M5317TX and CustomNet ISDN Telephone

Installation Guide

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About this document

This guide provides installation instructions for Northern Telecom's M5317TX and CustomNet ISDN telephone sets (Release 3.00 and up). As part of the documentation package that supports Northern Telecom's line of Meridian Integrated Services Digital Network (ISDN) business telephones, this guide has been prepared for use by telephone company installers and end users.

Chapter 1 gets you started with a brief introduction to the M5317TX and the installation process.

Chapter 2 summarizes the information you require to configure the set and describes how to prepare the installation site.

Chapter 3 explains how to install the set by using the Install Menu or by using the Network and Keys Menus.

Chapter 4 explains how to configure the BootROM on the set to configure a basic voice service and to prepare the set for firmware downloading.

Chapter 5 explains how to customize the set for the user.

Chapter 6 describes how to download new firmware releases to the M5317TX from a remote server.

Chapter 7 explains how to install optional equipment.

Chapter 8 helps you solve any problems that may come up during the installation.

There are also several helpful appendices and, including a glossary of terms and abbreviations.

Typographic conventions

This document employs various typographic conventions to help describe M5317TX operations.

Hard keys you are required to press are shown as:

˙®£•/¤‹›fi . . .

Soft keys are shown as

Clear

Information shown on your display is presented as:

```
Select configuration menu
Install     Network    Lang     Exit     more...
```

Notes concerning particular signalling environments are flagged using a boxed symbol, similar to the following example:

MFT

Related Documents

M5317TX Quick Installation Card - contains abbreviated instructions for installing the M5317TX with the DMS-100 switch. (P0745319)

M5317TX ISDN User Guide (NI-1 Voice Features) - contains instructions for using National ISDN-1 voice features in the Northern Telecom DMS-100 environment . (P0745320)

M5317TX ISDN User Guide (Meridian 1/ETSI Voice Features) - contains instructions for using Meridian 1 voice features. (P0745107)

M5317TX ISDN User Guide (NI-1 Voice Features: AT&T Environment) - contains instructions for using voice features in the AT&T switching environment. (P0744825)

M5317TX ISDN User Guide (Meridian Feature Transparency Voice Features) - contains instructions for using Meridian Feature Transparency (MFT) voice features. (P0738278)

M5317TDX Data Communications Guide - contains information about both packet-switched and circuit-switched data transmission using the M5317TX.(P0745110)

Contents

1 About the M5317TX and its installation

The M5317TX is an advanced business telephone for the Integrated Services Digital Network (ISDN). Combining voice and data capabilities using a single digital subscriber telephone line, the M5317TX allows the user to benefit from ISDN features and services available from the telephone company.

Figure 1-1: The M5317TX

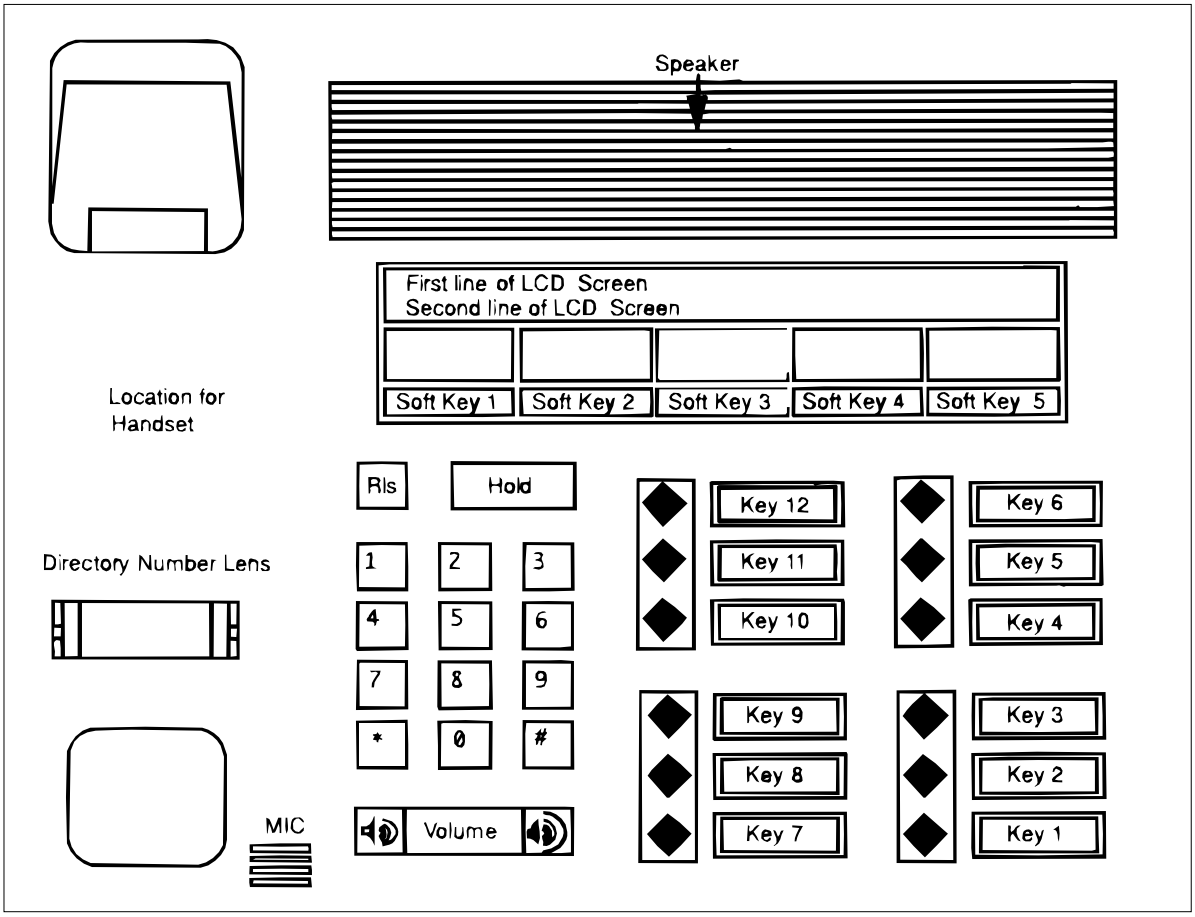


Figure 1-2: M5317TX displays and controls

Display	Shows the directory number of outgoing or incoming calls, the status of calls, and instructions for operating the set.
Speaker	Monitors the progress of a call without lifting the handset.
Handset	Used for talking on the phone-automatically selects the prime directory number when lifted.
Dial pad	Used for dialing and for entering information during installation.
Microphone	Picks up your voice during handsfree calls.
√	Adjusts the volume of the ring, the speaker, and the handset.
®	Releases a call without replacing the handset.
·	Puts a call on hold.
Softkeys	Provides quick access to features or installation options. The lower line of the display shows the current function of each key. If more features or functions are available than can be shown on a single line, the display shows the more... softkey.
more ...	Displays more menu options on the display.
Clear	Clears the display line showing your input.
<--	Erases the last dialpad number you pressed.
Feature/line keys	Acts as line key or as a feature key depending upon how the set is programmed.
Indicators	Indicates the status of the feature/line keys:
No diamond	Feature or line is not active.
Steady [a]	Feature or line is active.
Slow flashing [a]	Line is ringing or feature is being programmed.
Fast flashing [a]	Line is on hold.

M5317TX models

The M5317TX is available in one of two models:

- M5317TX Voice capabilities only. No data transmission capabilities are available.
- M5317TDX Both circuit-switched and packet-switched data transmission capabilities are available, in addition to the standard M5317TX voice capabilities.

The Australian version of the M5317TX is called the CustomNet. The CustomNet set is identical to the M5317TX and all references to the M5317TX in this guide apply equally to it.

M5317TX firmware

The M5317TX system software, or *firmware*, has two components:

- **BootROM**, which provides basic voice service and downloading capabilities.
- **MainROM**, which provides complete voice and data functionality.

Downloading firmware upgrades

M5317TX firmware can be upgraded by a remote computer (or *download server*) using the telephone network, or by a local PC using the M5317TDX serial port. Remote downloading is enabled during BootROM configuration (chapter 4). Instructions for downloading are provided in chapter 6.

Service Profile Management

When connected to the DMS-100 with Service Profile Management (SPM), voice features on the M5317TX can be configured automatically using a few simple steps, as described in chapter 3.

M5317TX installation

This guide provides complete instructions for installing the M5317TX in a variety of switching environments. The use of this guide varies according to the type of task you are required to perform.

If you are installing a new set :

- obtain the service profile and configuration parameters from the telephone service provider or system administrator, as summarized in chapter 2.
- perform instructions in chapter 3 to configure the MainROM with the service profile and configuration parameters.
- if required, configure the BootROM to enable remote firmware downloading.
- verify the installation and customize the set using instructions in chapter 5.

If you are installing optional equipment:

- perform instructions in chapter 7 to install a headset. If you are installing a data option card, follow the instructions which accompany the kit.
- configure data parameters on the set by performing instructions in chapter 3.

If you have added or removed features from your service profile:

- if Service Profile Management(SPM) is available (check with the system administrator or telephone company) you can update the service profile on the M5317TX by invoking the SPM function. Instructions are in **Invoking SPM from a working set** on page 32.
- if SPM is not available, you can change the function of hard and soft keys by performing **Using the Keys Menu** on page 29.

If you want to download new firmware to the M5317TX:

- perform instructions in chapter 4 to configure the BootROM with downloading parameters
- perform instructions in chapter 6 to download the new firmware.

If you need to configure the set for basic voice service only:

- if the M5317TX fails to function as configured in MainROM, you can configure the set to provide basic voice service for emergencies using instructions in chapter 4.

If you are moving a set to another ISDN line:

- follow the procedures described above in **If you are installing a new set**.

2 Preparing to install the M5317TX

This chapter has three sections:

- **Installation parameters and settings** discusses the type of information required to successfully complete the installation instructions in chapters 3 and 4.
- **Downloading parameters** describes the type of information required to enable the M5317TX for firmware downloading using instructions in chapter 4.
- **Preparing the installation site** goes through the tasks you need to perform before you install the M5317TX.

Installation parameters and settings

Before configuring the M5317TX, you need to know about the various settings required to enable communication with the telephone company switch. This section describes each type of parameter and setting which you need to obtain.

If you are a telephone company installer, the service order should contain all the parameters and settings you need.

If you are an end-user, your telephone company or service provider must provide the following information:

Signalling type

The signalling type indicates the protocol used by the switch to provide service to your ISDN line.

The M5317TX can be configured to operate with the following switches:

- Northern Telecom DMS-100
- Northern Telecom Meridian 1 PBX
- other National ISDN-1 compliant switches.

The M5317TX supports the following signalling types and versions as summarized in table 2-1.

Table 2-1: Signalling Types and Versions

Switch	Type	Version	Configure as:
DMS-100	Functional (CCITT)	*PVC 0 PVC 1 PVC 2 (NI-1) Austel	NI-1 NI-1 NI-1 Austel
	Stimulus (MFT)	PVC 0 PVC 1	MFT0 MFT1
	ETSI	PVC 0	ETSI
Meridian 1	ANSI(MER1)		MER1
	ETSI		ETSI
Non-NT switches	Functional (CCITT)	NI-1 mode	NI-1

* Protocol Version Control

B Channel configuration for voice and data service

The M5317TDX can be configured for voice and data service using one or two B Channels.

- **2B + D service** enables voice and data calls to be made at the same time. This configuration requires you to enter a voice TEI and SPID as well as a data TEI and SPID.

- **1B + D service** allows either voice or data calls to made, but not at the same time (sometimes referred to as *alternate* voice and data usage). This configuration requires you to enter a voice TEI and SPID only. The data TEI and SPID are left blank. Note that 1B + D service is not available for MFT signalling.

Note: The M5317TX (without the data option) may be configured for voice only.

Terminal Endpoint Identifiers (TEIs)

The M5317TX uses a *Terminal Endpoint Identifier* (TEI) to establish each service (voice, circuit-switched data, X.25 packet-switched data) provisioned on the ISDN line. For 2B+D service, you must enable both a voice and data TEI. For 1B+D service, only a voice TEI is enabled. If you have subscribed to X.25 packet-switched data service, you must also specify a X.25 packet TEI.

The M5317TDX uses *dynamic* TEIs for both circuit-switched voice and data services. A dynamic TEI is an identifier where the value is automatically determined when the set initializes-it is enabled by

entering an asterisk (•) in the configuration menu. A packet-switched TEI is *static* and is enabled by entering an actual TEI value (1-63).

Service Profile Identifier (SPID)

The SPID is a unique number which the switch uses to identify the location and features on the M5317TX. The SPID can be up to 20 digits long-the standard for DMS-100 switches is a 14 digit number, which is structured as follows:

- 3 digit area code
- 7 digit directory number (same as the Prime Directory Number)
- 2 digit optional suffix (00-99)
- 2 digit terminal ID (00-62) when using NI-1 signalling (not required on pre-NI-1 DMS lines, i.e. PVC0 or PVC1)

For Meridian 1, the SPID is a 1-9 digit number, usually a four-digit number identical to the Prime Directory Number (PDN).

In ETSI mode, a SPID is not required-leave as a blank when following the installation instructions in chapters 3 or 4.

Directory numbers(DN)

The Voice directory number is the number someone can dial to reach your M5317TX for spoken conversation. In addition to your Prime Directory Number (PDN), your set may have other directory numbers (including some which are shared with other sets). The X.25 DN is the number dialed to establish a packet-switched data link with your set, while the Data DN is the number used to establish a circuit-switched data call.

Directory numbers can be up to 12 digits long.

When configuring 1B + D service, you must enter a data DN (even though you are not entering a data TEI or SPID).

Call handling mode

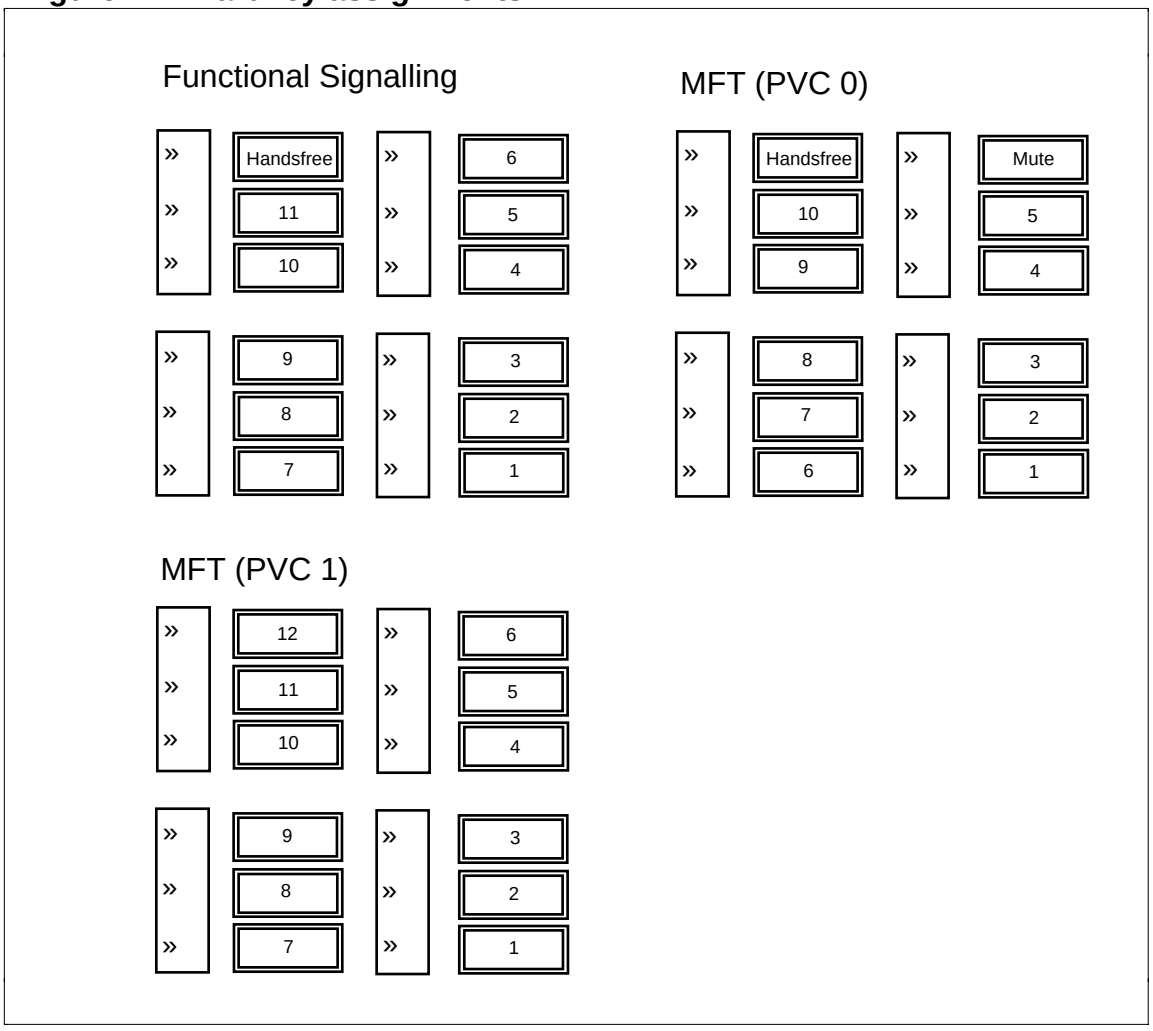
The M5317TX can be configured as a CACH (Call Appearance Call Handling) set when using NI-1 signalling. When set to CACH mode, the switch treats lines on the M5317TX as call appearances. When set to NoCACH, the switch treats the lines as directory numbers.

Hardkey assignments

The service order must indicate the function for each of the hard keys shown in Figure 1-1. Hardkeys can be assigned as either line appearances or feature keys. Some hardkeys have pre-assigned functions depending upon the signalling type being used on the set.

Hardkey numbering and pre-assigned functions differ between Functional signalling, MFT PVC0, and MFT PVC 1-consult figure 2-1 for the scheme used at your installation.

Figure 2-1: Hardkey assignments



Encoding Law(A/Mu)

There are two voice encoding laws supported in the M5317TX: Mu-law and A-law. In North America, select Mu-law; in Australia, select A-law.

In ETSI mode, set the encoding law to A-law.

Dial Plan

The dial plan setting on the M5317TX determines the numbering plan to use when sending information to the switch. The M5317TX must be configured for one of the following numbering plans:

Numbering Plan	Description
National	Area code plus DN. Use for NI-1 signalling.
Local	DN only.
InterNtl	Country code plus area code plus DN.
Unknown	Select for Meridian 1 signalling and pre-NI-1 DMS signalling(PVC0 or PVC1).

Note that the dial plan setting is not applicable for MFT signalling.

Presentation Indicator

The M5317TX can be configured to display the presentation indicator softkey (ID Pres) during normal voice operations. This key allows you to either suppress or reveal your line number to the party you are calling. This indicator can be configured only if the presentation feature is available on your ISDN line.

Downloading parameters

If you are enabling the M5317TX for remote firmware downloading, you must obtain the following information from the administrator responsible for providing the downloading service:

- server directory numbers
- trunk facilities
- server downloading method
- downloading bearer capability

Refer to chapter 6 for a description of setting up the M5317TX for firmware downloading.

Server directory numbers

The ServrIn number identifies your set for incoming calls from the server. The ServrOut number identifies the DN of the server for telephone-initiated downloading.

Trunk facilities(LAPB)

The LAPB parameter determines the transmission speed to be used for downloading, either 56kbps or 64kbps.

Server downloading method(Dnld TY)

This parameter determines the downloading type, either 1 Call or 2 Call.

Downloading Bearer Capability(Dnld BC)

This parameter determines the bearer capability (BC) for downloading.

Preparing the installation site

Inspect the site

1. Make sure the set can be placed in a well-lit area so the display is easy to read.

2. Avoid putting the set in a place where it can be exposed to sunlight for a prolonged period of time.

3. Confirm that the NT1 is installed and working.

   The M5317TX is designed for connection with the Network Termination 1 (NT1) and S/T bus. The NT1 can either be a stand-alone version located at the workstation or a rack mounted module version located in a central equipment room.

   Note that some Meridian 1 installations often use a U interface from the PBX to connect with the network, instead of an NT1. If this is the case, ensure that the Digital Subscriber Loop (DSL) and Terminal Service Profiles (TSP) are defined according to the *Meridian 1 ISDN Basic Rate Interface* NTPs listed in appendix C.

Northern Telecom Stand-alone NT1

When the stand-alone NT1 (shown in figure 2-2) is present at the site, connect the RJ45 line cord to the S/T jack.

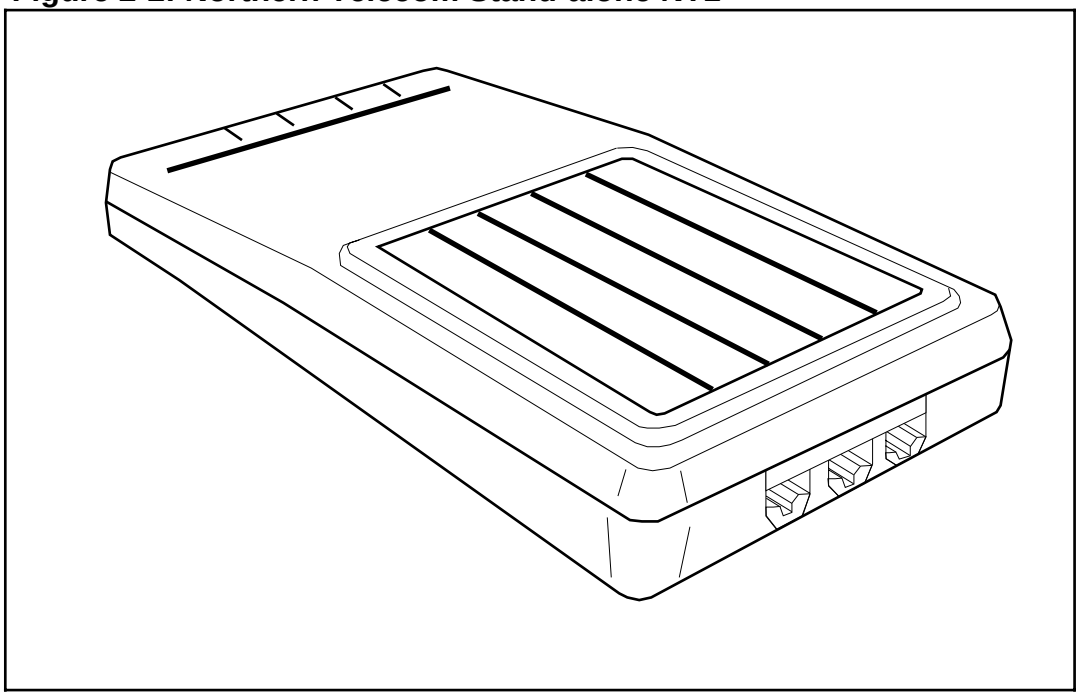
Northern Telecom Module NT1

For customers using the module NT1(see *NT1 and S/T Bus Installation Guide*, NTP 297-2451-207), the connection from the NT1 to the M5317TX is made via an installed wall jack.

Terminating Resistor

Depending upon the wiring configuration at the customer premises, there may be an external Terminating Resistor (TR) box connected to the S/T jack or wall jack. When you are instructed to connect the RJ45 line cord in the instructions that follow, connect it to TR box if there is one present.

Figure 2-2: Northern Telecom Stand-alone NT1



Confirming NT1 operation

Whether the NT1 is a stand-alone or module version, both types are working when the status indicators appear as summarized in the following chart:

Northern Telecom DMS NT1

Status Indicator	LED light
Power	ON
S/T	OFF
U-sync	OFF
Test	OFF

Status indicators for the AT&T NT1 are as follows:

AT&T NT1

Status Indicator	LED light
Power	ON
Terminal Error	OFF
Active	ON
Line Error	OFF

If the NT1 does not show these indicators, it is not ready for use with the M5317TX. Contact your supervisor or the System Administrator on site for direction. For more information concerning Northern Telecom NT1 configurations, consult the *NT1 and S/T Bus Installation Guide*, NTP 297-2451-207.

Unpack the M5317TX

4. Open the box on a flat, clean surface.

5. Check each component carefully for damage. Report any signs of damage immediately so that appropriate claims can be made to the transport company.

6. Set the box and packing materials aside in case the set must be returned to the factory.

7. Follow the instructions on the Installer card for leaving the M5317TX guides with user. The manual package should include:

   - Installer card
   - M5317TX ISDN User Guide (NI-1 Voice Features)
   - M5317TX ISDN User Guide (MFT Voice Features)
   - M5317TX ISDN User Guide (Meridian 1/ETSI Voice Features)
   - M5317TX ISDN User Guide (NI-1 Voice Features: AT&T Environment))
   - M5317TDX Data Communications Guide
   - M5317TX Quick Installation card

Prepare the M5317TX

8. Turn the set upside-down on a flat, static-free surface.

9. Connect one end of the handset cord to the handset connector on the base of the set. Route the cord through the channel and past the restraining tabs.

10. Connect the other end of the handset cord to the jack on the handset.

11. Connect one end of the RJ45 line cord to the connector on the base of the set. Route the cord through the channel and past the restraining tabs.

12. Turn the set right-side up and place it in the final workstation position.

Select the power supply configuration

Power source

The M5317TX is powered using one of the following power sources:

- phantom power (PS1) conducted over the T line card or the NT1
- auxiliary dc power (PS2) conducted over a third pair in the line cord (can be provided independently of the NT1 or line card)
- local dc power (PS2) conducted over a third pair from a power pack

Restricted powering

You can designate one telephone on the loop to operate in the event of a power failure. When power fails, the NT1 or line card reverses the polarity of the power output to the "designated" telephone and use at a reduced power can continue. Note that only one telephone on the loop can be designated for restricted powering-check your service order or ask the System Administrator to see whether the telephone should be designated for restricted powering.

Set the power switches

13. Pry open the power switch hatch underneath the set using a 3/16 inch (5mm) screwdriver.

14. Use the Power Alternatives Table shown below to set the power switches.

Power source and designation	V	
Phantom Supply PS1-non-designated	-	1
Phantom Supply PS1-designated	+/-	1
Remote Third Pair Supply PS2-non-designated	-	2
Remote Third Pair Supply PS2-designated	+/-	2
Local Third Pair supply PS2	- or +/-	2

15. Close the power switch hatch.

Apply power to the set

CAUTION
Do not plug in or unplug a PS1 powered M5317TX while other ISDN terminals are sending/receiving data on the same loop. Doing so causes data transmission errors.

16. Plug the free end of the 8-pin conductor cable into the wall jack.

17. If you are installing an auxiliary power source, plug the RJ-45 connector into the power source. Then connect the power source to the wall jack.

18. Wait several moments while the telephone performs a self-test. When the test is over, the display shows a copyright message and the time and date.

19. Continue by performing instructions in chapter 3.

3 MainROM configuration

This chapter provides instructions for configuring the M5317TX MainROM. Configuring the MainROM enables you to define a complete range of functionality for the M5317TX.

The MainROM configuration provides two methods for installing your M5317TX.

The Install Menu provides a step-by-step approach for setting each parameter. This menu is recommended when installing the M5317TX for the first time. Perform Method 1 in **Entering BootROM/MainROM configuration** and then perform instructions starting on page 21, **Configuring the MainROM using the Install Menu**.

The second method uses the Network and Keys menus to set individual parameters. The Network menu is used to set network dependent parameters such as TEIs and SPIDs. The Keys menu is used to program feature keys and directory numbers (DNs) on the M5317TX. Perform either Method 1 or Method 2 in **Entering BootROM/MainROM configuration** and then perform instructions starting on page 26, **Configuring the MainROM using the Network and Keys Menus**.

Entering BootROM/MainROM configuration

There are two methods of selecting the ROM to configure:

Method 1

1. Unplug the line cord (RJ-45 connector) from the jack underneath the set and wait ten seconds.

2. Re-insert the line cord back into the jack.

3. Within four seconds of reconnecting the line cord, press · and ® simultaneously until BootROM/MainROM appears on the display.

Select ROM to execute BootROM MainROM

You can now press either BootROM or MainROM, depending upon which ROM you want to configure.

Method 2

1. While the set is operating normally (in MainROM), press Setup in the idle screen display.

2. Press the digits fi⁄‡ to activate the special setup menus.

3. Press more... until BootROM appears.

4, Press BootROM. After a few seconds the display is blanked.

5. Press · and ® simultaneously until BootROM/MainROM appears on the display.

Select ROM to execute BootROM MainROM

You can now press either BootROM or MainROM, depending upon which ROM you want to configure.

Configuring the MainROM using the Install Menu

1. Press MainROM.

Select configuration menu				
Lang	Install	Network	Keys	more...

2. From the configuration menu, press Install. The display shows:

English	Francais	Espanol

3. Press the softkey corresponding to the desired display language. The display shows:

NI-1	DMS	Mu-Law	
SigType	SwType	A/Mu	EXIT

4. Press SigType until the required signalling type is displayed.

NI-1	DMS-100 and other National ISDN-1 switches.
Austel	For Telecom CustomNet telephones
Mer1	Meridian 1
MFT 0	DMS Proprietary Stimulus Signalling (PVC 0)
MFT 1	DMS Proprietary Stimulus Signalling (PVC 1)
ETSI	For DMS/M1 lines using ETSI protocol.

Note that you must select NI-1 for pre-NI-1 DMS switches.

5. Press SwType until the required switch setting is shown:

DMS	For a Northern Telecom DMS switch.
non-DMS	Set for all non-DMS switches.
Auto	To automatically detect the switch type.

NI-1

ETSI

The Switch setting is used for NI-1 and ETSI signalling only.

6. Press A/Mu until the required encoding law setting is shown:

Mu-Law	North American installations.
A-Law	Australian and ETSI installations.

7. Press EXIT. The display shows:

```
VoiceTEI:** DataTEI:   X25 TEI:
Voice                  Data       X25        OK
```

8. Press Voice.

9. Press • to enable the voice link.

   If you are not defining a TEI for either circuit-switched or packet-switched data service, go to step 14.

10. Press Data.

11. Press • to configure a TEI for circuit-switched data (CSD).

    1B +D

    Leave blank for 1B + D configurations-do not press •.

    If you are not defining a TEI for packet-switched data (PSD), go to step 14.

12. Press X25.

13. Enter the X.25 TEI.

14. Press OK to save TEI settings. The display shows:

Note that the Clear and <-- softkeys are displayed when a Voice SPID exists.

15. Enter the SPID for voice service, if required. Use the Clear and <-- softkeys to edit your input, if necessary.

ETSI Leave Voice SPID blank for ETSI signalling.

If you did not define a data TEI in steps 10 and 11, go to step 22.

16. Press OK.

17. Enter the SPID for CSD service, if required. Use the Clear and <-- softkeys to edit your input, if necessary.

1B +D

ETSI

Do not enter a Data SPID. For ETSI and 1B+D service, the Data SPID must be left blank. If a Data SPID is shown on the display, press Clear to remove the number.

18. Press OK.

1B +D

For 1B + D service, you must enter a data DN even though the data TEI and SPID are left blank. Usually, the Data DN is the same as the Voice DN. **Note:** Using a data DN which is shared with another set is not recommended.

19. Enter the DN for CSD service, if required. Use the Clear and <-- softkeys to edit your input, if necessary.

    If you did not define an X.25 TEI in steps 12 and 13, go to step 22.

20. Press OK.

X.25DN:		
<--	Clear	OK

21. Enter the X.25 Packet Data Network Address, if required.

22. Press OK.

Rear	NoCACH	National	yes	
Headset	CACHSet	DialPln	PresInd	EXIT

23. Press Headset until the display shows the jack location for the headset.

Rear	If there is no headset or the headset is plugged into the jack beside the data port.
Bottom	If the headset is to be plugged into the handset jack underneath the set.

24. Press CACHSet until the required setting is displayed.

CACH	Applicable only to CACH sets connected to a National ISDN-1 switch. The switch treats lines on the M5317TX as call appearances.
NoCACH	All sets connected to non-NI-1 switches and "No CACH" sets connected to a National ISDN-1 switch. The switch treats lines on the M5317TX as directory numbers.

25. Press DialPln until the required Dial Plan is displayed.

National	Area code plus DN. Select for sets using NI-1 signalling.
Local	DN only.
InterNtl	Country code plus Area code plus DN.
Unknown	Select for Meridian 1 signalling and pre-NI-1 DMS signalling(PVC0 or PVC1).

26. Press PresInd until the required presentation indicator setting is shown:

yes	ID Pres softkey is available.
no	ID Pres softkey is not available.

27. Press Exit.

```
Use SPM?
 Yes          No
```

Note that this menu appears only when SwType is set to DMS or Auto.

28. Press Yes if your ISDN line supports SPM (available on DMS switches only).

If you press No you need to enter feature key and DN assignments manually using the instructions provided in **Using the Keys Menu** on page 29.

29. The configuration of MainROM using the Install Menu is now complete. Press more... and then Exit to exit MainROM configuration. The set takes a few minutes to initialize. Press any DN key to speed up the process. After a few moments, the set returns to an idle state, as shown in the following example:

```
                                    1 JAN   00:00
Inspect      Forward     Auto#      Setup
```

The installation of voice and data features is now complete. If you need to install downloading parameters, follow instructions in chapter 4, **BootROM configuration**.

Configuring the MainROM using the Network and Keys Menus

1. Enter configuration mode using the instructions on page 20, **Entering BootROM/MainROM configuration**.

2. Press MainROM. The display shows the first of two Configuration Menu screens:

Select configuration menu				
Lang	Install	Network	Keys	more...

If you press more..., the second screen is displayed:

Select configuration menu			
Test		Exit	more...

Note that you can press more... to return to the first screen.

The Lang option allows you select the display language:

English	Francais	Espanol

The Install option enters the Install Menu, which enables you to set parameters in a pre-defined sequence (see the previous section Configuring the MainROM using the Install Menu).

The Network option is described in the next section, **Using the Network Menu**.

The Keys option is described in **Using the Keys Menu** on page 29.

The Test option is used by manufacturing only. Its use is not described in this manual.

The Exit option completes the installation process and initializes the set for service.

Using the Network Menu

The Network Menu enables you to set or change individual network settings without having to access the Install Menu. When you select the Network option from the Setup Menu, the following is shown on the M5317TX display:

Update network parameters				
Switch	TEIs	SPIDs	DNs	more...

When you press more..., additional options are displayed, as shown in the following screen:

Update network parameters			
Others		EXIT	more...

For a description of individual settings accessed through the Network Menu, please refer to the previous section, Install Menu.

Switch

Contains the SigType, SwType, and A/Mu settings:

NI-1	DMS	Mu-Law		
SigType	SwType	A/Mu		EXIT

TEIs

Contains the TEI settings for voice, data, and X.25 packet service:

VoiceTEI: **	DataTEI:	X25TEI:		
Voice		Data	X.25	OK

SPIDs

Contains the SPID values for voice and data:

Select SPID to update		
Voice	Data	EXIT

DNs

Allows you to set the data and X.25 directory numbers:

Select DN to update		
DataDN	X.25DN	EXIT

Others

Contains the Headset, CACHSet, DialPln, and PresInd settings:

Rear	NoCACH	National	Yes	
Headset	CACHSet	DialPln	PresInd	EXIT

Using the Keys Menu

The Keys menu allows you to manually configure voice features and DNs on the M5317TX or to invoke SPM. Manual configuration is required only when SPM is not available.

1. From the Configuration Menu, press Keys.

2. If the switch type has been set to DMS or Auto, the following screen is used to request SPM (SPM is not available on non-DMS switches).

Use SPM?	
Yes	No

   If you answer Yes, the switch uses SPM to automatically configure the set with directory numbers and features assigned to your line. No manual assignment is necessary and the Configuration Menu is displayed after SPM has been completed.

3. If you answer No, you are asked:

Delete current settings?	
Yes	No

   You should only select No when re-configuring a working set. In all other cases, you must select Yes to avoid the disruption of proper M5317TX operation.

4. The Key Assignment Menu is now shown on the display:

1	DN			
Key #	Type	Edit DN	Save	Exit

   Perform instructions in the **DN and Feature Key Assignment** section below for each defined key on your set.

DN and Feature Key Assignment

1. Press Key #.

2. Enter the two-digit key number which identifies the key you want to define. For example, if you entered key 02, the display shows:

2	DN			
Key #	Type	Edit DN	Save	Exit

   Hardkeys are identified as 01-11 on the M5317TX . Softkeys are identified as 12-64 and can only be assigned with softkey supported features.

3. Press Type until the display shows the desired key function:

DN	**Directory Number**. The key is used to make and receive calls. Use the Edit DN key to enter or change the DN.
FA	**Network Feature Activator**. The key can activate a feature provided by your telephone company or service provider. See the **Features available for FA keys** table
CAP	**Call Appearance**. The key is used to assign a call appearance or intercom feature.
LOC	**Local Feature Activator**. The key can be used to activate a local feature provided by the M5317TX.

4. If you are defining a DN key, use the EditDN key to enter or change the DN.

   If the type is FA, CAP, or LOC, press Feature until the display shows the feature code you want to assign to the key (see below):

Features available for FA keys

AFC	Additional Functional Call	GEN	Generic feature
AUD	Automatic Dial	LNR	Last Number Redial
AUL	Automatic line	LPA	Loudspeaker Paging
CAR	Call Request	MSB*	Make Set Busy
CFV	Call Forward Validation	MWT	Message Waiting
CFX*	Call Forward	PRL*	Privacy Release
CPK*	Call Park	PRV*	Privacy
CPU*	Call Pick-up	RAG*	Ring Again
EBO*	Executive Busy Override	SPL	Speed Call long
FCC*	Flexible Call Conference	SPS	Speed Call short
FCD*	Flexible Call Drop	SPU	Speed Call User
FCT*	Flexible Call Transfer		

* Features are supported by softkeys (keys 13-64).

Features available for CAP keys

CCH	Call Appearance	GIC	Group Intercom
ICM	Intercom		

CAP key features can only be assigned to keys 1-11.

Features available for LOC keys

Local features are listed in the M5317TX voice user guide

5. Press Save.

6. Repeat steps 1-5 for each feature and DN you need to assign to a key. When you have finished assigning all the required functions to keys, press Exit.

Invoking SPM from a working set

If you need to quickly re-configure the set with new or changed features, you can invoke SPM (when available) by using the Setup Menu, as described below:

1. While the set is operating normally (in MainROM), press Setup. in the idle screen display.

2. Press the digits fi⁄♯ to activate the special setup menus.

3. Press more... until SPM appears.

4, Press SPM. After a few moments a message is displayed which indicates SPM has been completed.

5. Press EXIT. Your set is now updated with new feature and DN key assignments

4 BootROM configuration

This chapter provides instructions for configuring the M5317TX BootROM. You need only configure the BootROM in one of two cases:

- you want to enable basic voice calls on the M5317TX in the event that MainROM functions have failed
- you need to enable the M5317TX for remote firmware downloading

To provide full voice and data service on the M5317TX, however, you must perform instructions in **MainROM Configuration**.

1. Use instructions in **Entering BootROM/MainROM configuration** on page 20 to enter configuration mode.

2. Press BootROM.

   After a few seconds the display shows:

   ```
   See Guide
   VoiceDN   ServrIn   ServrOut   Exit   more...
   ```

3. Press VoiceDN. The display shows:

   ```
   Your own DN:
                                          OK
   ```

   Note that if a DN has already been defined, it is shown on the first line of the display and the Clear and <-- softkeys are available. If you want to retain the DN displayed, skip step 4.

4. Enter the PDN for the set. Use the Clear and <-- softkeys to edit your input, if necessary.

5. Press OK

6. Press ServrIn.

   ```
   Server DN In:
                                          OK
   ```

7. Enter the DN of the server. The M5317TX uses this number to automatically identify a server-initiated download (see chapter 6).

   If you are not configuring the set for server-initiated downloading, leave ServrIn blank.

8. Press OK.

9. Press ServrOut.

   ```
   Server DN Out:
                                          OK
   ```

10. Enter the DN of the server for telephone-initiated downloading (see chapter 6).

    If you are not configuring the set for server-initiated downloading, leave ServrOut blank.

11. Press OK.

12. Press more....

See Guide				
SPID	TEI	Test	Exit	more...

13. Press SPID.

Select SPID to update			
Phone			Exit

14. Press Phone.

Phone SPID:		
<--	Clear	OK

    Note that if a SPID has already been defined, it is shown on the first line of the display. If you want to retain the SPID displayed, go to step 16.

15. Enter the Phone SPID. Use the Clear and <-- softkeys to edit your input, if necessary.

    ETSI Leave Phone SPID blank for ETSI signalling.

16. Press OK.

17. Press Exit.

See Guide				
VoiceDN	ServrIn	ServrOut	Exit	more...

18. Press more....

See Guide				
SPID	TEI	Test	Exit	more...

19. Press TEI.

20. Press Phone.

Phone TEI:	
	OK

21. Press • to enable the voice link.

22. Press OK.

23. Press more... until LAPB appears on the display.

24. Press LAPB until the required transmission speed for downloading is displayed (see chapter 6).

56Kbps	For standard trunks.
64Kbps	For clear channel trunks.

25. Press Dnld Ty until the required download method is displayed.

1Call	Single call download.
2Call	Two call download.

26. Press Headset until the display shows the jack location to which the headset is connected.

Back	If there is no headset or the headset is plugged into the Teladapt connector beside the data port .
Bottom	If the headset is to be plugged into the handset jack underneath the set.

27. Press more... until SigType appears on the display.

28. Press SigType until the required signalling type is displayed.

NI-1	DMS-100 and other National ISDN-1 switches.
MFT	DMS Proprietary Stimulus Signalling.
Mer1	Meridian 1 .
Austel	When installing a Telecom CustomNet telephone.
ETSI	For DMS/M1 lines using ETSI protocol.

Note that you must select NI-1 for pre-NI-1 DMS switches.

29. Press A/Mu until the required encoding law setting is shown:

Mu-Law	North American installations.
A-Law	Australian and ETSI installations.

30. Press Dnld BC until the required bearer capability setting is shown:

Speech	When speech bearer capability is used for download calls.
Data	When data bearer capability is used for download calls.

MFT This menu item does not appear when using MFT signalling.

31. Press DL Key.

MFT This menu item only appears when using MFT signalling. For all other signalling types, go to step 35.

32. If you must assign a hardkey other than the Prime Directory Number key for downloading, press the desired hardkey.

    You can use hardkeys numbered 1-10 (see appendix F for hard key locations).

33. Press more... until CACH Set appears on the display.

MFT This menu item does not appear when using MFT signalling.

34. Press CACH Set until the required call handling setting is shown:

CACH	Applicable only to CACH sets connected to a National ISDN-1 switch. The switch treats lines on the M5317TX as call appearances.
NoCACH	All sets connected to non-NI-1 switches and "No CACH" sets connected to a National ISDN-1 switch. The switch treats lines on the M5317TX as directory numbers.

35. Press DialPln until the required Dial Plan is displayed.

National	Area code plus DN. Select for sets using NI-1 signalling.
Local	DN only.
InterNtl	Country code plus Area code plus DN.
Unknown	Select for Meridian 1 signalling and pre-NI-1 DMS signalling(PVC0 or PVC1).

MFT This menu item does not appear when using MFT signalling.

36. Press Exit.

37. You have completed configuring the BootROM for basic voice service and download parameters.

5 Customizing the M5317TX

Verifying the datafill

When you have configured the BootROM/MainROM for use with NI-1 or Meridian 1 signalling, you can verify that the appropriate features have been installed by performing the following procedure:

1. At the idle display screen, press Setup(press more... if Setup is not displayed).

2. Press Query.

3. Use the Next and Prev softkeys to scroll through the following information:

   - Phone SPID
   - Data SPID
   - Phone TEI assigned by the network
   - Data TEI assigned by the network
   - DNs and features installed on hard/softkeys. Consult the table 5-1 for a description of feature abbreviations.

Table 5-1: Features available for FA keys

AUD	Automatic Dial	ICM	Intercom
AUL	Automatic line	LNR	Last number redial
CAR	Call Request	LPA	Loudspeaker Paging
CFX	Call Forward	MSB	Make Set Busy
CFV	Call Forward Validation	MWT	Message Waiting
CPK	Call Park	PRL	Privacy Release
CPU	Call Pick-up	PRV	Privacy
EBO	Executive Busy Override	RAG	Ring Again
FCC	Flexible Call Conference	RLS	Release
FCD	Flexible Call Drop	SPL	Speed call long
FCT	Flexible Call Transfer	SPS	Speed call short
GIC	Group intercom	SPU	Speed call user

Verifying the protocol

1. At the idle display screen, press Setup (press more... if Setup is not displayed).

Select update item				
Lang	Data	Clock	Volume	more

2. Press more... until Protocol is displayed.

Select update item				
Version	Protocol	Query	Ringing	more

3. Press Protocol. Your display shows the current protocol configured on the set, as shown in the following example:

NI-1(DMS)	Functional Sig	NT-TRF.000
		Exit

4. Press Exit. Press Exit again to exit the Setup menu.

Displaying the firmware version

1. At the idle display screen, press Setup(press more... if Setup is not displayed).

Select update item				
Lang	Data	Clock	Volume	more

2. Press more... until Version is displayed.

Select update item				
Version	Protocol	Query	Ringing	more

3. Press Version. Your display shows the current firmware version, as shown in the following example:

Version 3.3A	
	Exit

4. Press Exit. Press Exit again to exit the Setup menu.

Setting the date and time

Each time the M5317TX is powered up, the clock and calendar must be updated as explained in the following procedure:

1. Press Setup.

Select update item				
Lang	Data	Clock	Volume	more

If Clock is not shown, press more... until it is displayed.

2. Press Clock. The following is shown on your display.

Set date and time:			1 JAN 00:00am	
Day	Month	Hour	Minute	OK

3. Press the softkey for the setting you wish to change.

4. When you have displayed the desired time and date, press OK.

5. Press Exit.

Setting the display contrast

1. Press Setup.

Select update item				
Lang	Data	Clock	Volume	more

2. Press more... until the Contrst option is displayed.

3. Press Contrst.

	Use vol control [][][][][][][][]
	OK

4. Press either end of √ to adjust the display contrast.

5. Press OK, then press Exit.

Setting the volume levels

You can adjust the volume level of the handset, handsfree speaker or ringer using either the Setup menu or the Volume key.

Using the Setup menu

1. Press Setup.

2. Press Volume.

3. Press Ringing, Handset, or Speaker softkeys, depending upon which volume level you want to adjust.

4. Press either end of √ to adjust the volume level.

5. Press OK, then press Exit.

Using the Volume key to adjust handset volume

1. Press either end of √ while using the handset.

Using the Volume key to adjust handsfree speaker volume

1. Press either end of √ while on a handsfree call.

Using the Volume key to adjust ringer volume

1. Press either end of √ while using the M5317TX is ringing.

Selecting the ring tone and cadence

When connected to a DMS or Meridian 1 switch, you can select the ringer pitch (High or Low) and cycle speed (Slow or Fast). You can also adjust the ring cadence (Ring1 for North America, Ring2 for Australia).

Selecting the ring tone

1. Press Setup.
2. Press Ringing. You hear the current ring tone and cadence. If you do not see Ringing on the display, press more... until it appears.
3. Press each of the softkeys to listen to the ring tones.
4. When you have selected the tone you prefer, press more...
5. Press OK.

Selecting the ring cadence

1. Press Setup.
2. Press Ringing. You hear the current ring tone and cadence. If you do not see Ringing on the display, press more... until it appears.
3. Press Ring1 for North American installations.
   Press Ring2 for Australian installations.

Selecting the display language

1. Press Setup.

Select update item				
Lang	Data	Clock	Volume	more

If Lang is not shown, press more... until it is displayed.

2. Press Lang. The following is shown on your display.

English	Francais	Espanol

3. Press the softkey for the desired display language.
4. Press Exit.

Labelling the M5317TX

1. Remove the Key designation labels sheet from the Literature kit.
2. Print the directory number on one of the Telephone number cards.
3. Remove the handset from the telephone.
4. Insert the Telephone number card into the slot in the handset cradle.
5. Remove the plastic lens from the keycap package.
6. Snap the plastic lens into place, covering the Telephone number card.
7. Replace the handset.
8. Detach any key labels that are required from the key labels sheet.
9. If you cannot locate a specific key label, write the name on a blank key label and detach it from the sheet.
10. Fold the key labels and insert one inside each plastic key cover.
11. Snap each key cover onto the appropriate telephone key.

Selecting the customer documentation

1. Remove the remaining information from the Literature kit.
2. Give the customer a data communications guide and a voice features user guide. (In North America, use the table below to choose the appropriate voice features user guide.)

Signalling Type	User Guide
Functional signalling DMS	NI-1 voice guide
Functional signalling AT&T	AT&T voice guide
Meridian 1	M1 voice guide
Meridian Feature Transparency	MFT voice guide

3. Discard the Installer Card. (In North America, also discard the other two voice features user guides.)

6 Downloading firmware upgrades

M5317TX firmware can be upgraded using new firmware downloaded from a remote server. Both MainROM and BootROM firmware can be updated in this manner.

Firmware downloads can be performed using one of two methods:

- server-initiated downloading
- telephone-initiated downloading

Note that this chapter describes remote downloading only. The M5317TDX also supports local downloading using a PC application program. Instructions for local downloading are provided with the Firmware Upgrade kits available with each new firmware release.

Download parameters

To enable either method of downloading, you must first ensure that the required download parameters have been defined on the M5317TX. These parameters must be provided by the download server administrator and are entered when configuring the BootROM (see chapter 4).

ServrIn

The telephone number which the M5317TDX uses to automatically identify a call from the server.

ServrOut

The telephone number of the server which the M5317TDX dials to perform a telephone-initiated download. This number might be the same number as the ServrIn number, depending upon the numbering plan in use.

Dnld BC

Indicates the Bearer Capability (BC) used by incoming server calls. It must be set to either Data or Speech. Note that the Dnld BC parameter is not applicable when using MFT signalling (MFT automatically assumes a Speech BC).

Dnld Ty

Indicates the type of download procedure, either 1Call or 2Call.

DL key

Applicable only to MFT signalling, this parameter indicates which DN key to use for downloading.

LAPB

Indicates the transmission speed used for downloading, either 56kbps or 64kbps.

Server-initiated downloading

Server-initiated downloading enables the server administrator to upgrade the M5317TX as new firmware releases become available. Once downloading parameters have been programmed into the M5317TX, this downloading method requires no intervention from the end-user.

Telephone-initiated downloading

As an alternative to server-initiated downloading, you can manually initiate downloading from the set.

For telephone-initiated downloading to be successful, you must ensure that you obtain the server access password(if required), in addition to defining the download parameters previously described.

BootROM and MainROM upgrades

You can download both the BootROM and MainROM upgrades by making a separate call for each download. Since the BootROM download automatically erases the current MainROM load in your set, you must download the MainROM upgrade after a new BootROM upgrade is downloaded. Note that downloading a new MainROM upgrade does not affect the current BootROM.

Follow the instructions presented in the following sections to initiate downloading from your M5317TX:

- Preparing to download
- Downloading a BootROM load
- Downloading a MainROM load

Preparing to download

1. At the idle display screen, press Setup(if necessary, press more... until Setup appears).

Select update item				
Lang	Data	Clock	Volume	more

MFT Press the centre of the √ key.

2. Dial fi⁄‡.

3. Press BootROM.

   If necessary, press more... until BootROM appears.

   The M5317TX now takes a few moments as it restarts in BootROM mode.

4. Press Setup when it appears on the display.

MFT Press the centre of the √ key.

5. Dial fi⁄‡.

6. Press DnLoad.

7. If you are prompted to enter a password, enter the server access password and press OK.

8. Press OK.

Choose downloading modes		
DL Main	DL Boot	Exit

   If you are downloading a new BootROM load, continue instructions in the next procedure. If you are only downloading a new MainROM load, continue instructions starting at step 11.

   Note that downloading a new MainROM upgrade does not affect the current BootROM. Downloading a new BootROM, however, requires a subsequent MainROM download.

Downloading a BootROM load

WARNING
Do not remove power to the M5317TX during BootROM downloading. If power does fail during the process, the download will fail and the set might be damaged.

9. Press DL Boot

   If the server is not busy, it sends the new BootROM load to the set. When the server is busy, the M5317TX attempts to contact the server at 60 second intervals until a successful connection is established.

   As the download is transferred, your display shows a series of dots. After successful downloading, the set automatically reverts to BootROM mode and re-initializes.

10. Proceed to the next section to download the MainROM load.

Downloading a MainROM load

11. If the download menu is not shown on your display, repeat steps 1-8.

12. Press DL Main.

    If the server is not busy, it sends the new MainROM load to the set. When the server is busy, the M5317TX attempts to contact the server at 60 second intervals until a successful connection is established.

    As the download is transferred, your display shows a series of dots.

13. When the display indicates the download was successful, or if the set has been unable to contact the server after several attempts, press Exit.

    After successful downloading the set automatically goes into MainROM operation and is available for use. When an error code is displayed, repeat steps 11-13.

7 Optional equipment

Connecting a headset

To add a headset to the M5317TX

Plug the headset cord into the Teladapt connector in the back of the set, as shown in figure 7-1.

To replace a handset with a headset

1. Disconnect the handset cord from the handset connector underneath the M5317TX.

2. Plug the headset cord into the Teladapt connector in the back of the set, as shown in figure 7-1.

DIP-switch settings for Teladapt compatible headsets

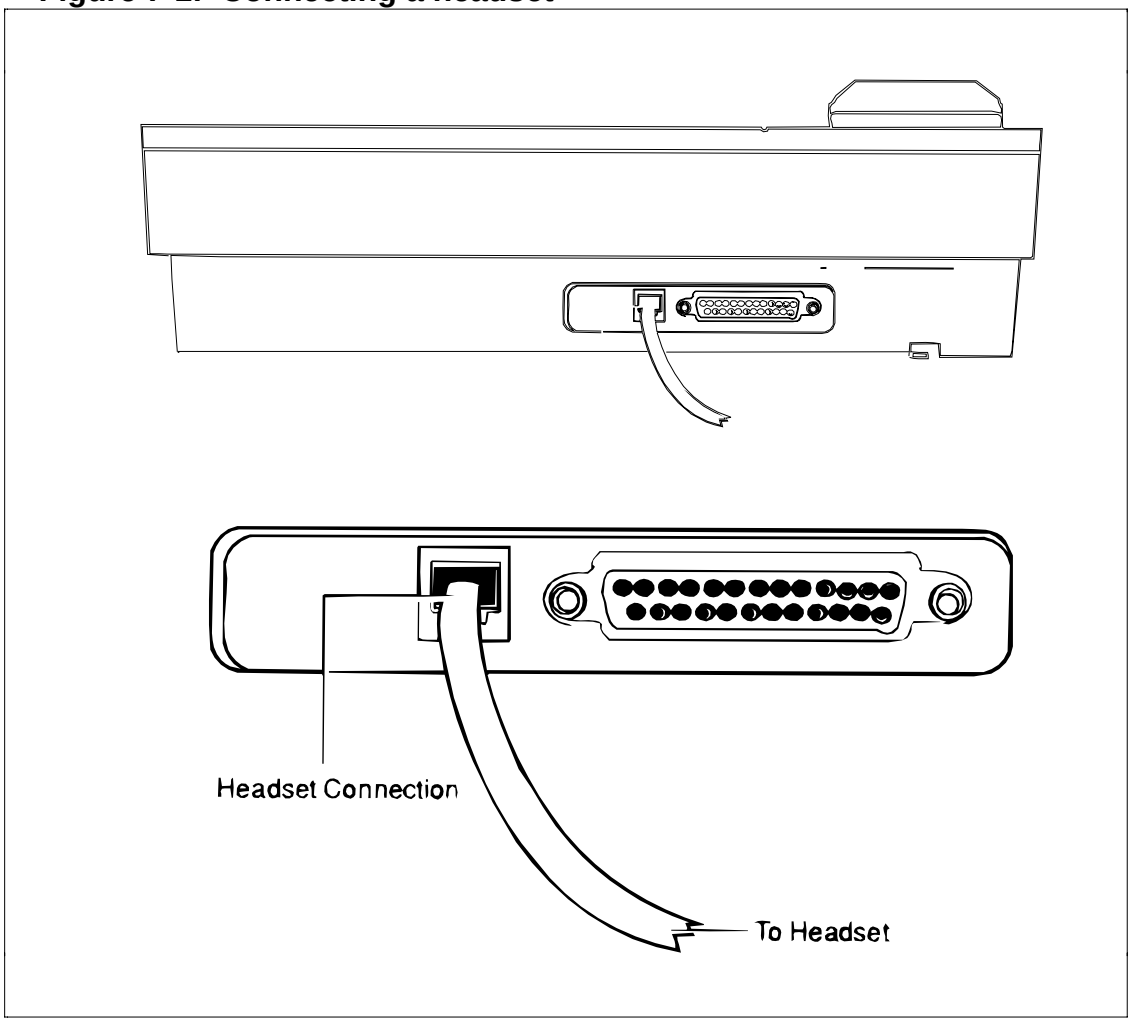
Plantronics Supra Model MHO530-1 or Starset Model MHO230-1

Switch	1	2	3	4	5	6	Volume
Setting	Off	On	On	Off	On	On	I I

ACS TelecTret II Model NWMP

Switch S3	1	2	3	4	5	6	7	8	9	10
Setting	Off	On	Off	Off	Off	On	On	Off	Off	Off
Switch S4	1	2	3	4	5	6	7	8	9	10
Setting	Off	On	On	On	On	On	Off	Off	On	Off
Volume setting 4										

Figure 7-1: Connecting a headset



7 Optional equipment

Trouble conditions may be reported by the telephone user (customer report), by way of automatic routine tests, or during installation procedures. For detailed diagnostic program description and input-output reference on an NI-1 mode system, consult 297-2101-300, -310, and -451 for DMS-100/200 systems. For special applications refer to 297-1001-001 *DMS-100 Family Master Index of Practices.*

Isolating switch problems

1. Run the appropriate diagnostic program for the switch (ISDN DMS MAP for DMS or LD32 for Meridian 1).

2. Check for error and location codes in the diagnostic output. (See Appendix D for a list of error codes.)

3. If the codes indicate a faulty component, replace it. Refer to the appropriate documents for replacement procedures (such as NTPs 297-1001-511 and 297-1001-514).

4. Run the diagnostic programs again to confirm that the error and location codes have been cleared.

Error Codes

If the M5317TX displays an error code after initialization, locate the code on the following table and go through the steps below. Check the display after each step-If the error code persists, go to the next step.

Error Code	Description
>>10<<	S/T loop sync loss and/or Frame sync loss
>>11<<	L1 transmit timer expired
>>21<<	Voice TEI removed by network
>>22<<	Circuit data TEI removed by network
>>23<<	Voice and circuit data TEI removed by network
>>27<<	All TEI removed by network
>>28<<	Voice link not established
>>29<<	Circuit data link not established
>>2B<<	No Layer 2 link established
>>30<<	No Layer 3 link established
>>31<<	No valid voice SPID
>>32<<	No valid data SPID
>>90<<	Restricted power mode in use. Lower ringer and speaker volumes apply

1. If error codes >>10<< or >>11<< are displayed, there may be a problem in the S/T loop. Check all connections to the NT1 and confirm that the NT1 is working properly-use the tables below to check normal indicators on the NT1.

Northern Telecom DMS NT1

Status Indicator	LED light
Power	ON
S/T	OFF
U-sync	OFF
Test	OFF

AT&T NT1

Status Indicator	LED light
Power	ON
Terminal Error	OFF
Active	ON
Line Error	OFF

If the NT1 does not show these indicators, it is not ready for use with the M5317TX. Troubleshoot the NT1 using the *NT1 and S/T Bus Installation Guide*, NTP 297-2451-207.

Also confirm that a terminating resistor is present in the loop, when necessary.

2. If error codes >>21<< - >>2B<< are displayed, there is a possible TEI mismatch problem. Check that all TEIs defined on the set match those expected by the network. Also confirm that no two sets on the same loop have the same TEI.

3. If error codes >>31<< or >>32<< are displayed, confirm that all SPIDs have been correctly defined on the set.

4. Replace or repair any defective wiring between the telephone and the network termination or line card.

5. Confirm that non-reversing cables are used.

6. Substitute a different telephone, datafilling it with the same information as the suspect telephone.

7. Replace the telephone and repeat the installation process.

Restoring dial tone

If there is no dial tone or if you cannot make a telephone call, follow these procedures. Check for dial tone and try to make a call after each step.

1. Check for flashing error codes as listed in the previous section.

2. Check and re-insert any loose Teladapt connectors.

3. Wiggle the line cord or handset cord while listening for sounds from the handset. If you hear crackling or ticking sounds, replace the cords.

4. Check the Teladapt socket for the handset or try another handset.

5. Re-run any defective wiring between the line card, distribution panel, and telephone.

6. Check the switch software to confirm the correct telephone assignment and voice channel operation in the network.

7. Replace the telephone.

Isolating faulty keys

Perform the following procedure if you suspect faulty key operation or if the display is behaving strangely.

1. Disconnect the RJ-45 connector from the bottom of the telephone.

2. After ten seconds, plug the RJ-45 connector back into the telephone. Note: Always wait at least 10 seconds between disconnecting a telephone and reconnecting a telephone on the same loop.

3. Press ® and ˙ simultaneously within four seconds of reconnecting the power.

4. Press BootROM or MainROM (select the mode you used to initially program the telephone).

5. Press more... until you see Test on the display.

6. Press Test .

7. Press Digital .

8. Press Display . The display clears for 2 seconds, all elements (pixels) darken for 4 seconds, then the Digital test display returns.

9. Press Ind/Key . The display clears except for the Exit softkey.

10. Press each of the keys on the telephone and verify the operation using the table of Keys and responses below.

Keys and responses

Key or action	Display
Dial pad keys	shows appropriate number
Left side of volume key	Vol Dn
Right side of volume key	Vol Up
Center of volume key	Store V
Rls (Release)	Rls
Hold	Hold
Handsfree	HFMute and key indictor turns ON
Indicator keys 1 to 11	Hard and key indictor turns ON
Softkeys 1 to 4	Soft1 to Soft4
Lift handset	OffHk
Replace handset	OnHk
Plug in headset	Seat
Unplug headset	Unseat

11. When the test is over, press Exit several times to return to the idle display.

Isolating transmission errors

A properly engineered digital transmission system provides a significant improvement in bit error rates over an equivalent analog system. Multidrop digital systems do, however, introduce some different sources for data errors, if incorrectly engineered. The S/T-bus requirements are discussed in the document *ISDN S/T Bus and U Loop Engineering* (NTPs 297-2451-181 and 2972451-182), but error possibilities are briefly listed here for reference:

- Loop characteristics: out of specification (range, cable parameters)
- NT1 configuration setting: different from loop arrangement
- Wiring polarity: if wiring polarity reversed for at least one terminal on multidrop loop
- Incorrect loop termination (missing, faulty, wrong location)
- Faulty terminal or line cord