation of multiple and single appearance DN within a group of TNs Hunt pattern, single step in either direction. Short hunting is not shown.
CUST	xx (xx), <cr>	Single customer or a range of customers (0-99) <cr> lists all customers
DATE	ACT dd mmm yyyy <cr>	TN service changes on or after the ACT date Print from selected date Ignore service change date
PAGE	YES, <cr>	Page control <cr> indicates no page control
DES	xxxxx x+ <cr>	Print information regarding this DES Print all DES starting with x ignore all DES
DN	xxxxx ALL <cr>	Single DN or a range of DNs(0-9999999) Print all MAG or MAP DNs All DNs
NACT	YES <cr> END	Resets ACT date to present system date Return to REQ, does not reset date Exit program. NACT appears after printout is completed

Table 5
Typical MAP printout (LD82)

MAG	Cust	DN	TN	Note	Type	Key	DES	Act date
001	00	200	00 1 01 2	- 0 1	SL1	03	YJK	10 JUN 1979
			00 1 01 3	HNT205	SL1	08	YMN	2 APR1979
	201	00 0 01 0	00 0 01 0	HNT NONE	SL1	03	AZK	1 MAY 1979
			00 1 01 2	- 0 1	SL1	02	YJK	10 JUN 1979
	204	00 0 01 0	00 0 01 0	HNT NONE	SL1	03	AZK	1 MAY1 979
			00 1 02 3	- 0 1	500		AMM	2 JAN1 979
	203	00 1 01 2	00 1 01 2	HNT NONE	SL1	04	YJK	10 JAN 1979
			00 0 02 2	- 0 1	500		AMK	10 SEP 1979

Note 1: Multiple Appearance Group (MAG) number is determined by the system, and assigns the group numbers in ascending order.

Note 2: The DN is indicated only on the lowest TN of multiple appearance. Single appearance DNs have only one TN listed.

Note 3: The system uses the first TN of the multiple appearance to determine hunting. ***01 indicates the order the TN is stored in the system (I-15). The first TN in the list (0) is identified either by a HNT number or HNT NONE.

Table 6
Typical MAG printout (LD82)

MAG	Cust	DN	TN	Note	Type	Key	DES	Act date
001	00	300	00 0 04 0	HNT 330	SL1	00	BVM	2 JAN1980
		302	00 0 04 0	HNT330	SL1	01	BVM	2 JAN1980
			00 0 04 1	xxx01	SL1	01	BFO	3 FEB 1980
		302	00 0 04 0	xxx01	SL1	02	BVM	2 JAN 1980
			00 0 04 1	HNT 330	SL1	02	BFO	3 FEB 1980
		303	00 0 04 0	HNT 330	500	03	BVM	2 JAN1980
			00 0 04 1	- 0 1	SL1	03	BFO	3 FEB 1980
		304	00 0 04 0	HNT 330	SL1	04	BVM	2 JAN1 980
		307	00 0 04 0	HNT 330	SL1	05	BVM	2 JAN1980
		310	00 0 04 1		SL1	00	BFO	3 FEB 1980
		400	00 0 04 0	HNTNONE	SL1	06	BVM	2 JAN1 980
002	00	200	24 0 01 0	- 0 1	500		GBA	9 MAR 1980
		200	24 0 01 3	HNT 309	2500		JLO	8 MAR 1980

Vote 1: Multiple Appearance Group (MAG) number is determined by the system and assigns the group numbers in ascending order.

Vote 2: The DN is indicated only on the lowest TN of multiple appearance. Single-appearance DN have only one TN listed.

Vote 3: The system uses the first TN of the multiple appearance to determine hunting. xxx01 indicates the order the TN is stored in the system (1-15). The first TN in the list (0) is identified either by a HNT number or HNT NONE.

Table 7
Typical hunt chain print (LD82)

Cust	DN	Hunt	DN	TN	Telephone type	Key	DES	ACT date
00	5040		5040	016 0 09 00	3000	00	ABC	30 OCT 1991
		FROM	2032	049 0 09 00	2500		YJK	31 OCT 1991
00	2032	TO	5040	016 0 09 00	3000	00	ABC	30 OCT 1991
			2032	049 0 09 00	2500		YJK	31 OCT 1991

Note: ** indicates a multiple appearances DN.

Designator sort print program (LD83)

Prompts and responses for LD83 are shown in Table 8 and typical printout formats are shown in Tables 9 and 10.

Table 8
Prompts and responses (LD83)

Prompts	Responses
REQ	LST, TNB Single line listing of TN in DES order TNB prints information in DES order
CUST	xx (xx), <cr> Single customer or a range of customers (0-99) <cr> lists all customers
PAGE	YES, <cr> Page control <cr> indicates no page control
NACT	YES Resets ACT date to present system date <cr> Return to REQ, does not reset date END Exit program. NACT appears after printout is completed

Table 9
Typical list printout format (LD83)

DES	ACT	Cust TN	Type	Density	Prime DN
ABC	24 OCT 1979	00 00 4 02 3	SL1	DD	3001
ABD	10 NOV 1979	00 00 4 03 0	500	SD	

Table 10
Typical TN printout format (LD83)

DES	AIB
TN	00 0 02 1
TYPE	SL1
CDEN	DD
CUST	0
KLS	1
FDN	2564
TGAR	0
RNPG	0
IAPG	0
CLS	UNR FBD WTA LPR MTD FNA HTD
HUNT	000
KEY	00 SCR 250 01 02 03 04 05 06 07 08 09 RLS
DATE	2 JUL 1980

Designator entry programs (LD84 and LD85)

Prompts and responses for LD84 and LD85 are shown in Table 11.

Table 11
Prompts and responses (LD84 and LD85)

Prompts	Responses	Comments
TN	lscu	Enter valid TN
	END	Exit the program
DES	xxxxxx	Enter one to six alphanumerical characters.

ODAS error codes

See X11 input/output guide (553-3001-400) for error messages.

Engineering

Memory requirements

In addition to the data store requirements given in *X11 Memory calculations* (553-2201-151), the ODAS feature requires the extra storage indicated in Table 13.

Table 13
ODAS memory requirements

Type of store	Requirements (words)
Program store	1100
Protected data store activity date per TN in system	1
Station line DES per telephone	2

SL-1

Office Data Administration System

Description and engineering

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SL-1

Automatic trunk maintenance

Description

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About this document

The Automatic Trunk Maintenance (ATM) feature allows a Meridian 1 to automatically test and report transmission and supervision performance levels on Meridian 1 trunk groups. The start times for tests and most of the test parameters are customer programmable in the Meridian 1 software.

This Northern Telecom Publication (NTP) describes the ATM feature, including its limits, and its interactions with other Meridian 1 features. Also described are the engineering requirements, the procedure for implementing the ATM data and schedule blocks, and an interpretation of the ATM reports.

Related documents

The ATM diagnostic program and system messages are described in the *X11 input/output guide (553-3001-400)*, while maintenance procedures for locating and clearing trunk faults are described in the fault clearing document for each system. Administration system messages are described in the *X11 input/output guide (553-3001-400)*.

Description

The ATM feature allows a Meridian 1 to be programmed to automatically run scheduled transmission and supervision tests on specified trunk groups terminating at the Meridian 1. ATM also reports the results to the system terminal and, if featured, to Communication Management Center (CMC).

In addition to scheduling the ATM function to run automatically, the program may be run manually at any time, by loading the ATM diagnostic program (LD92). Manual operation is described in the *X11 input/output guide* (553-3001-400).

Trunks that fail any of the tests are flagged so that more rigorous tests can be performed manually using transmission test equipment. The system can be programmed to disable any of these flagged trunks, up to a configurable limit per trunk group, if they reach the programmable out-of-service threshold.

Hardware and software requirements

Near-end Meridian 1

ATM requires the following hardware and software at the near-end Meridian 1:

- a tone and digit switch (TDS) card (QPC197, QPC251, or QPC609, for example) to provide a 1020 Hz tone and a silent termination
- a tone detector card to test loss and noise levels (see *QPC422 Tone Detector Card* (553-2001-191))
- Generic X11 Release 7 or subsequent software

Three active modes for the tone detector are used by ATM:

- **Mode 1**
The tone detector listens for and reports the type of tone detected (such as ringback, busy, overflow, or unidentified tone).
- **Mode 3**
The tone detector listens for 1020 Hz tone (nominal 1000 Hz) followed by silent termination and reports the loss and noise levels.
- **Mode 4**
The tone detector listens for and reports the presence of 1020 Hz tone (nominal 1000 Hz).

Far-end PBX

The far-end PBX must be equipped as follows:

- Meridian 1-compatible source of nominal 1000 Hz tone (a far-end Meridian 1 requires either a QPC197, QPC251, or QPC609 TDS card)
- Meridian 1-compatible loop-around facilities if near-end to far-end **loss** tests are to be done
- a Meridian 1 must be equipped with the 100 and loop-around test facilities if full ATM capability is to be supported
- Meridian 1-compatible loop-around facility at the far end will permit ATM near-to-far testing (non Meridian 1/SL-100 sites)
- a Meridian 1 at the far-end must have at least Generic X11, release 2 software for the 100 and loop-around test requirements of the full ATM feature to be supported

Feature description

ATM tests the trunks and Digital Trunk Interface (DTI) channels in a specified group or groups, compares the measured and stored values, flags those trunks and DTI channels which fail any tests, and disables any trunks and DTI channels that reach the specified out-of-service threshold.

The number of trunks in a group that can be disabled in this manner is limited to a percentage of the total number of trunks in the group. The percentage is defined in the ATM data block, which is part in the Trunk Route Administration program (LD16).

ATM performs the following tests:

- far-end to near-end loss and noise measurement
- near-end to far-end loss measurement

The values measured in each test are compared with the thresholds stored in the ATM data block. The results of each test will fall into one of the following ranges:

result \leq maintenance limit

- maintenance limit $<$ result \leq out-of-service limit
- result $>$ out-of-service limit

The result of all the tests performed on each trunk determine the overall status of each trunk. Along with the measured values, the following classifications are reported:

PASS	trunk passed all transmission tests
FAIL*	at least one test exceeded the transmission maintenance limit
DSBL* *	at least one test exceeded the out-of-service limit and the trunk has been automatically disabled
FAIL* *	at least one test exceeded the out-of-service limit, but the trunk has not been disabled because the number of trunks already disabled in the group has reached a percentage limit defined in the ATM data block

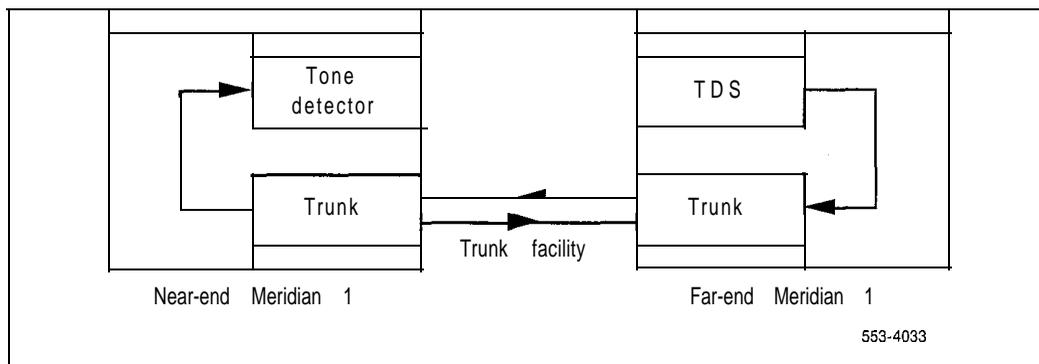
Far-end to near-end loss and noise measurement

The purpose of this test is to evaluate the far-end to near-end transmission loss and noise performance levels of the trunks under test against the standard assigned in the ATM data block for each trunk. The test is also used to choose the reference trunk required in the near-end to far-end tests.

ATM will measure and store:

- the dB loss of a nominal 1000 Hz tone transmitted from the far-end
- the noise level, in dB_{rn}, of a silent termination from the far-end (only if a Meridian 1 standard 100 test line is attached)

Figure 1
Far-end to near-end measurement



- With ATM running, the near-end Meridian 1:
 - seizes the trunk or DTI channel being tested
 - outpulses the DN of the far-end 100 test line or equivalent test line (the 100 test line returns 1020 Hz tone for 5.5 seconds, followed by silent termination; the non-standard test line returns nominal 1000 Hz tone only)
 - attaches a near-end tone detector and tests its integrity in modes 1, 3, and 4 (see *QPC422 Tone Detector Card* (553-2001-191))
- The tone detector determines:
 - that the connection between the far-end and near-end is established
 - that nominal 1000 Hz test tone is returned (the test is terminated and marked unsuccessful if test tone is not detected)
- The tone detector measures and stores:
 - the dB level of the transmitted tone (if the far-end test line is not a standard 100 test line, the tone detector times out after 7 seconds, and stores the loss level in software)
 - the noise level, in dB_{rn}, of the circuit during silent termination

- ATM software determines:
 - the actual measured loss (AML); the loss algorithm ensures that the proper pad values for the trunk under test are considered
 - the difference between the AML and the expected measured loss (EML); EML is defined in LD16 and stored in the ATM data block

ATM software compares:

- the EML/AML result with the maintenance limit (LMNL) and the out-of-service limit (LOUT) defined in LD16 and stored in the ATM data block
- the actual measured noise level with the maintenance limit (NMNL) and out-of-service limit (NOOUT) defined in LD16 and stored in the ATM data block

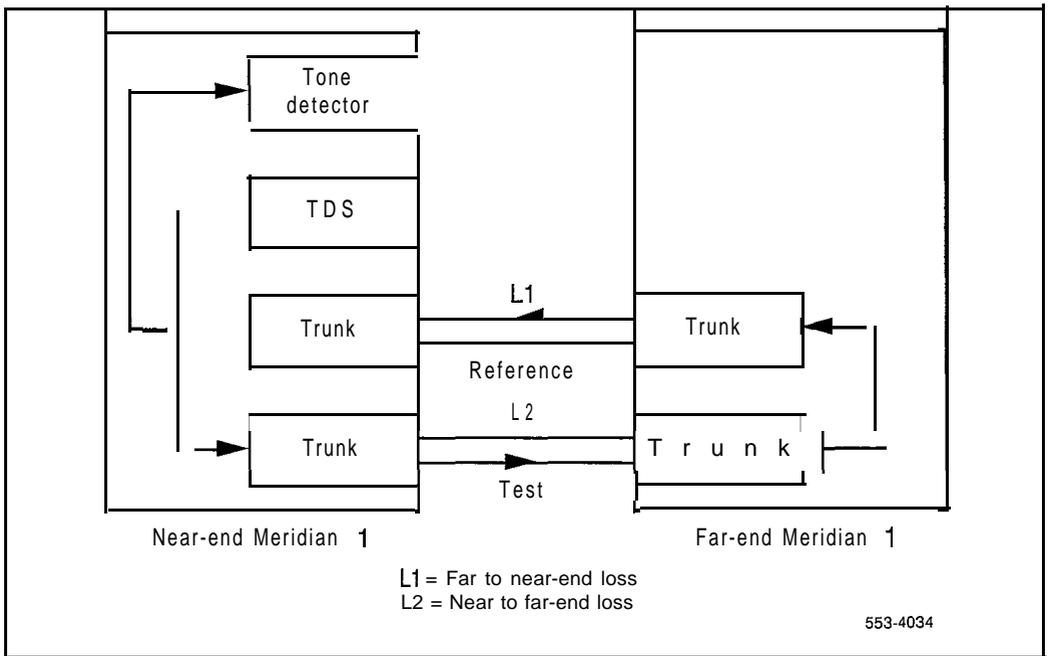
ATM software flags:

- trunks or DTI channels whose loss deviations from EML exceed maintenance, or out-of-service levels, or both
- during scheduled automatic trunk testing, ATM software disables trunks and DTI channels at the near-end Meridian 1 if both of the following conditions exist:
 - when the test results exceed the transmission out-of-service limits
 - the percentage of trunks that can be disabled in the trunk group has not been reached (the percentage is the DSBL value programmed in the ATM database)
- ATM software sends the test results to the system terminal and, if the feature is provided, to a CMC facility

Near-end to far-end loss measurements

The purpose of this test is to evaluate the near-end to far-end transmission loss performance levels of the trunks under test, against standard values, assigned in the ATM data block for each trunk. The test uses a loop-around test termination, at the far end, and a reference trunk or DTI channel whose loss is known and which belongs to the same trunk group as the trunks being tested (Figure 2).

Figure 2
Near-end to far-end measurements



Choosing a reference trunk

ATM uses the far-end to near-end tests, described previously, to choose the reference trunk needed to perform the near-end to far-end measurements. By definition, a reference trunk is a trunk or DTI channel with a far-end to near-end loss (AML) which satisfies:

$$EML - LMNL \leq AML \leq EML + LMNL$$

where: AML = the actual measured loss of the reference trunk
 EML = the expected measured loss
 LMNL = the loss maintenance limit

and a noise level N, which satisfies:

$$N < NOUT$$

where: NOUT = the noise out-of-service limit

Based on the measurements within a trunk group, one of the following will occur:

- No reference trunks are defined. No trunks fit the reference trunk criteria. No measurements can be made, in this case, with any assurance of accuracy.
- Only one reference trunk is defined. Only one trunk in the group fits reference trunk criteria. In this case, near-to-far end loss measurements can be made for all trunks or DTI channels in the trunk, except the reference trunk itself.

Two or more reference trunks are defined. Two or more trunks fit reference trunk criteria. All trunks in the trunk group can be tested.

The trunk whose measured loss, AML, is closest to the EML is chosen (if it is available at the time). When ATM is used in the manual mode, the first trunk in the route found to satisfy reference trunk criteria is chosen.

Setting up the near-end to far-end test

ATM does the following:

- seizes the chosen reference trunk, outputs the reference loop-around DN and attaches a tone detector, in mode 1 (to detect a far-end busy indication, if the loop-around DN is unavailable)

seizes the first test trunk, outputs the reference loop-around DN and attaches a tone detector, in mode 1 (to detect a far-end busy indication if the loop-around DN is unavailable)

The reference and test trunks are automatically connected at the far end and loop-around measurements can be made.

Near-end to far-end loss measurements on the reference trunk

If two or more trunks in the group meet reference trunk criteria, valid test data will be stored as follows:

- ATM attaches a TDS to the first reference trunk and sends 1020 Hz tone.
- ATM attaches a tone detector, in mode 4, to the second reference trunk.
- ATM records the total loss on the loop and computes the near-end to far-end loss on the reference trunk. If ATM times-out without an indication of tone from the tone detector, it indicates excessive near-end to far-end loss on the reference trunk.

Near-end to far-end loss measurements on the test trunk

ATM does the following:

- ATM attaches a TDS to the test trunk and sends 1020 Hz tone.
- ATM attaches a tone detector, in mode 4, to the reference trunk.
- ATM records the total loss on the loop and computes the near-end to far-end loss on the test trunk. If ATM times-out without an indication of tone from the tone detector, it indicates excessive near-end to far-end loss on the test trunk.

Near-end to far-end loss measurements on the next test trunk

Using the same reference trunk, ATM seizes and tests each trunk in the group. When all trunks scheduled for testing have been looked at, the results are sent to the system terminal and, if it is a feature, to CMC.

ATM seizes the next test trunk, outpulses the test loop-around DN and attaches a tone detector, in mode 1 (to detect far-end busy indication, if the loop-around DN is unavailable).

The reference and next test trunk are automatically connected at the far end and near-to-far measurements can be made as described previously for test trunks.

Feature interactions

Barge-In

Barge-In to a particular trunk is denied during scheduled or manual ATM testing. Overflow tone is returned to the attendant.

Traffic

To avoid interactions between traffic and ATM report outputs, scheduled ATM tests are performed 1.5 minutes past the hour specified in the Schedule data block (LD16).

Manual and automatic ATM trunk seizures are recorded on traffic peg counts.

Electronic Switched Network signaling

Because ATM is not intended to test tandem connections through Electronic Switched Network (ESN) switches, the network class-of-service (NCOS) value associated with the test call is not important. Therefore, the NCOS value of the trunk under test will be used.

Electronic Tandem Network signaling

Test calls to Electronic Tandem Network (ETN) switches are treated in the same way as standard tie trunk calls.

History File

ATM reports are classified as maintenance messages and are stored in the History File.

Digital Trunk Interface

ATM will measure transmission performance on DTI trunks, but not DLI connections to SL-Server.

Call Detail Recording

Because there is no originating telephone on an ATM call, Call Detail Recording (CDR) records for ORIGITYPE and ORGID will equal TERTYPE and TERID. TERID will contain trunk route and member number of the trunk which makes the outgoing call.

Aborting the ATM program

ATM can be aborted at any time to load another overlay program. ATM will “gracefully” disconnect any trunks seized, but will not provide a report of any collected results.

Far-end disconnect controls

ATM will not test a route with far-end disconnect controls (FEDC) set to far-end control. ATM requires that the far-end test line responds to a near-end disconnect by returning a disconnect signal. If FEDC for a route is set to far-end control, this will not happen until the far-end forces a disconnect.

Called party disconnect control

ATM testing to a far-end Meridian 1 should not be performed on trunks which have called party disconnect control (CPDC), because the test line will not respond to a disconnect from the ATM feature.

Limitations

Trunk types

ATM supports testing on the following trunk types only:

TIE	CSA	FEX
W A T	COT	

AUTOVON

ATM does not test AUTOVON trunks.

Trunk busy

When a seizure attempt by ATM fails because the trunk is busy, no attempt to re seize the trunk is made. For this reason, test results may be available in one direction but not the other.

Far-end supervision

Far-end test facilities must be compatible with Meridian 1 test lines insofar as disconnect is concerned. They must respond to near-end disconnect by releasing the test trunk towards the originating end immediately.

Tone plan frequencies

The far-end PBX must support precise tone plan frequencies for call progress tones. (See Tone Detector modes, 1, 3, and 4).

Other overlay programs

If an ATM test is unable to begin execution within its scheduled hour because another program is in the overlay area, it will be executed later when the overlay area becomes available within the scheduled hour. In any case, it is advisable to schedule the ATM tests so that they do not run when heavy use of the overlay area by other programs (such as midnight routines) is expected. Also, testing of large trunk groups should be made so that one set of measurements does not run past the starting time of another set.

Traffic

ATM and traffic data may become intermixed if sent to the same system terminal. Where possible, they should be routed to different terminals.

Trunk groups

ATM measurements are performed on a trunk group basis. If more than one trunk route exists between the Meridian 1 and a far-end switch, each will have separate measurement reports.

14 Description

ATM data administration

This chapter provides guidelines for programming the ATM database. It also describes the data administration procedures for adding, changing, or removing ATM data or ATM schedule data.

Programming ATM

The ATM feature makes use of a tone detector card (QPC422) to measure the level of incoming test signals. The level is a function of:

- the tone level at the source (such as a TDS)
- the losses in the circuits which include:
 - the pad losses at the switch interfaces
 - the trunk facility loss

This is equivalent to:

$$L = L_t - L_r - (P_f + P_n)$$

where

- L = facility loss
- L_t = tone level at the source
- L_r = tone level at the tone detector
- P_f = pad value at far end
- P_n = pad value at near end

Note: L_t and L_r are levels in dB below 0 dBm. L_t and L_r will always be positive whole numbers.

The values L_t , P_f , and P_n are predetermined and stored in the ATM database as the pad factor (PF):

$$\text{Pad factor} = L_t - (P_f + P_n)$$

ATM computes the facility loss by calculating the difference between the pad factor and the level of tone measured at the tone detector.

Pad factor for analog trunks

The pad factor for analog trunks is made up of the following elements:

- the tone level present at the source
- pad loss at the far-end
- pad loss at the near-end

From this it follows that:

$$L = PF - L_r$$

Pad factor for digital trunks — Meridian 1 -to-Meridian 1

When a connection is made between a TDS and a tone detector over a digital trunk (through DTI, for example), the transmit and receive pads are switched (set to 0) and the pad factor is equal to the level at the source. That is:

$$\text{Pad factor} = L_t$$

If the trunk is operating normally, the tone detector will see the same digital bit stream that it would see if the tone detector/TDS connection was a direct network connection at the same switch. In other words, the trunk facility loss determined by ATM would be 0 dB.

DTI continuously monitors and reports on the transmission performance of its channels. If, however, the DTI interfaces to a channel bank at the far end, ATM can be of value in testing the operation of the channel units. This can be done by determining the pad losses and tone levels at the far-end switch and channel bank in the same way that pad factors for analog trunks are computed. A knowledge of the characteristics of both the far-end channel bank and far-end switch are required to do this.

Meridian 1 pad switching

The state of trunk pads is determined by software on a port-to-port basis. Switchable pads are controlled in accordance with the connection matrix in Table 1, while the actual values to be used for the trunks under test are listed in Table 2.

Table 1
Meridian 1 pad switching algorithm

From	To		D to A (to)				
	Test line	Tie/NTC	co/NTC	Tie/TRC	co/TRC	Tie/VNL	
	Test line	N/A	*0	*0	*0	"0	*1
A to D (from)	Tie/NTC	0*	11	01	11	01	11
	CO/NTC	0"	10	01	10	01	11
	Tie/TRC	0*	11	01	11	01	11
	CO/TRC	0"	10	01	10	01	10
	Tie/VNL	1*	11	11	11	01	11

Note: The first digit in the table indicates the pad switching state of "From", the second digit indicates the pad switching test of "To".

Legend:
 Test line = tone detector or TDS
 Tie = E&M tie trunk
 CO = CO, FEX, WAT, or CSA trunk
 NTC = Non-transmission compensated class-of-service
 TRC = Transmission compensated class-of-service
 VNL = Via Net Loss class-of-service
 * = no pad
 0 = Pad switched out
 1 = Pad switched in

Table 2
Meridian 1 switchable analog pad losses

Trunk	A to D				D to A			
	Pad in		Pad out		Pad in		Pad out	
co	4	(7)	0	(3)	1	(2)	-3	(6)
Tie	2	(5)	0	(3)	-1	(4)	-3	(6)
ESN	1.5	(4.5)	-0.5	(2.5)	-1.5	(4.5)	-3.5	(6.5)

Note: Overload values, in dBm are enclosed in (). Pad losses are in units of dB.

Legend:
 CO = CO, FEX, WAT, or CSA trunk
 Tie = 2-wire and 4-wire E&M tie trunk
 ESN = 4-wire E&M/DX trunk

Pad computation (Meridian 1 -to-Meridian 1)

Far-to-near end loss example

In this example (Figure 3), two Meridian 1 switches are connected by an analog 2-wire tie trunk with VNL class-of-service. The analog equivalent of test tone at a TDS is 13 dB below 0 dBm. Using Tables 1 and 2, the pad factor to be entered into the ATM database is:

$$\begin{aligned}
 \text{Tone level at the far-end TDS} &= 13 \text{ dB} \\
 \text{Pad loss at the far-end Meridian 1} &= -1 \text{ dB} \\
 \text{Pad loss at the near-end Meridian 1} &= 12 \text{ dB} \\
 \\
 \text{Pad factor (PADT)} &= 14 \text{ dB}
 \end{aligned}$$

Near-to-far end loss example (Loop around)

In this example (Figure 4), two analog 2-wire tie trunks with VNL class-of-service are connected in loop-around mode. The tone level at a TDS is 13 dB below 0 dBm. Using Tables 1 and 2, the pad factor to be entered into the ATM database is:

$$\begin{aligned}
 \text{Tone level at the TDS} &= 13 \text{ dB} \\
 \text{Pad loss at the Meridian 1} &= 1 \text{ dB} \\
 \text{Pad loss at the Meridian 1} &= 1 \text{ dB} \\
 \\
 \text{Pad factor (PADL)} &= 1.5 \text{ dB}
 \end{aligned}$$

Figure 3
Far-end to near-end loss

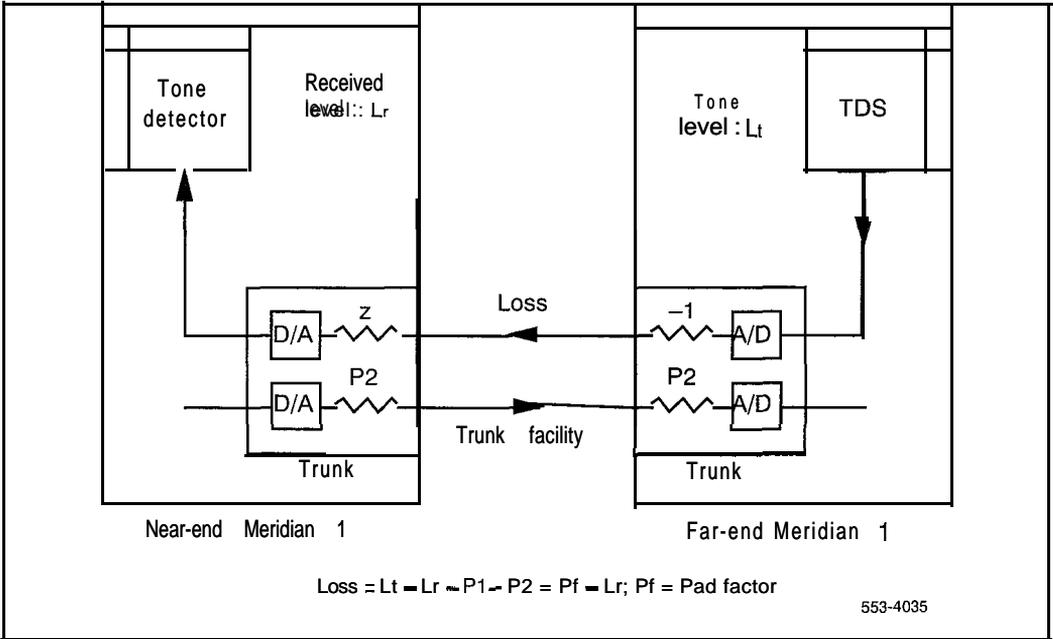
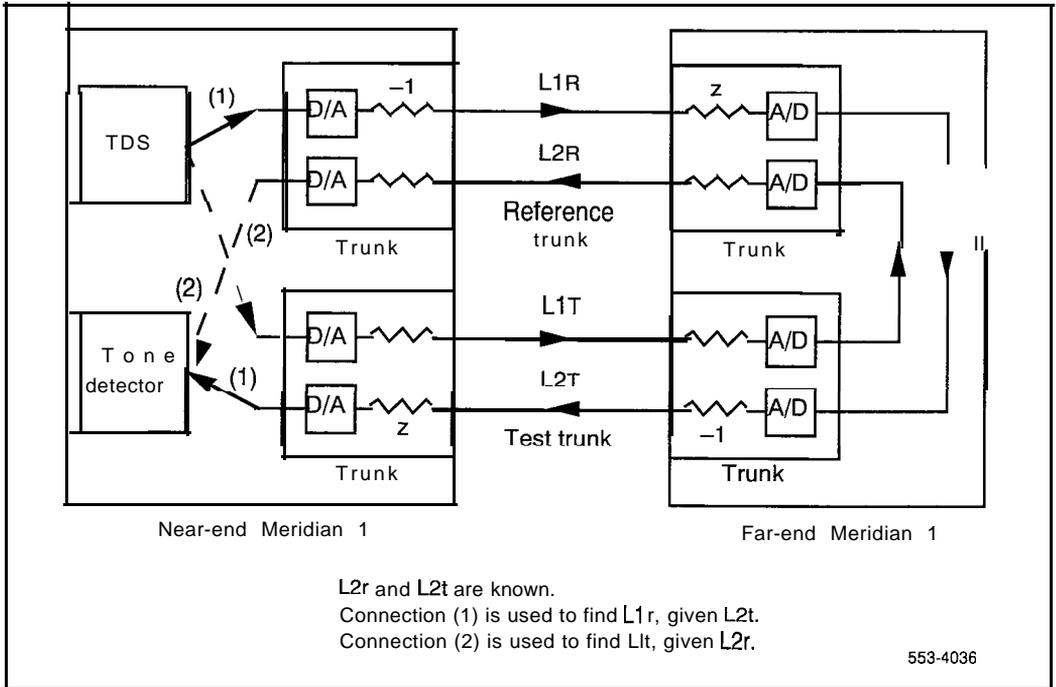


Figure 4
Near-end to far-end loss



From Table 1 we can see that both pads will be switched IN at the far end. Therefore, the loss through the far end connection is 1 dB (2 dB in the A to D direction and -1 dB in the D to A direction). The pad loss at the near end is the result of the 2 dB loss in the A to D direction and the 1 dB gain (such as -1 dB) in the D to A direction.

Pad factors for test connections — Meridian 1 -to-Meridian 1

Based on the preceding discussion, it is possible to tabulate pad factors for ATM tests. Table 3 lists values for far-end to near-end measurements, while Table 4 gives values for near-end to far-end measurements. Both tables assume the near-and far-end trunks have the same class-of-service (VNL, TRC, or NTC).

Table 3
Pad states and pad factors (PADT) by trunk route type

Trunk type and class-of-service		Far-end pad state and loss in dB		Near-end pad state and loss in dB		Pad factor (PADT)
Tie	VNL	IN	-1	IN	2	14
Tie	TRC	IN	-1	IN	0	12
Tie	NTC	IN	-1	IN	0	12
c o	TRC	IN	1	IN	0	14
c o	NTC	IN	1	IN	0	14
Digital						13

Note 1: Meridian 1 test line software always sets the far-end pad state to IN for the T100 test line.
 Note 2: The CO trunk class includes all trunks that are not tie trunks.

Legend:
 VNL = via net loss
 TRC = transmission compensated
 NTC = non-transmission compensated

Table 4
Pad states and pad factors (PADL) by trunk route type

Trunk type and class-of-service		Far-end pad state and loss in dB		Near-end pad state and loss in dB		Pad factor (PADL)
Tie	VNL	IN/IN	1	IN/IN	1	15
Tie	TRC	IN/IN	1	OUT/OUT	-3	11
Tie	NTC	IN/IN	1	OUT/OUT	-3	11
c o	TRC	OUT/IN	-1	OUT/OUT	-3	9
c o	NTC	OUT/IN	-1	OUT/OUT	-3	9
Digital						13

Note 1: The losses listed are combined losses at the far-end Meridian 1 and near-end Meridian 1 two pads at each end).
 Note 2: The CO trunk class includes all trunks that are not tie trunks.

Legend:
 VNL = via net loss
 TRC = transmission compensated
 NTC = non-transmission compensated

Pad computation (Meridian 1 to other PBX)

The typical loss between tie trunk ports at a PBX is 1 dB. If the far-end PBX has test line capabilities and can connect add-on test lines to tie trunks, it follows that the fixed circuit loss at the far end is:

- 1 dB for a T100 connection and
- 2 dB for a loop-around connection

Far-to-near end loss example

In this example, a Meridian 1 is connected to a non-Meridian 1 PBX by an analog 2-wire tie trunk with VNL class-of-service. The tone level at the source depends on the test line being used. The pad factor to be entered into the ATM database is:

Tone level at the far-end TDS	= x dB
Pad loss at the far-end PBX	= 1 dB
Pad loss at the near-end Meridian 1	= 2 dB
Pad factor (PADT)	= x + 3 dB

Note: "x" is the tone level, in dB below 0 dBm, of the far-end 100 type test line (for example a test tone level of -16 dBm will require a value of x = 16 dB).

Near-to-far end loss example (loop around)

In this example two analog 2-wire tie trunks with VNL class-of-service are connected in the loop-around mode. The tone level at a TDS is 13 dB below 0 dBm. The pad factor to be entered into the ATM database is:

Tone level at the TDS	= 13 dB
Pad loss at the far-end PBX	= 2 dB
Pad loss at the near-end Meridian 1	= 1 dB
Pad factor (PADL)	= 16 dB

Choosing maintenance and out-of-service thresholds

The following notes should be considered when choosing maintenance and out-of-service thresholds for loss and noise.

Tone level

The tone detector measures the level and frequency of single frequency tones in the range of 100 to 1370 Hz, with an accuracy of ± 1 dB and ± 10 Hz. The tone detector sends the results to ATM in steps of 1 dB, which means a resolution of ± 1 dB.

Further inaccuracies can be introduced by the pad factors programmed into the ATM database, because of variations in pad losses in the connection. For this reason, trunks flagged by ATM for exceeding maintenance thresholds (LMNL) or out-of-service thresholds (LOUT) should be further examined by manual measurements using transmission test equipment.

Noise

The tone detector measures noise in units of dBm. The readings are effectively 3 kHz flat noise measurements, with a range of 0 to -63 dBm. ATM equates this to a range of 90 to 27 dBn.

Because noise is frequency dependent, the noise readings taken by the tone detector cannot be translated directly into dBnC units. As a rule, the tone detector results should be considered to be 10 to 15 dB higher than the corresponding C-weighted value. This should be considered when setting noise maintenance thresholds (NMNL) and out-of-service thresholds (NOUT).

As an example, if a value of 3.5 dBnC is chosen as a noise maintenance threshold, a value for NMNL in the range of 50 to 55 dBn should be entered. Similarly, if a value of 45 dBnC is chosen as an out-of-service limit for noise, a value for NOUT in the range of 60 to 65 dBn should be entered.

Particular care should be exercised in choosing a value for NOUT. This parameter determines:

- whether the trunk can be used as a reference trunk in near-to-far end loss measurements
- whether the trunk should be removed from service automatically

For these reasons, NOUT should be set to a conservatively high value initially, until operating experience with ATM suggests using a lower value.

From this discussion on assigning NMNL and NOUT thresholds, it should be clear that ATM noise readings should only be used for flagging noisy circuits. Accurate circuit noise determinations must be made manually, using transmission test equipment.

Data administration

ATM impacts the following service change and print programs:

LD16	Trunk Route Administration (includes ATM data block)
LD21	Print Programs
LD29	Memory Management (for ATM program)

Procedure 1 describes the steps required to manage the ATM feature in the database.

Note: The general principles of data administration on the system are described in *X11 software management* (553-3001-300).

See the *X11 input/output guide* (553-3001-400) for a complete listing of prompts and responses for each overlay program. ATM supports the testing of tie, CSA, WAT, FEX, and COT trunk types. Default values are given in parentheses ().

Procedure 1
Defining the ATM and ATM schedule data blocks

Step	Task
1	Define route data blocks for the applicable trunk types before configuring the ATM route data blocks or ATM schedule data blocks.
2	Gather data to add, change, or remove an ATM route data block. Response to the following prompts in LD16 is required.
	REQ NEW, CHG, OUT
	TYPE ATM ATM data block
	CUST o-99 customer number
	ROUT o-51 1 route number
	T100 n...n T100 test line DN (2-1 0 digits)
	PADT 0-63 the pad factor for the far-to-near end loss measurement in dB
	STND (yes) test line is a standard T1 00 test line (1020 Hz tone for 5.5 s followed by silent termination at far end); ATM will do both loss and noise measurements on far-to-near end tests
	no test line is not a standard T1 00 test line; ATM will only do loss measurements on far-to-near test
	NMNL 27-90 noise maintenance limit (prompted if response to STND is "yes")
	NOUT 27-90 noise out-of-service limit, in dB rn (prompted if response to STND is "yes")
—continued—	

Procedure 1
Defining the ATM and ATM schedule data blocks

Step	Task
	NTOF (yes),no near-to-far measurement tests required
	REF n...n reference loop-around DN (2-1 0) digits (prompted if the response to NTOF is "yes")
	TST n...n test loop-around DN (2-10 digits) (prompted if the response to NTOF is "yes")
	PADL o-63. the pad factor for near-to-far end loss measurements, in dB (prompted if the response to NTOF is "yes")
	EML o-1 5 expected measured loss, in dB
	LMNL o-1 5 loss deviation for maintenance limit, in dB
	LOUT o-1 5 loss deviation for out-of-service limit, in dB
	DSBL (0)-100 maximum percentage of trunks to be disabled during scheduled testing if loss or noise exceeds the out-of-service limit; if 0 is entered, ATM will not disable any trunks in the specified trunk group
	MXTI 0-(5)-15 maximum waiting time, in seconds, for far-end test line to send test tone; if MXTI is exceeded and no test tone is received, the test is terminated unsuccessfully
3	Gather data to add, change, or remove the ATM test schedule start times. Response to the following prompts in LDI 6 is required.
	REQ NEW, CHG, OUT
	TYPE SCH schedule data block
	CUST o-99 customer number

—continued—

Procedure 1
Defining the ATM and ATM schedule data blocks

Step	Task		
HOUR	0-23	ATM test start time; the system schedules the start time for 15 minutes past the entered hour; the actual time is displayed at the terminal (for example, when "11" is entered "11:15" is displayed.)	
ROUT	<CR>	REQ is prompted again	
	0-51 1	route number (ROUT prompted until <CR> is entered)	
	X0-X511	delete a route number	
	<CR>	HOUR is prompted again	

ATM report description

The information in this chapter describes the ATM report (Table 5) which is sent to the system terminal and CMC, if featured.

Table 5
Output report format

ROUTE nnn		CUST nn dd mmm yy hh:mm:ss trunk type REF1=nnn REF2=nnn EML=nn LMNL=nn LOUT=nn DSBL=nn NMNL=nn NOUT=nn					
MEM	TN	F*N	N * F	F*N	F*N	N * F	REMARK
#		LOSS	LOSS	NOISE	STATUS	STATUS	

Output report fields

Each field in the output report is defined as follows:

ROUTE

The number of the trunk being tested.

CUST

The customer number.

dd mmm yy

The day, month and year of the test.

hh:mm:ss

The start/finish time of the ATM test, in hours, minutes, seconds for the specified trunk route (24 hour clock format).

Trunk type

Only tie, CSA, WAT, FEX, or COT are tested.

REF1

The reference trunk route member. This is the trunk that best fits the reference trunk criteria. It is used to test all other trunks through a distant loop-around.

REF2

The trunk route member of the trunk that is used to test the reference trunk REF1. Like REF1, it also fits the reference trunk criteria.

EML

The expected measured loss, in dB, as defined in the ATM data block.

LMNL

The loss deviation maintenance limit, in dB, as defined in the ATM data block.

LOUT

The loss deviation out-of-service, in dB, as defined in ATM data block.

DSBL

DSBL defined in the ATM data block.

NMNL

The noise maintenance limit, in dB, as defined in the ATM data block.

NOUT

The noise out-of-service limit, in dB, as defined in the ATM data block.

MEM #

The trunk group member. Test results are presented in ascending order.

TN

The loop, shelf, card and unit number of an analog trunk, or the loop and channel number of a DTI trunk.

F * N

Far-end to near-end measurement.

N * F

Near-end to far-end measurement.

LOSS

The circuit loss in **dB** units. This is equal to the tone level received from Tone Detector, minus PADT or PADL, depending on F to N or N to F measurements. If the value reaches the maintenance limit, one asterisk (*) is displayed after the number; if the value reaches the out-of-service limit, two asterisks (* *) are displayed.

NOISE

The measured flat noise in units of **dBm**. If the value reaches the maintenance limit, one asterisk is displayed after the number, if the value reaches the out-of-service limit, two asterisks are displayed.

STATUS

If the trunk test could not be completed, the cause is displayed in the status column. It may be any one of the following:

MSBY	maintenance busy
DSBL	disabled
BUSY	trunk was busy (call processing)
UNEQ	unequipped
SEIZ ERR	seizure error
CALL DRP	call was dropped
NO TONE	no test tone was detected
BAD TONE	bad test tone detected
DN BUSY	called DN returned busy tone
TRK TONE	during near-end to far-end testing, an unidentified tone was detected on the test trunk
DN OVERFL	called DN returned overflow tone
NO ANSER	far-end does not answer
BAD TSTL	bad test line — no quiet termination detected
TRK GLAR	trunk glare

Remark

For the overall test status of the trunk, the following remarks are valid:

- PASS trunk passed all transmission tests
- FAIL* at least one test exceeded the transmission maintenance limit
- DSBL** at least one test exceeded the out-of-service limit and the trunk has been automatically disabled
- FAIL* * at least one test exceeded the out-of-service limit, the trunk has not been disabled because percent limit of disabled trunks in the group has been previously reached

ATM report analysis

A typical ATM report is shown in Table 6. In this report, the values defined in the ATM data block are:

TEML 6dB	DSBL 10%
LMNL 4dB	NMNL 41 dBrn
LOUT 10 dB	NOUT 6 1 dBrn

Table 6
Sample ATM report

ROUTE nnn		CUST nn dd mmm yy hh:mm:ss trunk type REF1=nnn REF2=nnn EML=nn LMNL=nn LOUT=nn DSBL=nn NMNL=nn NOUT=nn					
MEM #	TN	F * N LOSS	N * F LOSS	F * N NOISE	F * N STATUS	N * F STATUS	REMARK
1	11090	7	5	35			PASS
2	11101	12*	15*	45"			FAIL*
3	11390	7		27		NO TONE	
4	11391	7			30	BUSY	PASS
5	11392				BUSY	BUSY	
6	11393		8		BUSY		PASS
7	11201	21**		45**		DSBL	DSBL**
8	11202	15*	20**	65**			FAIL"
9	11207				MSBY	MSBY	
10	12000				SEIZ	SEIZ	
11	12001		9		SEIZ		PASS

The actual measured loss (AML) ranges applicable in ATM are:

Pass $EML - LMNL \leq AML \leq EML + LMNL$

Maintenance $EML + LNML < AML \leq EML + LOUT$

or

$$EML - LOU \leq AML < EML - LMNL$$

Out-of-service $EML + LOU < AML < EML - LOU$

For the sample ATM report:

Pass $2 \leq AML \leq 10$

Maintenance $10 < AML \leq 16$

or

$$-4 \leq AML < 2$$

Out-of-service $16 < AML < -4$

For a measured noise (N), in dB_{rn}, the following ATM ranges apply:

Pass $N < NMNL$

Maintenance $NMNL < N \leq NOUT$

Out-of-service $N > NOUT$

For the sample report, the measured noise (N) falls within one of the following ranges:

Pass $N \leq 41$

Maintenance $41 \leq N \leq 61$

Out-of-service $N > 61$

Explanation of test results

The test results for each trunk in this sample mean the the following:

- | MEM # | Explanation |
|-------|--|
| 1 | passed all performance tests, chosen as reference trunk |
| 2 | fell into maintenance range on all tests |
| 3 | fell into the pass range for F to N tests and therefore was used as the REF2 trunk; N to F test was aborted when tone was not detected |
| 4 | fell into the pass range for F to N tests and was busy during N to F test |
| 5 | circuit was busy during all tests and could not be tested |
| 6 | was busy during F to N test and fell into the pass range for N to F tests |
| 7 | F to N tests fell into the out-of-service range and the trunk was disabled, which precluded making the N to F test |
| 8 | F to N tests fell into the out-of-service range but the trunk was not disabled because it would have resulted in more than 10 percent of the trunks in the group being disabled, for this reason, the N to F tests were done |
| 9 | could not perform any tests on this trunk, because it was in a maintenance busy state |
| 10 | could not perform any test on this trunk, because of seizure problems in both directions |
| 11 | could not perform any test on this trunk, because of seizure problems, trunk fell into pass range on N to F tests |

SL-1

Automatic trunk maintenance

Description

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Release 2.0

Standard

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SL-1

Multi-Tenant service

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Introduction

Multi-Tenant services is an optional Meridian 1 package that provides a customer with the means to resell his Meridian 1 features and resources to sub-groups, called Tenants. A record of Tenant activity is maintained by Call Detail Recording (CDR).

Multi-Tenant is not supported by Meridian Mail applications.

The number of tenants that can be configured per customer is dependant on the number of configured customers and the amount of available memory. The maximum is 512 tenants per customer.

Tenants A tenant consists of a group of telephones that use their customer's features and its attendant and trunk group resources. These resources may be assigned exclusively to a tenant (access denied for other tenants), or shared with some or all of the other tenants belonging to the same customer.

There are telephones that are not assigned tenant status but belong only to a customer (implied Tenant Number 0). These customer resource telephones have access to all other telephones, attendant consoles and outgoing trunk routes belonging to the customer.

Availability Multi-Tenant service is available on X11 release 7 and later software.

Related documents

To properly administer and maintain your system for Multi-Tenant services, refer to these documents.

XII Memory calculations (553-2201-149)

XII CDR description and formats (553-2631-100)

XII features and services description (553-3001-305)

XII input/output guide (553-3001-400)

Features

Customer features

All tenants share the same numbering plan.

All tenants share the same customer level service changeable features of the customer. Because they are defined at the customer-level, they are identical for each of a customer's tenants. The features consist of the following.

- Attendant Administration access code, 1 per customer
- Attendant Billing Number, 1 per customer
- Attendant DN, 1 per customer
- Attendant Network Class of Service (NCOS), 1 per customer
- Attendant Overflow DN, 1 per customer
- Attendant Queue timing threshold
- Automatic Identification of Outward Dialing (AIOD) prefix and attendant identifier
- Automatic Number Identification DN, 1 ANI DN per customer
- Busy Lamp Field Array (BLFA) information
- Call Detail Recording (CDR) records contain each tenant number
- Call Forward No Answer (CFNA). Attendant consoles receiving CFNA calls are tenant dial-zero consoles
- Call Forward Originating Party/Forwarding Party COS
- Call Park allowed/denied
- Call Waiting thresholds

- Camp-On Tone allowed/denied
- Centralized Attendant Service (CAS) specification, 1 per customer
- Charge Account number length
- Console Presentation Group Services
- Exclude/Include Lamp Field Array
- Exclude/Include Trunk Group Busy field
- Flash Timing
- Forced Charge Account number length
- Integrated Messaging System (IMS)
- Integrated Voice Messaging System (IVMS)
- Intercept Treatment as follows:
 - Access Denied
 - Call to Maintenance Busy Number
 - Call to Vacant Number
 - Calls to LDN
 - DO Not Disturb
 - Invalid NARS/BARS Call
 - Invalid NARS/BARS Translation
 - NARS/BARS Blocked Calls
 - NARS/BARS Restricted Calls
 - Restricted Call
- ICI configuration and definition. All attendant consoles have the same ICI configuration and definition
- Lockout option allowed/denied
- Message Center allowed/denied
- Message Center
- Night service DN, 1 per customer

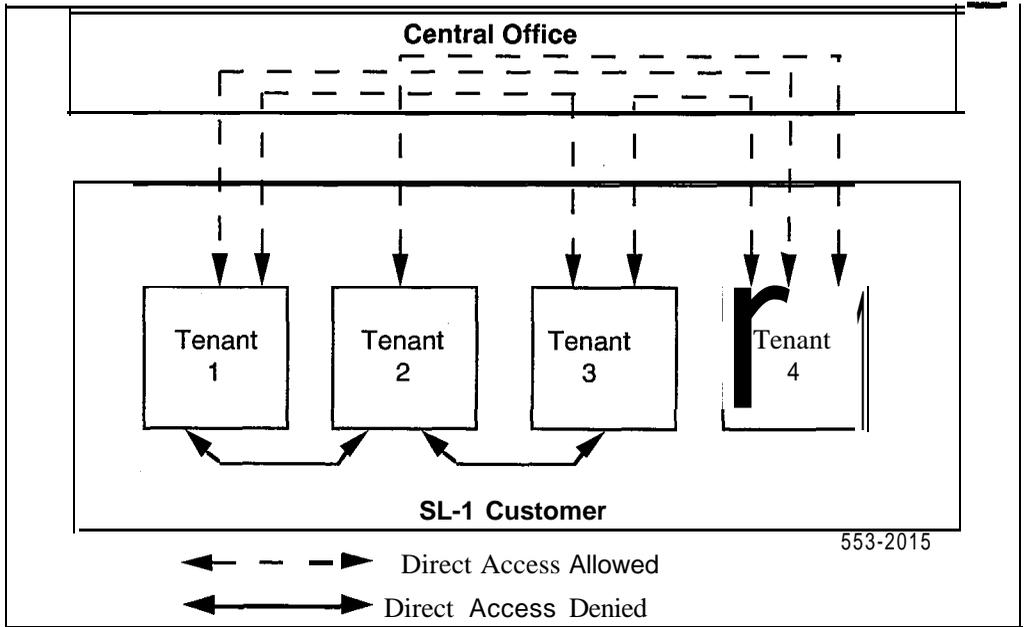
- Number of Listed Directory Numbers (LDNs), maximum 4 per customer
- Number of Listed Directory Numbers (LDNs), maximum 4 per customer
- Permanent Hold Reminder ring timing
- Recall Timers (slow-answer, camp-on, call-waiting)
- Recorded Overflow Announcement (ROA) definitions
- Secrecy allowed/denied
- Secure Data Password
- Set Relocation security code
- Special Prefix Number(SPRE)
- Test line DN
- Test trunk DN, maximum 4 per customer

Tenant-to-tenant access

Calls between tenant groups for the same customer are defined by **tenant-to-tenant** access. A tenant can be configured to allow direct internal call access to some or all tenants of the same customer. Likewise, the tenant can be denied direct access to other tenants. To reach these tenants, the caller must dial the tenant's Listed Directory Number. Access is always two-way.

Therefore if Tenant A has direct internal call access to Tenant B, Tenant B also has the same access to Tenant A. Customer telephones not belonging to a tenant have two-way access to all tenant telephones in the customer group.

Figure 1
Tenant-to-tenant access



For example, tenant-to-tenant Access is allowed or denied for tenants of the customer ,as depicted in Figure 1, can be seen as follows:

Tenant	Direct access allowed	Direct access denied
1	2	3 & 4
2	1 & 3	4
3	2	1 & 4
4		1,2 & 3

Outgoing Tenant-to-trunk route access

The Meridian 1 supports up to 512 trunk routes per customer, and each tenant can share or have private access to any or all of these routes. Tenant access applies only to outgoing calls. All tenants have access to incoming calls on any route. Customer telephones have access to all the customer's outgoing routes.

A tenant can have private outgoing trunk routes assigned. This is done by denying all other tenants access to the routes. Figure 2 shows examples of the following.

- Tenant 1 has private access to routes 1 and 5
- Tenant 2 has private access to routes 3 and 4
- Tenant 3 has private access to routes 6, 7 and 8

A tenant can share outgoing trunk routes with other tenants of the same customer. Again, Figure 2 shows that:

- Tenants 2 and 3 share access to route 2

A tenant can be denied access to specific outgoing trunk routes. Figure 2-2 indicates that:

- Tenant 1 is denied access to routes 2, 3, 4, 6, 7 and 8
- Tenant 2 is denied access to routes 1, 5, 6, 7 and 8
- Tenant 3 is denied access to routes 1, 3, 4 and 5

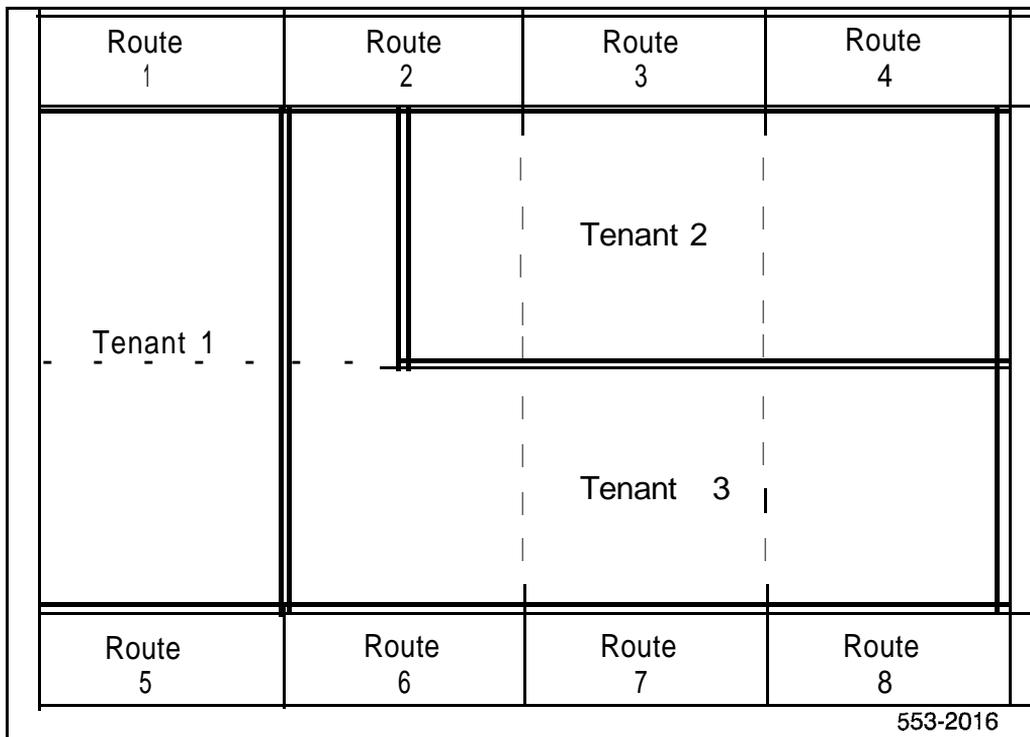
Individual tenants can be allowed or denied trunk access (private or shared) for the following trunk types.

ADM	Add-on Data Module
CAMA	Centralized Automatic Message Accounting
CCSA	Common Controlled Switching Arrangement
co	Central Office
DID	Direct Inward Dialing
DIC	Dictation trunk
DOD	Direct Outward Dialing
FX	Foreign Exchange
MDM	Modem
PAG	Paging trunk
TIE	Tie lines (direct, dedicated)
WATS	Wide Area Telephone Service

There are no restrictions on calls which are routed to the following trunk types.

AIOD	Automatic Identification of Outward Dialing
MUS	Music trunk
RAN	Recorded Announcement
RLM	Release Link, Main
RLR	Release Link, Remote
ACDR	ACD Emergency Recorder

Figure 2
Tenant-to-trunk route access



Attendant console groups

Within Multi-Tenant service, all attendant consoles are placed into groups which are associated with specific tenants and specific incoming trunk routes. The Group Number range is 0 to 511. All attendant consoles configured for a customer are automatically members of group 0. The other Groups are defined in the software to fit tenant requirements. Please refer to the section on Functions in this document for a description of the structure and functions of the attendant console groups.

Tenant-to-Attendant Access (Internal Calls) Tenant-to-Attendant access specifies which attendant console group receives automatic presentation of a tenant's dial-zero calls.

Trunk Route-to-Attendant Access Route-to-Attendant access specifies which attendant console group receives automatic presentation of incoming calls from a particular route.

Console Presentation Groups (CPG)

Console Presentation Groups (CPGs) are assigned to handle attendant calls from one tenant for a customer, or for calls originating from certain trunks in a particular route.

Most of the attendant console features and parameters apply to CPGs. For a complete description of the functionality for CPGs, please refer to the section on CPGs in this document.

Feature descriptions

Attendant console

Internal attendant-DN calls When a tenant telephone dials the attendant DN, the call is presented to an idle attendant console. The call is routed to an Attendant Group associated with the tenant of the calling telephone, if Attendant Console Groups have been specified for the tenant. Otherwise, calls are presented to any idle attendant console belonging to the customer. For example in Table 1, an attendant DN call from a Tenant 2 telephone is presented to an idle attendant in group 2 (consoles 1 or 2).

Incoming external calls Incoming external calls are presented only to the Attendant Console Group specified to serve the trunk group. Also from Table 1, incoming calls on route 3 are presented to attendant consoles in group 6 (consoles 9 or 10).

Attendant initiated calls All attendants have access to the customer's numbering plan and can initiate calls to any of a customer's tenants.

Attendant overflow position The Attendant Overflow DN should be accessible to all tenants. Attendant calls from tenants who do not have AODN access will not divert to AODN. They remain in the attendant queue.

Attendant recall When a tenant telephone recalls the attendant, the call is presented to an attendant in a group specified for the tenant of the calling telephone.

Attendant extend When an attendant extends a call from tenant A to tenant B, a 3-way conversation is set up only if tenant A and tenant B are allowed tenant-to-tenant access.

Automatic Timed Recall When Automatic Timed Recall (ATR) alerts the attendant, the call is presented to an attendant within the tennant group of the originally called number.

Console Presentation Group

A Console Presentation Group (CPG) is a subset of the consoles configured for a customer. A CPG is assigned to handle Attendant calls from one tenant for a customer. A CPG can also be assigned to handle calls originated by trunks on a route.

CPG improves functions on the following CPG Level Services.

Attendant Overflow Positions (AOP) Each CPG can have its own AOP-DN and waiting time threshold specified.

Call Waiting Indication The count thresholds, timers, and buzz options for Call Waiting can now be defined for each CPG.

Incoming Call Identification (ICI) The ICI keys can be defined for each CPG. Attendants see only those ICI key definitions for their own CPG.

Listed Directory Numbers (LDN) Each CPG allows four (4) LDNs.

Night Service (NSVC) Each CPG can go into Night Service mode regardless of the status of the other CPGs.

Feature requirements

Console Presentations Groups (CPGs) are supported as a separate package (172) which requires the Multi-Tenant package (86) in support.

Other features expected in a CPG environment must be packaged for complete functionality.

Centralized Attendant Service-Remote (CASR), package 26

Centralized Attendant Service-Main (CASM), package 27

Recorded Oveefflow Announcement (ROA), package 36

Attendant Overflow Position (AOP), package 56

The maximum number of route list entries for **BARS/NARS** is always 64, independent of the CPG Level Services package (172).

CPG services are mutually exclusive with Departmentally Listed DNs (DLDN).

Access to incoming trunk routes

Any tenant can be accessed on an incoming call from any incoming trunk route. Attendant console groups can be specified to receive automatic presentation of incoming calls from specified routes. This includes calls that terminate at an attendant console and calls that intercept to an attendant console as well. For example (table 3-A) incoming calls on route 2 are automatically presented to Attendant Console Group 5 (console 7 only).

Table 1
Typical attendant group arrangement

Attendant group number	Attendant consoles	Incoming Trunk routes	Tenant
0	1-10		
1	1		1
2	1, 2	1	2
3	1		3
4	3, 4	4	
5	7	2, 5	
6	9, 10	3	

Access to outgoing trunk routes

Tenants dial the appropriate trunk route access code to connect to a trunk route. Access codes are assigned on a trunk route basis, therefore all tenants use the same access code to connect to a particular route. customer telephones have access to all outgoing trunk routes belonging to their customer. Access to specific trunk routes is allowed or denied to individual tenants through service change. Tenants who try to access denied routes receive normal intercept treatment.

Feature interactions

Access restrictions

Multi-Tenant access restrictions affect the way that tenants interact with other tenants, trunk routes, and attendant consoles.

In general, Multi-Tenant access restrictions take precedence over the Meridian 1 features with which they interact and the technician must take care to see that tenant configurations do not have **unwanted** interactions.

For example, when a direct tenant-to-tenant call has been made, the called telephone cannot transfer the call to a different tenant if the first and third tenants are denied access to each other.

In addition to Class Of Service (COS) and TGAR/TARG restrictions, Multi-Tenant service may impose the following access restrictions:

- tenant-to-tenant
- tenant-to-Trunk Group
- tenant-to-Attendant Group
- Trunk Group-to-Attendant Group

Attendant administration

An Attendant can dial the access code and activate the Administration Mode for that CPG group. In this mode, they can modify the configuration of any set for this customer.

Automatic Call Distribution

Be aware of the following information when using ACD with Multi-Tenant services.

ACD basic

All agents and supervisors configured for an ACD DN, must belong to the same tenant. Internal calls to an ACD DN are only allowed if **tenant-to-tenant** access is allowed between the tenant of the calling telephone and the tenant assigned to the ACD DN.

ACD Night Treatment

ACD Night Service operates in three different modes, depending on agent status.

Day mode – all agents are working and operations are normal.

Transition mode – where some of the agents are logged out.

Night mode – when all agents are logged out, or the Supervisor has forced the system into the Night mode with an overriding key

Please refer to the ACD Publications for a complete description of Night Service and operating guidelines.

External calls

When the ACD DN is in night service, incoming external calls are routed to its ACD Night Call Forward DN.

Internal calls

When the caller's tenant has access to the tenant of the night telephone or trunk route, calls are delivered to the ACD Night Call Forward DN. When the caller's tenant does not have access to the tenant of the night telephone or trunk route, callers receive normal intercept treatment.

ACD Interflow

Incoming external calls

Incoming external calls inter-flow normally.

Incoming internal calls

Incoming internal calls interflow if the originating tenant has access to the interflow route or DN.

ACD Load Management

ACD Load Management provides a customer with the capability of altering the ACD configuration in response to varying ACD loads. One Load Management package per customer is allowed. Load Management functions for all tenants with ACD, are performed by a customer appointed ACD Load Manager from a Load Management TTY. The Load Manager must ensure that the following guidelines are adhered to:

- When any of the following ACD DNs are added or changed, they must be accessible by all tenants that can access the originally dialed ACD DN.
 - ACD Night Call Forward DN
 - Queue Interflow ACD DN
 - Queue Overflow ACD DN
- When agents are moved to a different ACD DN (**SAPA** or **LAPA** command), the destination ACD DN must belong to the same tenant as the original ACD DN.
- When an agent is assigned to another supervisor (**SATS** or **LATS** command), the new supervisor's telephone must belong to the same tenant as the agent being reassigned.

ACD-ADS (ACDD)

Tenant numbers are not sent to the ACD AUX processor.

Automatic Timed Recall (ATR)

When ATR alerts the Attendant, and Multi-Tenant services are in effect, the call is presented to an attendant in the same tenant group as the originally dialed DN.

AUTOVON

AUTOVON overrides CPG level operations. AUTOVON should not be enabled with CPG level services. Although these two features can coexist on the same switch, they should remain as different customers.

Basic -Authorization Codes (BAUT)

All tenants share their customer's authorization code tables, however tenant-to-tenant and tenant-to-Trunk Route specifications override BAUT.

Call Detail Recording

With the Multi-Tenant package, all tenants are included in CDR records. The tenant Numbers of the originating and terminating parties are added to the following CDR records.

CDR record type	Description
A	Authorization Code
C	Charge Account
E	End
L	internal Record
M	Charge Conference
N	Normal
P	Calling Party Number
Q	Connect Record
S	Start

Tenant number and customer number are included by the system in the CDR output to provide the customer with data for call billing and chargeback activities.

Call Forward

Call Forward All Calls

Originating Party COS

If the Originating Party (CFO) option is defined in the customer data block (LD 15), inter-tenant Call Forward is allowed if the calling party's tenant has access to the tenant of the Call Forward DN as well as access to the tenant of the dialed DN. If the Call Forward DN is in a tenant group inaccessible to the caller, the DN is treated as invalid. Overflow tone is returned to the caller. An access check is done by the software.

Forwarding Party COS

If the Forwarding Party (CFF) option is defined in the customer data block (LD 15), inter-tenant Call Forward is allowed if the Call Forwarding party's tenant has access to the tenant of the Call Forward DN. The telephone company must decide whether the option should be defined.

Call Forward Busy

DID calls to a busy telephone are forwarded to an idle attendant console specified for the tenant of the dialed telephone.

Note: Hunting and Call Waiting take precedence over Call Forward Busy.

Call Forward No Answer (CFNA)

Attendant option

After a customer defined number of rings, an unanswered call is forwarded to an idle attendant console specified for the tenant of the dialed telephone.

Any DN option

If the tenant of the calling party has access to the tenant of the Call Forward DN, the unanswered call will be forwarded (after the defined number of rings), to the Call Forward DN. If tenant-to-tenant access is denied, the call is processed as if no CFNA-DN existed.

Secretarial filtering

Calls receive secretarial filtering only if the tenant of the call forward DN is accessible by the tenant of the caller.

Second Level CFNA

All the same operands apply to the forwarded DN with Second Level CFNA (CFNA-2) allowed.

Call Forward by Call Type (CFCT)

The originally dialed DN must have access to the tenant of the forwarding DN. That way, external calls are easily forwarded to the programmed DN.

If the system is forwarding an internal call by CFCT, the originator must have access to the tenant of the programmed forwarding DN.

Call Park

Parking a Call

Call Park allows an attendant or a telephone to park an established call, usually prior to paging. The parked call is later retrieved, or may be accessed by a different attendant or telephone.

Retrieval

When the parked party is a trunk, any telephone without COS restrictions can retrieve the call. When the parked call is a telephone call, that telephone can only retrieve a parked call if its tenant has access to the tenant of the parked telephone.

Note: An attendant can retrieve any parked call.

CPG Level services

Parked calls recall back to the Attendant who parked them. If that Attendant goes into Position Busy mode, then the call recalls to an Attendant in the same CPG as the original. Recalls to Attendants going into Night Service mode are returned to the attendant queue until the caller abandons the call.

Call Transfer

A telephone user can transfer its original party to a third party only if the transferred parties can access each other. Software prevents joining tenants who are denied access to each other.

Calls Waiting Indication

The Calls Waiting Indication displays the calls waiting count for the customer. It is not tenant related but, because routes and tenants specify the consoles to which calls are automatically presented, it is possible that a **non-zero** call-waiting count will be displayed, even though no calls are being presented to the console.

Centralized Attendant Service (CAS)

CAS main

Specific attendant consoles can be assigned to receive automatic presentation of incoming calls from Release Link-Main (RLM) trunks.

CAS remote

All tenants have access to Release Link-Remote (RLR) trunks.

Code restriction

The code restriction data configured for a customer, applies to all tenants belonging to that customer.

Conference

All members of a conference must have access to each other. Meridian 1 software runs an access check which prevents the addition of access denied tenants.

Controlled Class of Service (CCOS)

The tenant of the CCOS Controlling Station must have access to the tenant of the controlled telephone to activate CCOS.

Departmental Listed DN (DLDN)

The Departmental Listed Directory Number (DLDN) takes precedence over Multi-Tenant services. For either Dial-Zero or Recall initiated from a tenant telephone, two events may occur.

- The call is presented to the DLDN attendant when the telephone has specified DLDN.
- The call is presented to the console specified by the telephone's tenant when the telephone does not have DLDN specified.

Dial Intercom Group (DIG)

The tenant of the dialing telephone must have access to the tenant of each telephone reached by DIG dialing.

Electronic Switched Network (ESN)

All tenants have access to the ESN features specified at the customer level. Except for tenant-to-Route access, all ESN features are identical for each tenant belonging to the same customer.

Coordinated Dialing Plan (CDP)

All tenants are allowed access to all of a CDP if they are configured for access to Tie trunk routes that are a part of the CDP.

Flexible Call Back Queuing (CBQ)

The originating tenant must have access to an eligible route in the CBQ route list.

Free Calling Area Screening (FCAS)

FCAS checks occur normally, if the originating tenant has access to the selected route.

Basic/Network Alternate Route Selection

All tenants have access to the BARS/NARS access codes of their customer, but tenants that do not share access to the selected route are denied access to that route.

Network Authorization Code (NAUT)

NAUT does *not* override tenant-to-Route access restrictions within the call originator's Meridian 1.

Network Speed Call (NSC)

All tenants have access to their customer's NSC lists, however, any route selected via NSC must have tenant-to-Route access allowed.

Off-Hook Queuing (OHQ)

OHQ is allowed if the tenant has access to a route in the initial route list of their customer that is eligible for OHQ.

Flexible Hot Line

Flexible Hot Line allows designated telephones to place calls to a predetermined destination by going off hook. The Hot Line telephone's tenant must have access to the tenant of the Hot Line DN, or standard intercept treatment is provided.

Group Call

Group Call allows a QSU telephone user to place a call to up to 10 predefined DNs simultaneously by pressing a Group Call key. The tenant of the telephone initiating the Group Call must have access to the tenant of each member in the group. Restricted members are excluded from the group. Meridian 1 software access checks the originator against each group member.

Hunting

Circular, Linear, Secretarial, or Short Hunting routes calls from a busy DN to the next idle DN in a prearranged group. If the DN being hunted is not accessible by the dialing telephone it is handled as an invalid member in the hunting chain. Short Hunting requires that all DNs configured on a QSU telephone belong to the same tenant.

Hunting Route

One step Route Hunting takes place between routes of the same trunk type. Tenants share their customer's route hunting specification and can use the stepped to route if they have tenant-to-Route access allowed for the route.

Integrated Messaging System (IMS)

Tenants can share or be denied access to their customer's IMS.

Integrated Voice Messaging System (IVMS)

Tenants can share or be denied access to their customer's IVMS. Tenants who do not have direct access to each other can use the IVMS Broadcast capability to leave messages for each other.

Intercept

All tenants share the customer's intercept specification.

Intercept on a **BARS/NARS** Call. When tenant-to-Route access restricts a **BARS/NARS** call, intercept treatment is the same as any invalid **BARS/NARS** call.

Intercept to Attendant. When an internal call intercepts to an attendant because of defined restrictions or dialing irregularities, it automatically presents the call to one of the attendant consoles specified for the calling tenant.

Intercept to RAN. When intercept treatment includes a Recorded Announcement and tenant-to-tenant access restricts a call, an Access Denied RAN will play.

Lamp Field Array

The Lamp Field Array, which can be located on an attendant console or a QSU telephone, indicates the busy/idle status of 150 consecutive DNs. These DNs are displayed regardless of tenant-to-tenant access specifications of the array equipped tenant telephone. For this reason, the DNs assigned in the array should be accessible by the tenant of the array associated telephone.

Maintenance telephone

QSU telephones with maintenance allowed COS must be allowed access to all tenants, all trunk routes and all attendant consoles.

Manual service

When a manual telephone goes off-hook, the call is presented to an idle attendant console belonging to a group specified for its tenant.

Manual Trunk service

When an incoming trunk terminates on a DN, there is no access check. Incoming trunks can terminate on an attendant console only if the console is specified for that manual trunk route.

Tenant-to-Route access checking is done for outgoing manual trunk calls.

Multiple Appearance DNs

All appearances of a DN should reside on telephones belonging to the same tenant. When a multiple appearance DN is called, the last non-fully restricted TN in its TN list determines the terminating tenant number for tenant-to-tenant access checking.

Multiple Listed Directory Numbers

Route-to-Attendant Console Access determines which Attendant Console Group receives automatic presentation of calls from a specific DID trunk route. Each of the four DID LDNs can be configured to have its calls presented at the loop key of specific attendant consoles, by using DLDN.

Night Service (NSVC)

Automatic Call Distribution (ACD) allows special functionality for the system under certain conditions, like going in to Night Service.

The Night DN should be assigned as a customer resource so that when Night Service is in effect, all tenants will have access to the Night DN for internal calls. Otherwise the call is treated as if no Night DN exists.

Position Busy

When all attendant consoles designated to receive incoming trunk calls from a particular trunk route become Position Busy, incoming trunk calls from those routes are directed to the Trunk Night Service DN.

Office Data Administration System (ODAS)

ODAS does not contain tenant information.

Ring Again

Ring Again is permitted when the originating tenant has access to the destination tenant.

Ringling Number Pickup (RNPU)

RNPU enables a telephone to answer calls to other telephones in the same RNPU Group. All tenants have access to their customer's RNPU access code. Members of an RNPU group can only answer calls for other members if their tenant has access to the tenant of the calling telephone. For this reason, members of an RNPU group should be selected from telephones belonging to the same tenant. The caller is access checked against the telephone picking up the call by the Meridian 1.

Route Selection-Automatic Number Identification (RS-ANI)

All tenants can dial the RS-ANI DN, however the ANI route selected from the RS-ANI list is used only if the tenant of the originating telephone can access the route.

Secrecy

The Secrecy option specified for a customer applies to all CPG Attendants for that customer.

Speed Call (SCL)

Speed Call allows a telephone user to place calls to specified DN's (telephones, CO trunks, DDD numbers) by dialing a two-digit code. A user of a Speed Call List receives normal intercept treatment if his tenant does not have access to the listed destination tenant.

Supervisory consoles

Supervisory consoles specified for a customer belong to one Console Presentation Group (CPG). In the Supervisory mode, ICI lamps show only the information for ICIs in that CPG. Thresholds specified in the customer Data Block (LD15) apply only to the CPG where that console resides, and do not effect any other CPG.

System Speed Call (SSC)

All tenants share their customer's SSC lists. When a System Speed Call DN is used tenant-to-Trunk Route access restrictions apply.

Traffic

Traffic data is collected on a per customer basis, not per tenant.

Trunk Group Access Restrictions (TGAR)

All tenants share their customer's TGAR, but tenant service access restrictions take precedence, even though the telephone COS and TGAR do not restrict access to a route. Normal intercept treatment is provided when tenant service access is denied.

Trunk routes

Dictation routes

Tenants may have private or shared access to the Dictation routes configured for their customer.

Modem Trunk routes

Tenants may have private or shared access to the Modem Trunk routes configured for their customer.

Music Trunk routes

All tenants have access to their customer's Music trunks.

Paging routes

Tenants may have private or shared access to the Paging routes configured for their customer.

Recorded Announcement (RAN) routes

All tenants have access to their customer's RAN trunks.

Voice Call

Tenant-to-tenant access must be allowed between the Voice Call originating telephone and terminating telephone.

SL-1

Multi-Tenant service

Description

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