TSU 600e

User Manual

Part Number 1202076L1

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Trademarks:

Windows is a registered trademark of Microsoft Corp.
T-Watch is a trademark of ADTRAN, Inc.

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FCC regulations require that the following information be provided to the customer in this manual.

1. This equipment complies with Part 68 of the FCC rules. The required label is affixed to the bottom of the chassis.

2. If your telephone equipment TSU 600 causes harm to the telephone network, the Telephone Company may discontinue your service temporarily. If possible, they will notify you in advance. But if advance notice isn't practical, you will be notified as soon as possible. You will be advised of your right to file a complaint with the FCC.

3. Your telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of your equipment. If they do, you will be given advance notice so as to give you an opportunity to maintain uninterrupted service.

4. If you experience trouble with this equipment TSU 600, please contact ADTRAN Customer Service for repair / warranty information (see the inside back cover of this manual). The telephone company may ask you to disconnect this equipment from the network until the problem has been corrected, or until you are sure the equipment is not malfunctioning.

5. This unit contains no user serviceable parts.

6. The following information may be required when applying to your local telephone company for leased line facilities.

Service Type	Digital Facility Interface Code	Service Order Code	Network Jacks
1.544 Mbps Digital Interfacl ESF	04DU9-B	6.0F	RJ48C
1.544 Mbps Digital Interface ESF	04DU9-C	6.0F	RJ48C
1.544 Mbps Digital Interface ESF with B8ZS	04DU9-S	6.0F	RJ48C

FEDERAL COMMUNICATIONS COMMISSION
RADIO FREQUENCY INTERFERENCE STATEMENT:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instuction manual, may cause harmful interference to radio frequencies. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Shielded cables must be used with this unit to ensure compliance with Class A FCC limits.

WARNING *Change or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.*

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Chapter 1
Introduction

TSU 600e OVERVIEW

The TSU 600e is a T1-FT1 CSU/DSU multiplexer with six option slots and embedded SNMP. This unit is designed for the most demanding T1 data and voice applications. Each module offers up to four additional data ports for a total of 24 possible data ports.

The TSU 600 serves as the link between user data sources such as local area network (LAN) bridges and routers, computers, CAD systems, teleconferencing equipment, and PBXs. Through the use of multiple data ports, the TSU 600e can simultaneously connect one or more of these devices to a T1 circuit. The amount of bandwidth allocated to each port is custom-programmable. You can manually allocate bandwidth or set the bandwidth to automatically change at predetermined times to use the available bandwidth most advantageously. Changes in the configurationdo not disrupt data flow in channels that are not being reconfigured. The unique architecture and the availability of the option modules provides a path for growth to accommodate future requirements.

The TSU 600e is an enhanced version of the TSU 600, offering SNMP options and other upgrades. The new features added to the TSU 600e are listed below.

New Features in the TSU 600e

The TSU 600e offers the following upgrades from the TSU 600:

- SNMP, Telnet, and T-Watch management via SLIP or 10-Base-T.
- Ability to proxy for “agentless” units What does agentless really mean?

- Enhanced terminal mode.
- Support for a backup power supply.
- Fractional T1 loopbacks as defined in annex B of ANSI T1.403-1995.

Standard Features in the TSU 600 and TSU 600e

The following list describes the standard features in both the TSU 600 and the enhanced TSU 600e.

- A DS1 interface and a 60 Hz power supply.
- Six slots to house option modules with up to four additional data ports, including voice.
- Allows mix of port types to meet the data interface requirements.
- Easy configuration capabilities using simplistic menus displayed in a liquid crystal display (LCD) window operated by a front panel keypad.
- Two programmable configuration maps that define the bandwidth allocation between data ports. Second DS1 interface provides three MB aggregate throughput.
- Data drop and insert, as well as full drop and insert.
- Flash memory for software updates.
- Timing is selectable from the network, from the slot 1 data port, internally, or from a secondary interface.
- QRSS; 511 test patterns using Nx option.
- Extensive self test and monitoring provides assurance of proper operation.

TSU 600E CONFIGURATION APPLICATIONS

The following examples illustrate possible configurations of TSU 600e applications.

TSU 600e Option Modules

The TSU 600e features a unique architecture that allows the addition of six option modules and plug on boards providing an opportunity for growth to accommodate many applications (see Figure 1-1).

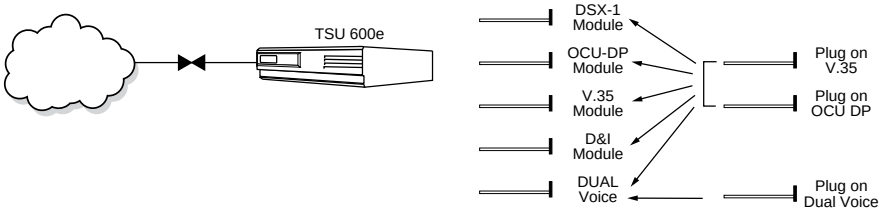


Figure 1-1
TSU 600e Option Modules

Bridge, PBX, Video Conferencing Application

In this application, an Nx54/64 module provides a V.35 interface to a bridge. The PBX is interfaced to the TSU 600e with the DSX-1 module. An OCU DP module and OCU DP plug on board provide two switched 56 circuits. See Figure 1-2.

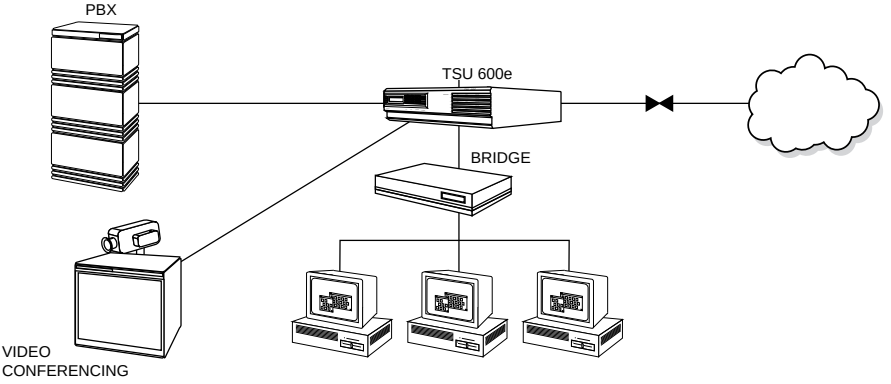


Figure 1-2
Bridge, PBX, Video Conferencing Application Set Up

All Voice Application

In this application 24 voice channels are provided for telephones and for fax machines. Six FXS dual modules with six dual FXS plug on boards provide the voice interfaces. See Figure 1-3.

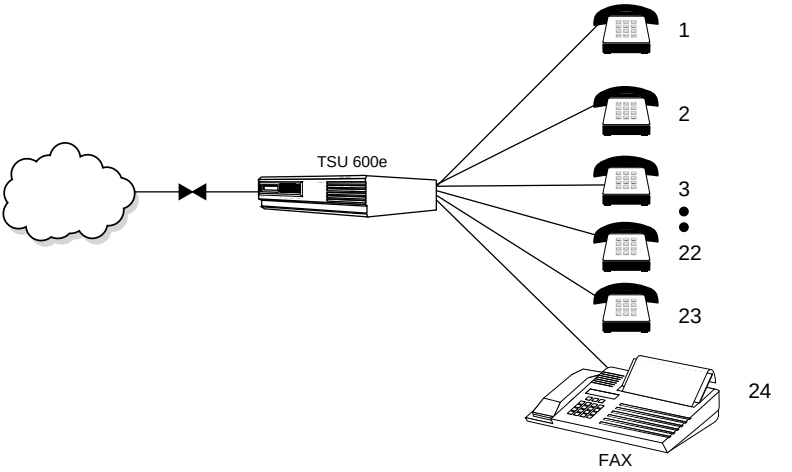


Figure 1-3
All Voice Application Set Up

Drop and Insert, Voice, and Bridging Application

The TSU 600e provides a bridge interface with an Nx56/64 module. A drop and insert module provides an interface to a remote TSU 100. The OCU DP module is used for a 56 kbps DDS circuit to a remote warehouse. T-Watch (which runs on a PC) easily manages the network. See *Figure 1-4* on page 13.

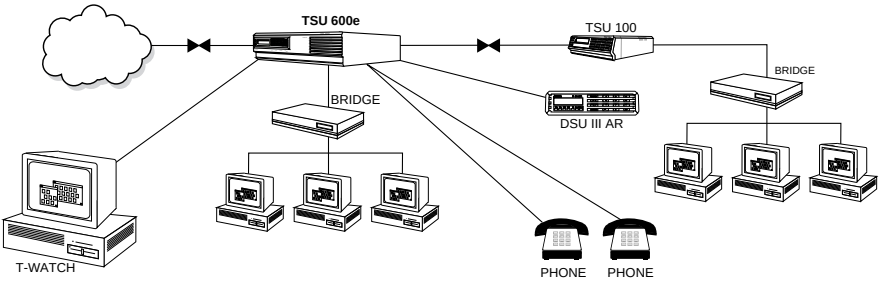


Figure 1-4
Drop and Insert, Voice, and Bridging Application Set Up

Variations of Mixed Applications

Regional Sales Office

TSU 600e supports LAN bridge with base Nx. The PBX uses a DSX-1 module. Video conferencing is interfaced by use of the plug-on V.35 interface. See *Figure 1-5* on page 14.

Branch Office

TSU 600e supports LAN bridge with base Nx. The KEY system uses the DSX-1 module. See *Figure 1-5* on page 14.

Corporate

TSU 600e supports LAN bridge with base Nx. The PBX system uses the DSX-1 module. The plug-on V.35 interfaces to the video telecom equipment. See *Figure 1-5* on page 14.

T-Watch Management Software

The T-Watch software runs under Microsoft Windows® allowing full access to local and remote TSU units. Test, monitor, and performance information is available with pull down menus. It is possible to dial into the system with a modem or to access remote units via the FDL. See *Figure 1-5* on page 14.

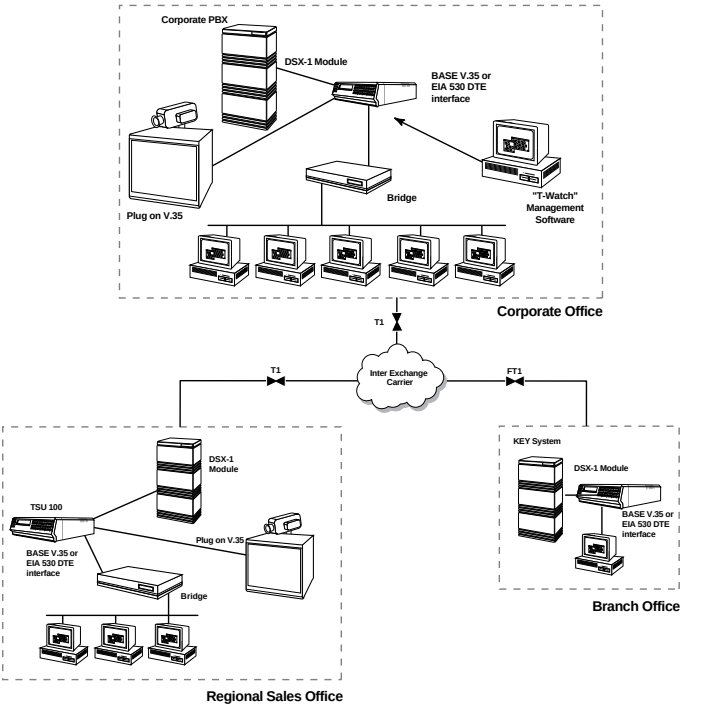


Figure 1-5
Variations of Mixed Applications

T1/FT1 OVERVIEW

Telephone companies (telcos) have used the T1 digital communications link for transmitting voice since the early sixties. The D4 channel bank is a T1 digital carrier system that was introduced in the mid seventies and telcos still widely use this system. Communication demands of businesses continued to grow to the point that the telcos began offering T1 service directly to the public. D4 channel banks began to be used for T1 in corporate network topographies for voice. The technological advances in computer development also created a demand for T1 data communication which now is a large part of the T1 traffic.

T1 Service Offerings

T1 is a digital service that is delivered to the user over two pairs of wires from the service provider. The signal operates at 1.544 Mbps and repeaters installed about every mile after the first 600 feet usually extend the signal. The T1 signal is divided into 24 time slots (DS0s) which operate at 64 kbps. Each time slot is occupied by digitized voice or by data.

The T1 signal originally used a type of framing known as D4 Superframe which identifies how the T1 is multiplexed. An enhancement of that framing format, called Extended Superframe Format (ESF), is available. It provides a non-disruptive means of full time monitoring on the digital facility. Service providers originally used ESF to monitor the performance of their service offering. Since the introduction of ESF, equipment that is installed in private networks can also provide the same performance information to the user.

Fractional T1

Fractional T1 (FT1) lets you purchase less than a full T1 circuit between two points. Most carriers offer fractional T1 in increments of 56 or 64 kbps. Connection is made to the same network elements. The network allows multiple users to share the same interoffice T1 bandwidth.

Fractional T1 remains almost exclusively an Inter-Exchange Carrier (IXC) service. Local Exchange Carriers (LECs) typically do not offer FT1, so the proximity of the user to the point of presence (POP) of the IXC is key in the savings that fractional T1 offers.

Fractional T1 local access is available in two forms: 56 kbps or a full T1 line. In 56 kbps, the required number of DDS lines is extended from the IXC POP and the bandwidth is combined at the office on an outbound T1 circuit. The user pays for the individual 56 kbps lines and the amount of the interoffice T1 used. In T1 access, the user pays for full T1 to the IXC POP and then only for the bandwidth used.

SNMP

Simple Network Management Protocol (SNMP) broadly refers to the message protocols used to exchange information between the network and the managed devices, as well as to the structure of network management databases. SNMP is built into the TSU 600e. SNMP has three basic components:

Network Manager

The network manager controls a program that collects, controls, and presents data pertinent to the operation of the network devices. It resides on a network management station.

Agent

The agent controls a program that resides in each network device connected. This program responds to queries and commands from the network manager and returns requested information or invokes configuration changes the manager initiates

MIB

The MIB is an index to the organized data within a network device. It defines the operation parameters that the device can controll or monitor.

The TSU 600e supports the ??? standard. MIB files are available from ADTRAN in the support section of the ADTRAN World-Wide-Web page at http://www.adtran.com.

The TSU 600e's embedded SNMP feature allows the unit to be accessed and controlled by a network manager through either a device running SLIP or async PPP protocol (connected to the CONTROL port of the TSU 600e).

TELNET

TELNET provides a password-protected, remote login facility to the TSU 600e. TELNET allows a user on a network manager to control the TSU 600e through the terminal menus. See the chapter ??? for detailed information.

DIAL BACKUP OPERATION

The TSU 600e's DBU cards are field-installable by the customer. See the chapter ??? for information on installing DBU cards. All DBU cards are compatible with other products supporting DBU.

Which types of DBU cards are compatible with this product?

WARRANTY AND CUSTOMER SERVICE

ADTRAN will replace or repair this product within five years from the date of shipment if the product does not meet its published specifications or if it fails while in service. For detailed warranty, repair, and return information refer to the ADTRAN Equipment Warranty and Repair and Return Policy Procedure.

Return Material Authorization (RMA) is required prior to returning equipment to ADTRAN.

For Service, RMA requests, or more information, contact ADTRAN Customer Service listed on the inside back cover of this manual.

Chapter 2
Installation

UNPACK, INSPECT, POWER UP

Receipt Inspection

Carefully inspect the TSU 600e for any shipping damages. If you suspect damage, file a claim immediately with the carrier and then contact ADTRAN Customer Service (see the last page of this manual). If possible, keep the original shipping container for use in shipping the TSU 600e back for repair or for verification of damage during shipment.

ADTRAN Shipments Include

The following items are included in the ADTRAN shipment:

- The TSU 600e
- A line interface cable: an 8-position modular to 8-position modular
- The user manual

Customer Provides

You must provide the following items:

- DTE cable(s)
- Cables for any expansion modules to be used with the TSU 600e

Power Connection

Each TSU 600e is equipped with a captive eight-foot power cord, terminated by a three-prong plug which connects to a grounded power receptacle.

CAUTION *Power to the TSU 600e must be from a grounded 115 VAC, 60 Hz source.*

Identification of Rear Panel Layout

The configuration of the rear panel of the TSU 600e is shown in Figure 2-1.

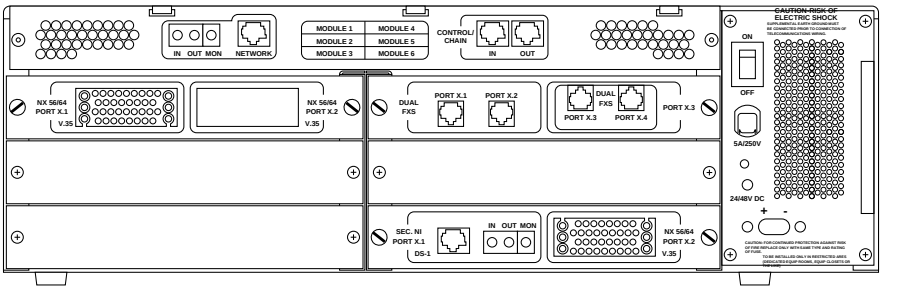
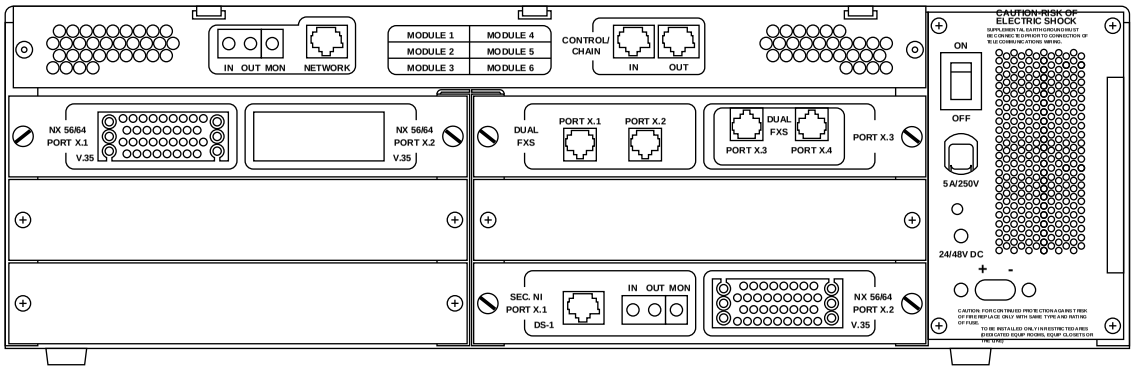


Figure 2-1
TSU 600e Rear Panel

LIST OF ITEMS ON REAR PANEL

Backup Power Supply

The TSU 600e has a second slot on the right side of the shassis to accommodate a second backup power supply. MORE INFO ON THIS. GRAPHIC THAT POINTS THIS OUT>


IN OUT MON
NETWORK
MODULE 1
MODULE 2
MODULE 3
MODULE 4
MODULE 5
MODULE 6
CONTROL/ CHAIN
IN
OUT
CAUTION-RISK OF ELECTRIC SHOCK
ON
OFF
5 A/250V
24/48V DC
+ -
NX 56/64
PORT X.1
V.35
NX 56/64
PORT X.2
V.35
DUAL FXS
PORT X.1
PORT X.2
DUAL FXS
PORT X.3
PORT X.4
PORT X.3
SEC. NI
PORT X.1
DS-1
IN OUT MON
NX 56/64
PORT X.2
V.35

TSU 600e Interfaces

The TSU 600e is equipped with six slots in the rear panel to house option modules which provide a variety of additional data ports. See *Figure 2-2* on page 23.

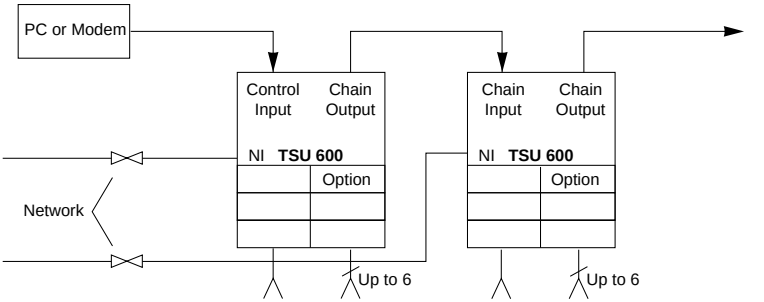


Figure 2-2
TSU 600e Interfaces

The options slots are backwards compatible with all existing options modules. Also, the unit contains a two-wire serial bus that allows flash download of option modules with new or updated modeuls that support this features. The TSU 600e also can source timing from modules in any slot.

Option Slot Arrangement

As viewed from the rear of the TSU 600e, the slots are numbered as shown in *Figure 2-3* on page 24. All slots are functionally identical except slots one and six. These slots offer additional functions.

Slot 1

Slot 1 is used as the source of DTE timing when the DTE timing mode is selected. If DTE timing is desired, the DTE interface port sourcing the timing must be connected to Slot 1. This slot will accept all other interface types except Secondary Network interface option modules, including DSX-1 (PBX), the Full Drop and Insert (D&I) network interface, or the Dial Backup (DBU).

Slot 2

Slot 2 is used for the Dial Backup module if a DBU is installed. This slot accepts all other interface types except Secondary Network interface option modules, including DSX-1 (PBX) and the Full Drop and Insert (D&I) network interface.

Slots 3-5

Slots 3-5 will accept any interface type except secondary interface, the interface for DTE timing, or the DBU. If other interfaces have any restriction on their location, this will be specified in the individual option card manual (provided with the option cards).

Slot 6

Slot 6 services any option module type including secondary network interface ports (DSX-1 (PBX) and Full D&I), but not the DTE timing source. If a secondary network interface port is to be used, it must be installed in slot 6

.

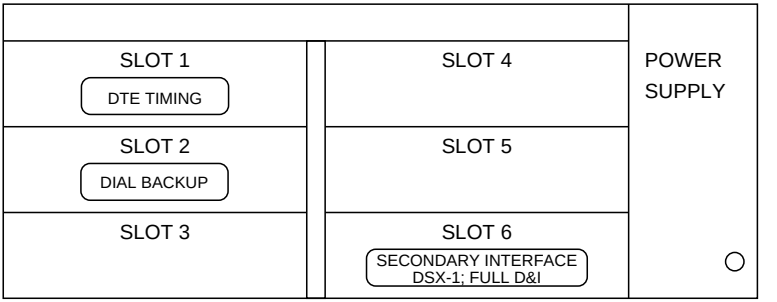


Figure 2-3
TSU 600e Slot Designation (Rear View)

Option Ports

The option ports vary depending on the option modules installed.

Secondary Interfaces (SI)

The secondary interface is an additional interface to a DS1, a DSX1 facility, or some other network service, and it offers a source of timing. The type of interface depends on the option module installed. The interface includes the following:

- DSX1 provides connection to a digital PBX.
- Full Drop and Insert permits the dropping of data and insertion of new data into the same DS0 time slot. This SI module includes a long haul DS1 interface. It can also be used as a second DS1 interface to provide an up to 3 MB aggregate throughput.

Other Data Interfaces

Additional data interfaces can be installed in the option slots, and include the following:

- Nx56/64 serial interface. This module is the same as the base Nx interface but offers single or dual V.35 ports.
- Analog voice modules (FXS/FX0/E&M) for connection to an analog PBX or key system.
- OCU DP and DSU III modeuls for interfaces to DDS or 4-wire Switched 56.
- Dial backup for ISDN backup of data networks.
- V.34 Modem Module.

GROUNDING INSTRUCTIONS (UL 1459)

Grounding instruction information from the *Underwriters' Laboratory UL 1459 Standard for Safety: Telephone Equipment*, of September 20, 1993, is provided in this section.

An equipment grounding conductor that is not smaller in size than the ungrounded branch-circuit supply conductors is to be installed as part of the circuit that supplies the product or system. Bare, covered, or insulated grounding conductors are acceptable. Individually covered or insulated equipment grounding conductors shall have a continuous outer finish that is either green, or green with one or more yellow stripes. The equipment grounding conductor is to be connected to ground at the service equipment.

The attachment-plug receptacles in the vicinity of the product or system are all to be of a grounding type, and the equipment grounding conductors serving these receptacles are to be connected to earth ground at the service equipment.

A supplementary equipment grounding conductor shall be installed between the product or system and ground that is in addi-

tion to the equipment grounding conductor in the power supply cord.

The supplementary equipment grounding conductor shall not be smaller in size than the ungrounded branch-circuit supply conductors. The supplementary equipment grounding conductor shall be connected to the product at the terminal provided, and shall be connected to ground in a manner that will retain the ground connection when the product is unplugged from the receptacle. The connection to ground of the supplementary equipment grounding conductor shall be in compliance with the rules for terminating bonding jumpers at Part K or Article 250 of the National Electrical Code, ANSI/NFPA 70. Termination of the supplementary equipment grounding conductor is permitted to be made to building steel, to a metal electrical raceway system, or to any grounded item that is permanently and reliably connected to the electrical service equipment ground.

Bare, covered, or insulated grounding conductors are acceptable. A covered or insulated grounding conductor shall have a continuous outer finish that is either green, or green with one or more yellow stripes.

POWER UP TESTING AND INITIALIZATION

When shipped from the factory, the TSU 600e is set to factory default conditions. At the first application of power, the unit automatically executes a memory self test. A full self test can be run from the front panel, and a pass code and unit ID may be set using the UTIL menu.

Self Test

Upon a power-up, the LCD displays Memory Test Now Testing and the Test LEDs are illuminated. When the self test is completed with no failures detected, the OK LED lights up and the LCD momentarily displays All Tests Passed. If a failure is detected, a list of failures is displayed in the LCD window. The full self test procedure (invoked from the front panel or T-Watch) consists of the following steps:

1. Board level tests. Each of the TSU 600e boards contains an on board processor which executes a series of tests checking the cir-

cuitry on the board.

a. RAM tests; EPROM checksum.
b. DS0 map tests.
c. On board data path. Sending a known test pattern through an on board loop.

2. Unit level tests.
   a. Front panel LED verification.
   b. Phase lock loop verify.
   c. Board-to-board interface test. A test pattern is sent from the controller through a loopback on all other boards and checked on the controller. This verifies the data path, clocks, and control signals.

Set User Passcode

The TSU 600e is designed to operate with or without the use of a passcode.

The passcode should be a number easily remembered. Once entered, the passcode is required to access any operation other than viewing. See *Set Passcode* on page 48 for details.

Set Control Port

The TSU 600 can be configured from the control port only when a unit ID number has been entered. (It can be configured from the faceplate whether a unit ID number has been entered or not.)

If the control port is to be used, the control port baud rate must also be selected.

Possible uses of the control port are control in and chain in.

Control In (PC)

The unit can be controlled from an external PC connected directly or via modem to the Control In port. When using Control In, the selection of the Control Port baud rate from 9600 (factory default), 1200, 2400, or 4800 must be made using the Unit Configuration menu. See *Unit* on page 41 for details.

Unless locked out externally, the front panel can also control the unit.

Chain In

TSU 600e's and TSU 100s can be linked together to form a chain. Figure 2-1 provides an example of a chain-in arrangement with a PC or a modem. The first TSU 600e in the chain receives controlling input from the PC or modem.

Subsequent TSUs in the chain are in a position to intake information from another TSU. This in-taking of information from another TSU in the chain is identified as Chain In. The baud rate for the chained units must match that of the first unit.

Unless locked out externally, the front panel can also control the unit.

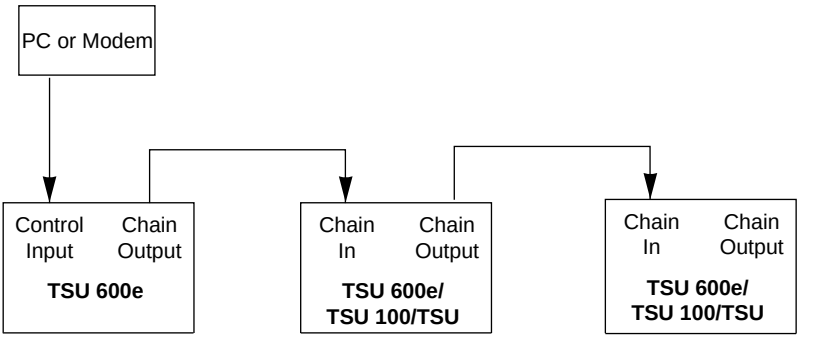


Figure 2-4
Example of Chain In

At this point, the Unit Initialization procedure is concluded. If the unit is to be configured remotely, there are no additional items necessary to complete prior to executing remote configuration.

The Passcode, the Unit ID, and the Control Port settings are stored in a nonvolatile memory. This assures they are operable for subsequent power-up sequences.

Normal Power-Up Procedure

After the unit has been put into operation with the initial power-up and initialization, subsequent power-up procedure includes only the Power-Up Self Test followed by the request for a passcode (password) if this option was selected during initialization.

Use the number keys to enter the previously recorded passcode followed by pressing Enter.

Set Unit Identification

The Unit ID sets the unit to respond to remote control (controlled by a device other than the front panel). If no Unit ID is recorded it is not possible to operate from any remote control device, including the local PC. See *Unit ID: ID* on page 49 for details.

Chapter 3
Operation

FRONT PANEL

The TSU 600e front panel both monitors operation and controls the configuration of the unit. The TSU 600e front panel is shown in *Figure 3-1* on page 31. Descriptions of each part of the front panel follow.

Figure 3-1
TSU 600e Front Panel Layout

LCD Window

Displays menu items and messages in two lines by 16 characters. It also displays alarm and status information.

Enter

Selects active menu items. To select a menu item, press the number of the item. The menu item flashes, indicating it is activated. Press Enter to select the menu item.

Keypad

The keypad contains dual-function keys numbered 0 through 9 with alpha characters A through F. These keys are used to activate menu items and enter information.

Shift (entering alphabetic characters)

Enter alpha characters by pressing and releasing Shift before pressing the key representing the desired character. To activate a menu item deisgnated by an alph character rather than a number, press Shift and then the letter. The menu item flashes, indicating which parameter is activated. PRess Enter to select the item.

If a key is presed without using SHift, the numbered item becomes active instead of the alpha item

Cancel

Pressing the Cancel key stops the current activity and returns to the previous menu. Repeat until the desired menu level is reached. When a submenu item is displayed, press Cancel to exit the current display and return to the previous menu.

Up and Down Arrows

Up and Down Arrows scroll through the submenu items available in the current menu.

LED Descriptions

Remote

When illuminated, this panel indicates that the TSU 600e is accessed remotely by the PC program.

Module Status

The module status LEDs display the operational condition of ports installed in the option slots.

- OK (green)
  Indicates the operation is in the normal mode and no errors have been detected.

- Test (yellow)
  Indicates that one of the interfaces is operating in a test mode. This includes a self test or a test loopback. When lighted, this LED also indicates that normal data flow is not occurring in at least one of the module ports.

- Alarm (red)
  Indicates an alarm condition has been detected. When the alarm condition is no longer valid, the OK LED activates (turns on). To view an alarm condition, select the active alarm menu item or select Alarm by pressing shift 8. If the alarm conditions have been corrected, the alarm which caused the activation of the Alarm LED can be viewed under the Unit History menu.

CSU Status

Indicates the status of the network interface located on the controller board in the unit. These LEDs show the same indication as the

Module, with the addition of the Error LED. The Error LED indicates an error such as BPV, OOF, or CRC error.

Operation Keys

Copy
Used in the DS0 mapping menu operations to copy the last data entered into the current DS0. This key operates without pressing the Shift key.

Remote
Reserved for future use.

Home
Used to return home to the Main menu from any menu location.

Alarm
Used as quick access to the active alarm display menus. This can be activated while any other menu item is in use. When the Alarm menu is exited, the unit returns to the location of the same menu that was active when Alarm was selected.

Clear
Used in various menus to clear data / result fields.

Keypad
These nine keys have dual functions. The first function is indicated by the lettering on the key itself. This is a standard phone keypad. The second function is a shifted function accessed by pressing and holding the shift key # along with another key. The shift function is indicated by the lettering above the keys.

Front Panel Menu Navigation

To choose a menu item, press the corresponding number of alpha character on the keypad. Press SHift to activate menu items with alpha selections. The flashing menu item indicates which selection is activated. press Enter to select the item. The following steps and Figure ?? illustrate how to select TSU 600e options.

Front Panel Menu Structure

The TSU 600e uses a multilevel menu structure containing both menu items and data fields. All menu operations and data display in the LCD window or the terminal window. See ??? for the terminal main menu.

The opening menu is the access point to all other operations. Each Main menu item has several functions and submenus to identify and access specific parameters.
Front panel LCD of the Main menu:

1=STATUS 3=UTIL
2=CONFIG 4=TEST

Set the Data Field

Data fields preceded by a colon (:) can be edited. See Figure 3-4.

With the cursor positioned on the submenu item number, press Enter. The cursor moves to the data field, (to the right of the submenu item name).

Using the arrows, scroll to scan the available value settings. The value settings display one-at-a-time in the data field position. When the desired value is displayed in the data field position, press Enter to set that value. When the value is set, the cursor moves back to the submenu item position indicating the operation is complete.

Another submenu field may be selected, or press Cancel to return to the submenu.

Pressing Cancel prior to pressing Enter voids any data changes. The original data value is restored and the cursor returns to the submenu field.

Display Only Data Fields

Data fields preceded by an equal (=) symbol cannot be edited. See Figure 3-4.

Pressing Enter moves the cursor to the data field. Use arrows to select AUTO and press Enter. The unit automatically sets the Line

Build Out. The display field shows the value actually set. The equal symbol after LBO in the second line indicates the information that follows is displayed data and cannot be edited.

Exit Any Menu Field Operation Or Display

Press Cancel as many times as required to return to the desired menu level or press Home to return to the main menu.

Data Port Identification

When configuring the unit, menu selections will include options from data port submenus. Selection of data ports is necessary because the TSU 600e uses a Slot-Port method to identify which data port the menu item is referencing. If a module containing a PBX DSX-1 option card with an Nx56/64 plug-on interface is installed in option slot 6, it would be designated as:

DSX-1 Passthru=6.1
Where slot=6 and port =1.
The DSX-1 is located in option slot 6 and is the first port in that slot.

Nx56/64=6.2
Where slot=6 and port=2.
The Nx is located in Slot 6 and is the second port in that slot.

Viewed from the rear of the TSU 600e, the module slots are arranged as shown in Figure 3-5.

T-Watch control

Terminal Mode

THREE METHODS OF CONTROL

Front Panel

The front panel provides complete and easy control of all items that can be configured through menu guided options. The front panel LCD also displays the status of operation and performance reports for the unit. A complete discussion of the operation of the front panel and all the menu options is found in the chapter *Operation*.

ADTRAN PC Program

T-Watch is the ADTRAN PC control program for Microsoft Windows®. It provides complete control over the configuration of the TSU 600e using a graphic interface. The T-Watch program displays the same status and performance data as the front panel LCD. These data are displayed in the form of tables and graphs.

The T-Watch program has the following capabilities:

- Interfaces with a modem which permits dialing into a remote TSU 600e location to configure the unit or read the unit's status or performance.
- Receives traps from the TSU 100 network alarm.

SNMP

The ADTRAN TSU 600e is designed to support the Simple Network Management Protocol (SNMP)
This needs to be updated

through an ADTRAN ADVISOR. The proxy agent runs on a PC and can interface to the TSU 600e directly or through a modem, in the same manner as the T-Watch PC
program. For detailed information about SNMP, see *Understanding SNMP* on page 71.

Chapter 4
Status

The Status menu branch provides the ability to view the status of the TSU 600e operation. See Figure 4-1.

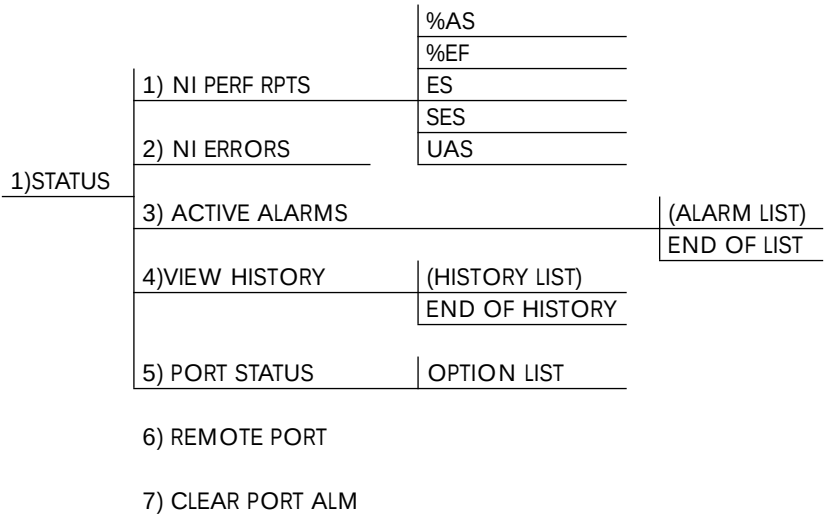


Figure 4-1
Complete Status Menu

Menu flow is normally depicted from left to right. Arrows on the lower right of the screen indicate the direction of scrolling to use to view additional menu items. At every level of the menu pressing Cancel returns the system to the previous menu level. Pressing Cancel repeatedly returns the system to the main menu.

Network Performance Reports (NI PERF RPTS)

The Network Interface Performance Reports display the user copy of the performance data. The TSU 600e maintains this performance data on the network in compliance with ANSI T1.403 and AT&T document TR54016. The data displayed is data accumulated over the last 15 minutes and over the last 24 hours.

With the cursor on Main menu item 1)STATUS, activate the menu with Enter or number 1. The unit displays the first two Status sub-menu items with the cursor on
1)NI PERF RPTS.

Activate the selection with Enter or number 1. The unit displays the first of five items in the Network Interface Performance report. See Figure 3-9. The equal symbol on the right of the item indicates a non-editable field follows.

Figure 4-2
Network Interface Performance Report

Scroll keys are used to access the complete display of the following report fields:

%AS =	% of available seconds
%EF =	% of error free seconds
ES =	Number of errored seconds (1 or more errors / second
SES	Number of severely errored seconds (more than 320 errors / second)
UAS	Number of unavailable seconds (10 or more consecutive seconds)

If insufficient time has passed to collect data, NA is displayed. Continue with standard operating procedures to exit the display.

When this menu is active, performance data can be cleared by pressing Clear (shift 9) on the keypad. Only the user copy of the performance data is cleared.

Since only the user's copy of performance data is cleared by the TSU 600e, the data displayed here might be different from the data sent to the network as PRM data.

Network Interface Errors (NI ERRORS)

The NI Errors submenu displays the types of errors the Network Interface (NI) detects. A blinking CSU error LED indicates that network errors are detected.

The asterisk (*) above an item indicates the type of errors detected. The error types are the following:

CRC	CRC-6 bit errors based on the FDL. This is valid only in ESF mode.
BPV	Bipolar violations.
XS0	Excess zeros.
FER	Framing errors.

Active Alarms

This menu item displays a list of current alarms reported by either the base controller or any of the ports. If no alarms are current, using this menu item displays End of List.

This display includes two lines of text. The top line is the alarm source. The bottom line is the alarm message. A list of alarm messages is found in the appendix, TSU 600e System Messages.

In addition to normal menu operation, you can also access this menu item with the Alarm function (shift 8) on the keypad. If one or more of the ALarm LEDs are illuminated, an alarm is present. Pressing Cancel will return to the previous menu item.

View History

This menu item is used to both view and clear the accumulated status changes of the unit.

View History displays a history of 20 status changes in the unit, including the date, time, and type of change. The unit also records for viewing the date and time an alarm became active and when it became inactive, as well as the date and time of test activation and deactivation.

To clear the View History display press Clear (shift 9) with the View History menu active.

Port Status

Port Status displays the signals monitored on the data ports. For example, an Nx56/64 interface monitors the RTS, CTS, TD, and RD, along with other signal lines. When a port is selected, the LCD indicates if the signal is present.

Remote Port

Remote Port displays the status of activity on the Control In remote port. This is useful for troubleshooting communication sessions, as well as verifying cabling.

RX	Characters received at remote port
ID	Unit ID received at remote port
CRC	Correct CRC received
PC	Correct passcode received
TX	Characters transmitted from the remote port

Clear Port Alarm

Chapter 5
Configuration

The Configuration menu is used to set the TSU 600 operational configuration, including all network interface parameters and the allocation of the DS0s and the port parameters. See Figure 5-1.

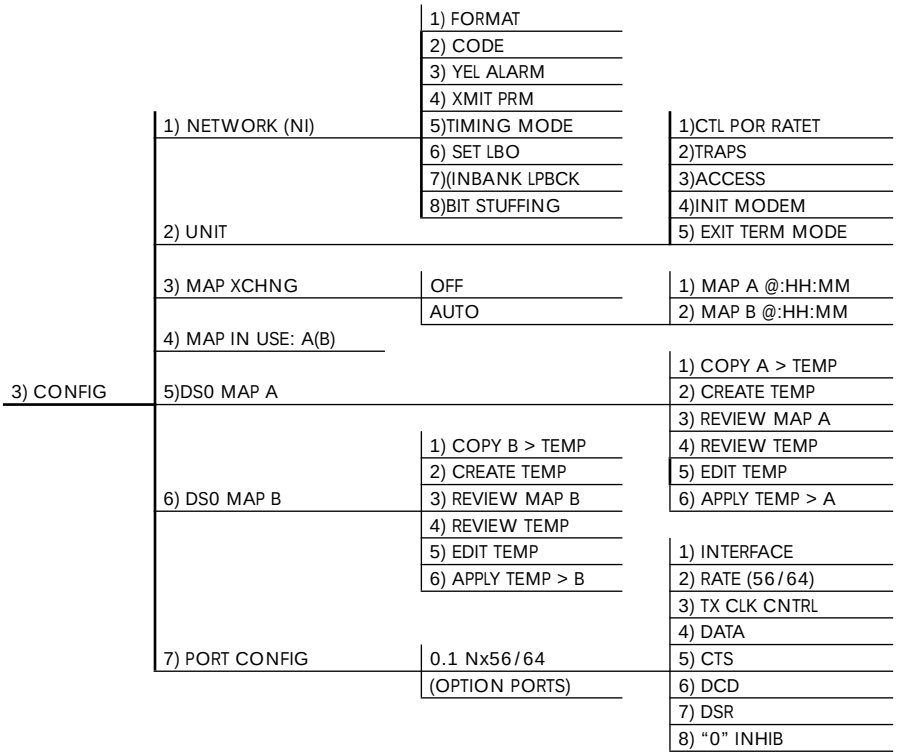


Figure 5-1
Complete Configuration Menu

Menu flow is normally depicted from left to right. Arrows on the lower right of the screen indicate the direction of scrolling to use to view additional menu items. At every level of the menu pressing Cancel returns the system to the previous menu level. Pressing Cancel repeatedly returns the system to the Main menu.

TSU 600E CLOCK SOURCES

The TSU 600e is operable from various clock sources permitting it to perform properly in many different applications. The network interface clocking options are set by using the clocking options set by using the Network (NI) Configuration menu options. The following clock source options are available:

- Network
- DTE timing
- Internal timing
- Secondary timed
- Normal (CSU)

The clock option selected always designates the clock source for transmission. Clocking necessary for receiving data is always recovered from incoming data.

Network Timed

The network is the source of timing. The received data clocking is looped back to the network where it is used to determine the transmission timing. This option is also referred to as loop timed as the transmission clock is derived from the received clock. See Figure 1-5.

DTE Timed

The DTE is the source of timing. The TSU 600e uses the incoming DTE clock to determine the transmission timing. This is typically used in applications where it is necessary to have the DTE as the primary clock source, (such as limited distance line drivers). See Figure 1-6.

The DTE source timing is restricted from use when a secondary interface is used at the same time.

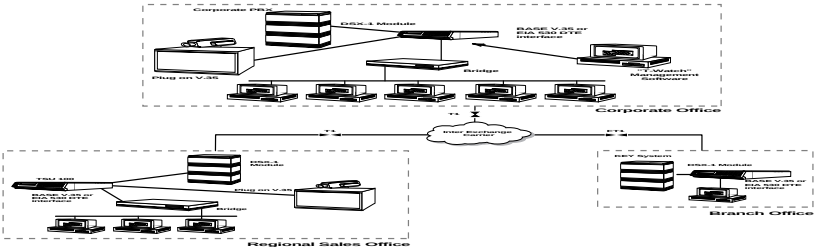


Figure 1-5
Network Timed Clock Source

Internal Timing

The TSU 600e is the source of timing. The TSU 600e is configured to use its own internal oscillator as the source of timing. Applications include private line driver circuits where one end is set to network and the other to internal. See Figure 1-7.

The internal source timing is restricted from use when a secondary interface is also used.

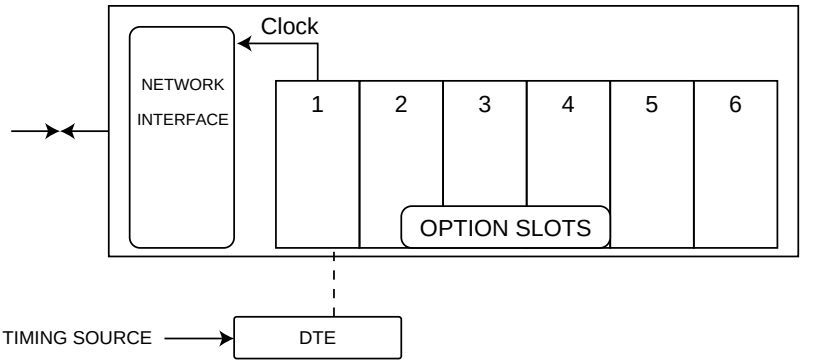


Figure 1-7
Internal Clock Source

The typical timing option arrangement is shown in Figure 1-8. The PBX is looped timed sending data to the TSU 100 which is actually synchronous to the received data. The Network Interface (NI) is the actual source of all timings. This timing option is the same as that typically used for CSUs. This is the preferred mode for use with a

PBX application.

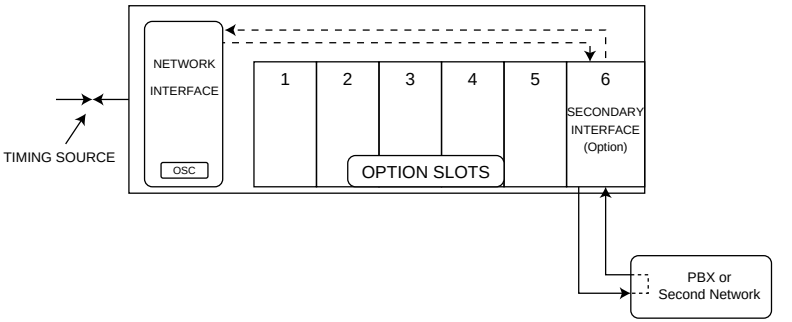


Figure 1-8
Normal (CSU)

The network interface and secondary interface clocking options are set by using the Network (NI) Configuration menu options.

Network (NI)

This menu item accesses the configuration of parameters associated with the network interface in the base unit. There are eight submenu items that include setting the format, the line build out (LBO), and the timing mode. Submenu items do not include setting the parameters which may be necessary for a secondary interface (DSX-1 Passthru, etc.).

Network Interface (NI)

The Network Interface (NI) port complies with the applicable ANSI and AT&T standards.

The NI provides the following functions:

- AMI or B8ZS coding
- Automatic or manual line build out
- D4 or ESF framing
- Network performance monitoring and reporting
- Test loopbacks with QRSS generation and checking
- Extensive self test

Network (NI) Menu Items

The menu items are:

FORMAT

Sets the frame format for the NI. Choose between D4 and ESF.

D4 is equivalent to superframe format (SF).

CODE

Sets the line code for the NI. Choose between AMI and B8ZS.

YEL ALARM

Enables and disables the transmitting of yellow alarms. Choose between ENA and DISA.

XMIT PRM

Enables and disables the sending of PRM data on the facility data link (FDL). The PRM data continues to be collected even if XMIT PRM is disabled (possible only with ESF Format). Choose Off or On.

CLOCK SOURCE

Selects the clock source for transmission toward the network from the NI. Choose between Network, Base DTE, Internal, and Secondary (SI).

Base DTE and Internal are available only if no secondary interface is installed.

SET LBO

Selects the line build out for the network interface. In AUTO mode, the TSU 600 sets the LBO based on the strength of the receive signal and displays the selected value. Choose from 0.0 dB, 7.5 dB, 15 dB, 22 dB, and Auto.

INBAND LPBCK

Sets unit to accept or reject the in-band loop up and loop down codes as defined in ANSI T1.403. This is a line loopback. Choose Accept or Reject.

BIT STUFFING

When enabled, bit stuffing causes the TSU 600 to monitor for ones (1s) density violations and insert a one (1) when needed to maintain

ones at 12.5 %. Choose Enable or Disable.

Unit

The Unit menu changes the baud rate of the Control In port and the setup of the Dial Out port.

Unit Menu Items

The menu items are:

CTL PORT

Sets the baud rate for communication with the PC or modem. Choose from 1200, 2400, and 9600 kbps.

TRAPS

Enables or disables the transmission of trap messages.

ACCESS

Sets the method of connection from the TSU to T-Watch / SNMP. Select from:

- Direct - Used if connected directly to the PC.
- Dial - Used when connection is through a modem. The dial string is entered from T-Watch / SNMP.

INIT MODEM

EXIT TERM MODE

Map Exchange (Map Xchng)

The Map Exchange menu enables and sets the automatic time of day map switch. The unit provides selection of the hour, minute, and seconds for the map switching to take place.

Map Exchange (Map Xchng) Menu items

The menu items are:

OFF

Indicates the map in use does not change (disabled).

AUTO

Indicates the system displays the screens to set times for switching

(enabled).

Scroll to select Auto to enable or Off to disable the Automatic Map Change feature and press Enter to activate the selection.

When Auto is selected the unit displays the screens to set times for switching. See Figure 3-14.

Figure 3-14
Selection Times for Map Exchange

After editing Map A, press Enter to record the Map A settings and activate the selection fields for Map B. Use the same operation to edit switching time for Map B.

When ESF is used with an FDL channel between units, the units automatically coordinate the automatic map switch by sending a map switch command from end-to-end over the FDL. Only one end needs to be set to Auto for this to work.

Map In Use: A(B)

This menu item controls the DS0 map the TSU 600e uses and displays the map in current use.

DS0 Map A and DS0 Map B

The DS0 maps designate which DS0s are assigned to which port. See Figure 3-15. There are three maps, DS0 Map A, DS0 Map B, and the Temporary (Temp) map.

Figure 3-15
DS0 Map Designations

DS0 A and DS0 B are the current maps the TSU 600 uses. The Temp map generates a map before putting it into use.

You can copy DS0 A to DS0 B by copying the DS0 A map into the TEMP map. Then apply (write) the TEMP map into DS0 B.

DS0 Map A and Map B Menu Items

The menu items are:

COPY A >TEMP

This copies the current map (A or B) into a TEMP map area. This permits modification without disturbing the existing map. When the modifications are completed the TEMP map is written to current MAP A (B) by selecting Apply.

CREATE TEMP

This creates a map by defining a port or Idle for all DS0s. Any or all of the DS0s can also be designated for Passthru if a secondary interface capable of Passthru is present. When 2)CREATE TEMP is selected, all DS0s are set to Idle, and those in use are set to the proper port.

A sample selection follows:
DS0: 01 to 24
PASSTHRU: Y for Yes
N for No
PORT: IDLE, TST, + option module ports

TST designates which DS0s are used for QRSS testing when activated under the 4)TEST Menu. When not used for testing, the TST designation is identical to IDLE.

Scroll to select the port which is dependent on the installed option card. Press Enter to complete the selection and move the cursor to the next field, DS0.

With the cursor on the DS0 field, the DS0 number can be incremented or decremented by scrolling. If Copy is pressed, the contents of the last DS0 entered are placed in the new DS0 number.

When all entries are complete, Cancel moves the cursor to the last of the submenu choices, 6)APPLY. Either apply the newly created DS0 map or press Cancel to return to the DS0 Map A (B) submenu choices.

REVIEW MAP A(B)
Permits a quick review of the number of DS0s assigned to each port and the number of unassigned DS0s (Idle or TST) as defined in the currently applied Map A(B).

REVIEW TEMP
This menu item is operated the same for the TEMP map as is 3)REVIEW MAP A or Map B.

EDIT TEMP
The map in the TEMP file can be edited to whatever configuration is desired. If Map A had been copied into the TEMP file, then after editing, the TEMP file could be applied to MAP A or MAP B.

APPLY TEMP > A
Writes the TEMP map into Map A. Apply is usually the last step in updating a map and is accessed automatically at the end of editing or creating a temporary map. It can be bypassed at this time by selecting another menu choice.

Selecting Apply disrupts normal data flow while the current map is overwritten with the new map. This will not cause a switch of the executing map; i.e., if Map A were modified while Map B was executing, selecting Apply will rewrite Map A but will not switch execution from Map B to Map A.

Port Configuration (Port Config)

Port Configuration selects and configures the parameters associated with any data port in the unit. For example, parameters for the DSX-1 (PBX) interface are set through this menu. The items that can be set depend on which option module is installed. The list of option ports will vary with the configuration.

The TSU 600 is designed so that any additional ports developed in the future will contain the appropriate menu selections to provide

access by use of this menu item.

The Config menus for options ports are described in separate sections of the manual supplied with the option card.

Chapter 6
Utility Menu

The utility menu tree is used to view and to set system parameters (see Figure 6-1). This includes setting the time and date and resetting all parameters to factory values or to re-initiate the unit. This menu is also used to view the unit software revision and the unit ID setting.

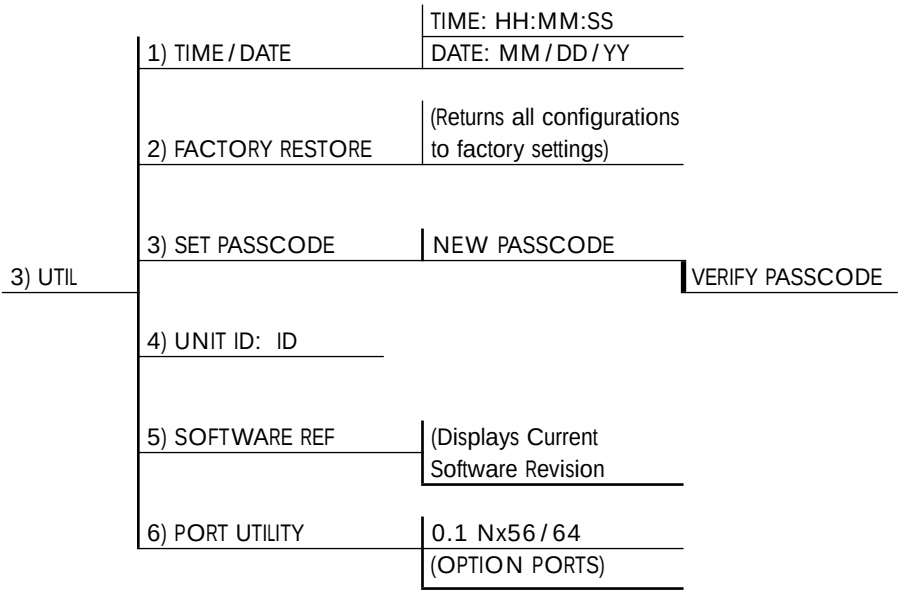


Figure 6-1
Complete Utility Menu Tree

Menu flow is normally depicted from left to right. Arrows on the lower right of the screen indicate the scrolling direction to view additional menu items. At every level of the menu, press Cancel to

return the system to the previous menu level. Pressing Cancel repeatedly returns the system to the Main menu.

Time/Date

This menu option is used to view or to edit the current time and date. The time and date are maintained during power off conditions.

Pressing Enter after any numeric change always records the entry and moves to the next editing position. Moving to a different field to edit is also possible by pressing Enter at the editing position without making any change, or by using the Up and Down Arrow keys. Pressing Cancel at any time can be used to end the editing process.

Factory Restore

This menu item is used to restore the factory default setting for all unit parameters. It will restore all parameters, including configured DS0 maps, to the factory settings. Factory defaults are listed in the appendix, System Configuration Charts.

Set Passcode

Enter Passcode from Other Menus

The appearance of the Passcode prompt may make an unexpected appearance from other menu operations. This happens only when the unit is operating in the limited access mode, i.e., without an active passcode. The limited access mode may become active even if a passcode was entered as it does when there is no activity for ten minutes. If the unit is to be remotely accessed using T-Watch, a passcode must be entered. When managing a number of units, the passcode can be the same for all.

The unexpected appearance of the PASSCODE prompt occurs, for example, while operating in a limited access mode and attempting to change the Data Rate, (2)CONFIG, 2)UNIT, 1)CNTROL PORT, 1)DATA RATE. Use the number keys to enter the correct passcode and press Enter. The unit displays Access Granted.

Pressing any key after entering a passcode causes the unit to return to the previous active menu. In this case it returns to 2)CONFIG, 2)UNIT, 1)CNTRL PORT, 1)DATA RATE to permit changing the data rate.

Change/Set a Passcode

The passcode can be changed or set at any time or eliminated altogether through the Utility menu item 3)SET PASSCODE. This procedure requires the current passcode (if one is established) for operation.

The passcode can only be entered by using numbers. After entering the desired passcode, press Enter.

Set a null passcode at the 3)SET PASSCODE menu by pressing Enter without any numbers. This sets a null passcode and grants unlimited access.

Special Feature

For added security protection the unit is equipped with an automatic time out for operation with the password. After ten minutes of inactivity, the unit reverts to limited access operation. To make changes in the configuration, the passcode can be reentered. See *Passcode* in the chapter *Operation* for further information concerning passcode use, and both limited and editing access.

If the passcode number is lost, contact ADTRAN Customer Service for assistance.

No Passcode Desired

At the New Passcode prompt (in the Set Passcode menu), press Enter without any numerical entry. The system nullifies the need to enter a password for subsequent use and proceeds to the Unit ID prompt.

Unit ID: ID

This menu is used to access the current Unit ID setting. Viewing is

available in limited access mode. Editing or changing the Unit ID requires the use of a password as in editing mode. Unit Identification numbers must be between 2 and 250. If an out of range number is entered, the unit assumes the upper limit number of 250.

To Set the Unit Identification

In the Unit ID menu (item 4) under the UTIL menu, enter any value between 2 and 250. The number 1 is reserved for the PC.

Pressing Enter records the Unit ID number and establishes its availability for operation by remote control. The unit proceeds to the Set Control Port prompt.

No Unit ID Desired

Without entering any numbers at the Unit ID prompt, press Enter. Pressing Enter with no Unit ID recorded establishes the unit as not able to be operated by remote control.

Software Revision (Software Rev)

This menu provides access to the display of the current software revision level loaded into the base unit controller. This information is required when requesting assistance from ADTRAN Customer Service or when updates are needed.

Use Cancel to exit.

Port Utility

This menu provides access to the display of the current software information for each port installed in the unit. This information is required when requesting assistance from ADTRAN customer service or when updates are needed.

Chapter 7
Test

The Test menu initiateS different types of unit tests and to displays test results in the LCD window. The Test menu contains four items (see Figure 7-1).

The execution of tests will disrupt some of the normal operation. See individual menu items concerning tests before executing.

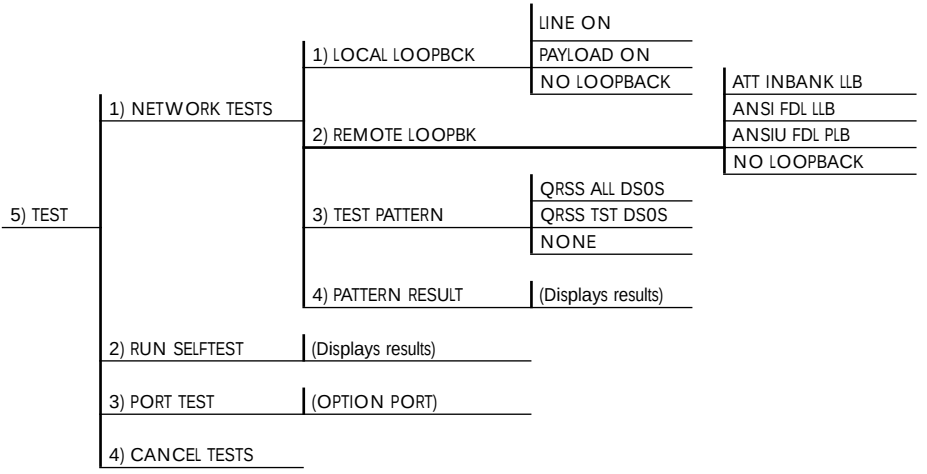


Figure 7-1
Complete Test Menu

Menu flow is normally depicted from left to right. Arrows on the lower right of the screen indicate the scrolling direction to view additional menu items. At every level of the menu pressing Cancel returns the system to the previous menu level. Pressing Cancel repeatedly returns the system to the Main menu.

TSU 600E TESTING

The TSU 600e offers three forms of testing:

- Self test
- Loopback tests (local and remote)
- Pattern generation and check

Self Tests

The self test checks the integrity of the internal operation of the electronic components by performing memory tests and by sending and verifying data test patterns through all internal interfaces. Although actual user data cannot be passed during these tests, the self test can be run with the network and DTE interfaces in place and will not disturb any external interface.

The memory portion of the self test automatically executes upon power up. A full self test can be commanded from a front panel menu or from T-Watch.

In addition to the specified self tests, background tests are also run on various parts of the internal electronics. These run during normal operation to confirm continued correct functioning. The background tests include: (1) monitoring the phase locked loop for lock, (2) sending test data through a parallel path which is looped back and verified, and (3) the standard background network performance monitoring, as required by ANSI T1.403 and AT&T 54016 specifications for which the results are stored.

Loopback Tests

A number of different loopbacks can be invoked locally from the front panel, by T-Watch commands, or remotely by using special in-band codes (AT&T D4 network loop up and loop down codes; V.54 loop up/loop down codes for the Nx56/64 serial interface). Additionally, the loopbacks can be remotely controlled by means of out-of-band commands by the T1 ESF FDL or from T-Watch by a modem connection.

Classes of Loopbacks

There are two classes of loopbacks: network interface and DTE interface.

Network Interface Loopbacks

Network interface loopbacks (see Figure 1-9) affect the entire T1 data stream. There are two types of network loopbacks, line loopback and payload loopback.

Line loopback loops all of the received data back toward the network. The transmitted data is the identical line code that was received, including any bipolar violations or framing errors.

Payload loopback is similar to line loopback, except that the framing is extracted from the received data and then regenerated for the transmitted data.

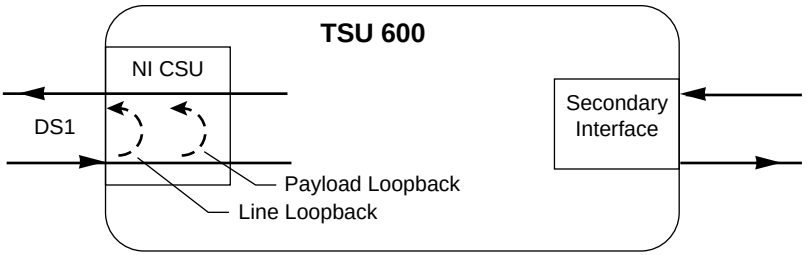


Figure 1-9
Network Loopback Tests

DTE Interface Loopbacks

DTE interface loopbacks affect only that portion of the data stream programmed to that particular interface port. The Nx56/64 serial interface offers two loopbacks, a DTE loopback and a port loopback. See Figures 1-10 and 1-11.

DTE loopback loops all data from the DTE back towards the DTE. This loopback occurs just past the interface circuit allowing a verification of the operation of the DTE to TSU 600e. This loopback may be initiated by using front panel or T-Watch commands. The DTE (or external test equipment) must provide any test pattern in order to check the DTE interface. See Figure 1-10.

NOTE *The TSU 600e also activates a port loopback when the DTE loopback is asserted.*

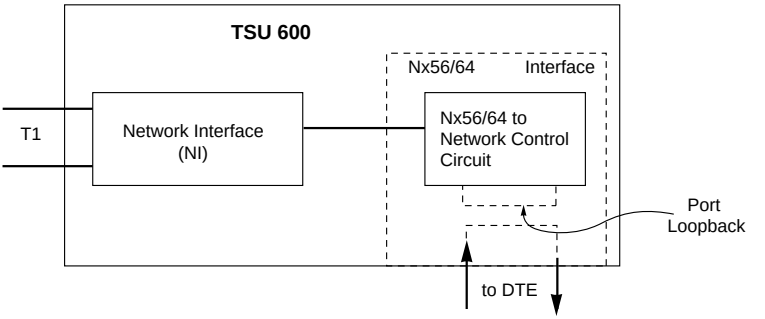


Figure 1-10
DTE Interface Loopback

Port loopback loops that portion of the network bandwidth programmed for a port back toward the network. This loopback occurs within the port electronics, but before the DTE interface. See Figure 1-11. The port loopback also automatically activates the DTE loopback looping the DTE data back on itself. The port loopback is activated by command from the front panel or from the T-Watch program. This causes a V.54 loopback code to be sent to the far end unit.

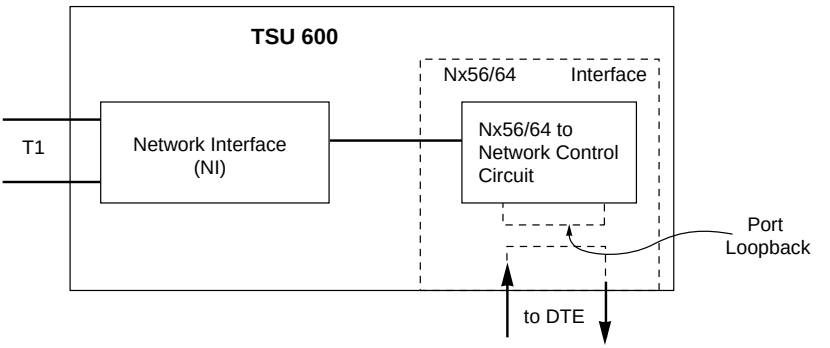


Figure 1-11
Port Interface Loopback

Pattern Generation

The TSU 600e offers two available test patterns: QRSS and 511.

QRSS Pattern

The QRSS pattern is commonly used to simulate real data in T1 interfaces. This pattern can be assigned to appear in all DS0s or only in TST DS0s. When QRSS is set in all DS0s and one of the network loopbacks previously described is activated at the far end, a total end-to-end integrity check can be run without the need for any external test equipment. When QRSS is assigned to TST DS0s, an integrity check of the link can be run along with normal data flow. The TST DS0s are user assigned as part of the DS0 Map.

511 Pattern

The 511 pattern is generated and checked by an Nx56/64 serial interface option card. It only appears in the DS0s assigned to the Nx56/64 port which is generating the pattern. When used in conjunction with the port loopback at the far end as previously described, an end-to-end integrity check can be made on the DTE ports.

Network Tests

Network tests control the activation of loopbacks and the initiation of data test patterns. See Figure 3-5 for the list of tests.

Network tests are run on the Network Interface (NI). You can select three different test configurations to determine the type of loopback and the pattern to run. Test results display in the LCD window.

Executing Network Tests will disrupt normal data flow unless only TST DS0s are selected for testing.

Network Tests Menu Items

The menu items are:

LOCAL LOOPBCK
There are three available choices for setting the local loopback:

Line On	Activates the line loopback
Payload On	Activates the payload loopback
No Loopback	Deactivates the loopback

Scroll to select a setting and record it by pressing Enter. The unit returns the display of 1)LOCAL LOOPBCK and 2)REMOTE LOOPBCK

REMOTE LOOPBK
This activates the same loopbacks as Local Loopback but at the far end. It uses either the inband loopup code as specified by ANSI T1.403 for line loopback (ATT In-Band LLB), or the FDL as specified in ANSI T1.403 for payload and line loopback codes. The following options are available:

ATT In-Band LLB	Activates the line loopback using inband code
ANSI FDL PLB	Initiates the transmission of an FDL payload loopup code toward the far end
ANSI FDL LLB	Initiates the transmission of an FDL line loopup code toward the far end
No Loopback	Deactivates the loopback

Remote Loopback cannot be used with Fractional T1 since the full T1 stream including the FDL is not transported to the far end.

After a Remote Loopback option is selected, the TSU 600 verifies that the far end is actually in a loopback by checking for the receipt of a code looped back from the far end. Once the Remote Loopback type is selected, the LCD displays the loopback progress by displaying Looping until loopback is verified.

PATTERN
This sets the pattern for the test and initiates the transmission of the pattern. The test is terminated by selecting None. The following

patterns are available:

QRSS All DS0s	Generates a QRSS test pattern and inserts the pattern into all DS0s
QRSS TST DS0s	Inserts a QRSS pattern in those DS0s mapped as TST in the currently active map (A or B)
None	Terminates pattern generation

QRSS always runs at 64K/DS0.

Use the up and down scroll to select, for example, QRSS ALL DS0. Press Enter to record the selection. The TSU 600 starts to generate a QRSS test pattern and inserts the pattern into all DS0s.

To end the test, select None.

PATTERN RESULT

Displays the results of the test currently active. See Figure 3-21. Leaving and returning to this menu item does not interrupt the test.

Code (version K or later): Pressing 2 injects errors into the test pattern. These errors are detected by the device performing the pattern check.

Figure 3-21
Test Pattern Results Display

ES	The number of seconds with at least 1 bit error.
BES	The number of seconds with more than 1 bit error and less than 320.
SES	The number of seconds with more than 320 bit errors.
***SYNC**	Indicates if pattern sync is (yes) or is not (no) valid. The asterisk (*) indicates if pattern sync has been lost since the start of testing.

Clear results by pressing shift 9. The results are accumulated until the test pattern is set to None or Cleared.

Using TST DS0s for testing can be very useful, particularly in Fractional T1 applications. You can run an end-to-end test on the Fractional DS0s by 1) setting for Map B the TST in the same DS0 as used

by Map A to receive data from an Nx56/64 port and 2) by looping the far end using a V.54 loopback code on the Nx56/64 port. In addition, a single DS0 can be used for continuous testing while other DS0s are passing normal data. This will also provide an end to end check on the entire link. Set each end to send QRSS in TST DS0s (using 1 DS0) and occasionally view the results on the Pattern Result menu selection.

Run Selftest

This menu selection is used to execute a full internal self test. The results of the self tests are displayed in the LCD. Upon invoking the command the LCD displays System Self-Test and the Test LEDs are illuminated. Test failures are displayed in the LCD window. The self test consists of the following steps:

1. Board level tests. Each of the TSU 600 boards contain an on board processor which executes a series of tests checking the circuitry on the board.

   a. RAM tests; EPROM checksum
   b. DS0 map tests
   c. On board data path; sending a known test pattern through an on board loop

4. Unit level tests.

   a. Front panel LED verification
   b. Phase Lock Loop verify
   c. Board to board interface test

A test pattern is sent from the controller through a loopback on all other boards and checked on the controller. This verifies the data path, clocks, and control signals.

If a failure is detected, note the failure number prior to contacting ADTRAN Technical Support.

The execution of Self Test will disrupt normal data flow and prevent remote communication until the Self Test is completed.

Port Tests

The Port Tests menu is used to activate testing of specific data ports. It controls the activation of loopbacks and the initiation of data test patterns. Test results are displayed in the LCD window.

The execution of Port Tests will disrupt normal data flow in the port being tested.

Cancel Tests

Use this menu selection to deactivate all active tests, including tests on option modules.

Chapter 4
Example Operations

This chapter provides examples of how to configure the system for a variety of operations.

Voice and Data Mix

The following is an example of the use of a TSU 600 to mix voice data from a PBX with data from a customer's DTE, possibly a LAN bridge (see Figure 4-1). This example assumes that B8ZS service is not available end to end and therefore must use 56K (672K rate) for the data and run AMI on the network. In addition, the format on the network is ESF while the PBX is D4.

The configuration charts shown here are filled in for the example. The appendix, *System Configuration Charts*, contains the same configuration charts with the selections not filled in.

Figure 4-1
Example of Voice and Data Mix

STEPS TO SET UP VOICE AND DATA MIX

The five steps required to set up voice and data mix are presented in this section along with tables that provide examples of the required

information.

Prior to Step 1

Complete the configuration chart. The configuration charts from the appendix, *System Configuration Charts*, can be copied and filled out to use as a reference or guide prior to actually setting any configuration.

Step 1.

Table 4-A provides configuration information for the network interface.

Table 4-A
Configuration for Network Interface

Step 2.

Table 4-B provides configuration information for DTE ports.

Table 4-B
Configuration for DTE Port

Step 3.

The number of DS0s / Port is based on the Data Rate Table in the appendix, *Configure DTE Port:*
(1.1 - Nx56 / 64).

Step 4.

Table 4-C provides information for configuring DS0 maps.

Table 4-C
Configuration for DS0 Map

Step 5.

PBX Passthru

Table 4-D provides information for configuring the DSX-1 PBX passthrough.

Table 4-D
Configuration for DSX-1 PBX Passthru

Step 6. Activate Configuration Menu

From the Main menu select the Configuration menu.

The unit displays the first two Configuration submenu items: Network (NI) (network interface) and Unit (see Figure 4-2).

CONFIGURING THE

Place the cursor on 1)NETWORK (NI) with the number 1 or by scrolling. Activate the Network Interface Configuration menu with Enter or the number 1 again.

The unit displays the first two Network (NI) submenu items (see Figure 4-3).

Figure 4-3
First Two Network (NI) Configuration Menu Items

The Code (Item 2) is incorrectly set. To make changes, scroll down or use number 2 to select the CODE menu item. Press Enter to move the cursor to the data field (B8ZS), to the right of 2)CODE.

Pressing 2 again will not move the cursor into the data field. This helps prevent inadvertent activation of menu actions.

Scroll down to display AMI and press Enter to set the line code to AMI (changed from B8ZS). The cursor moves back to 2)CODE menu position.

Scroll to examine the other Network (NI) items.

Since no other items need to be changed, press Cancel to exit the Network(NI) submenu. The display returns to the first two Network (NI) submenu items (see Figure 4-4).

CONFIGURING THE DS0 MAP

From the first menu position scroll down or use number 5 to select the DS0 MAP A configuration. Press number 5 again or Enter to enter the DS0 MAP A Configuration menu (see Figure 4-5).

Figure 4-5
DS0 Map A and Map B Configuration Menu Items

Scroll down or press number 2 to place the cursor on 2)CREATE TEMP menu item. Press Enter to activate the Create Map menu which opens a display from which a DS0 number can be selected (see Figure 4-6).

Figure 4-6
Create Map Menu with Displayed DS0 Number

If the DS0 number displayed is the desired number, press Enter to select it for an entry.

Display the correct numbers by entering numbers or by scrolling. Press Enter to record the displayed DS0 for an entry and advance the cursor to the Passthru selection field.
According to the DS0 Map work sheet, Passthru for this DS0 should be set to Y for Yes (see Figure 4-7).

Figure 4-7
Passthru Selection Field

Scroll down to display the Y and press Enter to select. The cursor advances to the PORT selection field.

If the Port is set to DSX-1 the TSU 600 will automatically set the Passthru (PT) bit to Y.

Scroll down to advance through the Port list until the 6.1 DSX-1 Port name is displayed (see Figure 4-8). Press Enter to select and move the cursor back to the DS0 # field.

Figure 4-8
Display of DS0 Port Name

Another DS0 may be selected by incrementing the DS0 number using the up arrow key or, for this example, typing number 2.

Since the data for this DS0 is identical to the previous DS0 just entered, it can be duplicated using Copy. The PT and PORT data fields are set to the same value as was last entered.

This operation (changing the DS0 number and copying) can be repeated for DS0s 3 through 12 which, according to the configuration chart, are all identical.

At DS0 13 the data values changes can be set with the same operational procedures as used for DS0 #1. DS0 13 PT field is set for N

and the PORT is 1.1 Nx56/64.

At DS0 14-24, the setting of the data is accomplished by using the same incrementing and copy technique.

When all DS0 settings are complete press Cancel to exit Create menu.

TEMPORARY MAP

The TSU 600 is now holding the newly created DS0 Map A in a file as a temporary map. It can be reviewed or edited through the DS0 Map A menu.

Review

To Review the Temporary file, follow standard operating procedures to access the first two submenu items of 5)DS0 MAP A (see Figure 4-9).

Figure 4-9
First Screen for Choosing to Review Temporary Files

Throughout this review example, it is assumed that DS0 17 was inadvertently skipped.

Upon activating the 5)DS0 Map A menu, the fourth submenu item must be accessed. Select Review Temp by pressing number 4 or using the scroll to place the cursor on 4)REVIEW TEMP. Press Enter to activate the Review function. The unit begins the display with the number of DS0s set for Idle (see Figure 4-10).

Edit

The Review reflects that one of the DS0s is still programmed as Idle, and since the 1.1 Nx56/64 port has one less DS0, the error must be

somewhere between DS0 13 and 24.

The map that was just created is still a Temp Map, and must be edited as such.

Return to the DS0 MAP A configuration items by using Cancel. Use number 5 or down scroll to move the cursor to 5)EDIT TEMP (see Figure 4-11). Press Enter to display the settings for DS0 #1 that have just been entered. The cursor is on the DS0 # field.

Figure 4-11
Window Showing Edit Temp Option

Since the error is between DS0 13 and 24, use number 1 and 3 to set the DS0 at number 13. Press Enter to display the contents of DS0 # 13.

Use up scroll to increment through the DS0s, reviewing each for accuracy. The display of DS0 17 will identify the error (see Figure 4-12).

Figure 4-12
Window Showing the Error

To correct the setting press Enter twice to advance the cursor to the Port data field. Use scrolling to display the correct Port and Enter to record the selection.

The Temporary Map can be reviewed as many times as necessary. When all corrections are completed use Cancel to exit the Edit Temp menu. The unit returns to the DS0 Map A submenu listing with the cursor on 6)APPLY TEMP >A. Press Enter to activate Apply.

Since applying a map will disrupt data flow, the unit verifies that such an interruption at this time is acceptable by displaying a disrupt data prompt (see Figure
4-13). No indicates data flow will not be disrupted.
Scroll to select Yes, and press Enter to confirm Apply.
The unit displays Map Applied as the map just created is written into Map A and will be used to pass data.

The entire map can be cleared by first selecting CREATE, which has all DS0s set to PSTRU=N and PORT=IDLE, and then select APPLY to write the Idle map into the Current map.

Use Cancel to exit DS0 Map A and return to the Config submenu.

Configuring the Ports

Scroll down or use the number 7 to move the cursor to 7)PORT CONFIG. Press Enter to activate the Port Configuration menu item (see Figure 4-14).

Figure 4-14
Window Showing Port Configuration Option

Press Enter to enter the Base Nx Configuration menu.
Using the same operational methods as before, select item 2)RATE to change from 64K mode to 56K mode (see Figure 4-15).

Scroll to continue viewing the remainder of the menu selections, comparing all the settings against the configuration chart.

Cancel returns to the PORT menu. Scroll to change the port designation to 6.1 DSX-1.

Enter the DSX-1 Configuration menu.

The TSU 600 is now completely configured and capable of passing data from the PBX and the DTE. Prior to actually using the configuration to pass voice and data, it is recommended that tests be run on the circuit.

Appendix A
Understanding SNMP

As local area network (LAN) environments became standardized over the past ten years, multi-vendor equipment grew with competition. It became necessary to manage the various vendor equipment from a single control console. Thus, the SNMP emerged as the standard for managing commercial TCP/IP networks.

The term *SNMP* broadly refers to the message protocols used to exchange information between the network and the managed devices, as well as to the structure of network management databases.

Basic Components

SNMP has three basic components: Network Manager, Alert, and MIB.

Network Manager

This is a control program that collects, controls, and presents data pertinent to the operation of the network devices. It resides on a network management station.

Agent

This is a control program that responds to queries and commands from the network manager and returns requested information or invokes configuration changes initiated by the manager. It resides in each network device.

•

MIB

This is an index to the organized data within a network device. It defines the operating parameters that can be controlled or monitored.

When requesting the network manager to retrieve or modify a particular piece of information about a network device, the network manager transmits the request to that network device. The agent in that device interprets the incoming request, performs the requested task, and sends its response to the network manager. The network manager collects all the data from the various network devices and presents it in a consistent form.

Commands

Using SNMP Version 1, the network manager can issue three types of commands: GetRequest, GetNextRequest, and SetRequest.

- **GetRequest**

This command retrieves a single item or the first in a series from a network device.

- **GetNextRequest**

This command retrieves the next item in a series from a network device.

- **SetRequest**

This command writes information to a network device.

Message

The network device issues two types of messages: GetResponse and Trap.

- **GetResponse**

This message is the response to a network manager GetRequest or GetNextRequest command.

- **Trap**

This is an unsolicited message issued by a network device to report an operational anomaly or an alarm condition to the network manager.

These messages are typically encased within informational packets

and transported over the LAN or WAN (wide area network).

AGENT CARD SNMP ACCESS

By default, SNMP MIB Browser access to the Agent Card's IP address with the configured community names accesses the host TSU / HSU the card is installed in. The Agent Card can also act as an SNMP proxy agent for external units. To access MIB variables on externally chained devices, append a period and the Unit ID of the device to the Read and Read / Write community names. For example, if the Read community name configured in the Agent is public, specifying "public.3" as the community name in the SNMP MIB Browser allows reading SNMP MIB variables from externally chained unit 3.

If the external unit's passcode is not the default, an entry must be added to the Unit Access Table for SNMP MIB access. See the Unit Access Table section in the chapter *Operation* for a description of this operation. However, SNMP traps for the unit can be forwarded without the entry.

SNMP TRAP CONFIGURATION

Traps received by the Agent Card from external units and the host unit are converted into SNMP traps and forwarded to the configured NMS. The source of the trap is uniquely identified at the NMS by a combination of the IP address of the Agent Card, and the Unit ID of the sending device. The Unit ID is present in the trap packet appended to the end of the trap community packet name, for example public.4. It is also included as an Octet String variable (adProdPhysAddress) in the trap packet as defined in the individual product MIBs. The latest versions of the product MIBs by default display the appended trap community name in their descriptions.

Typical steps required for Management Station trap configuration are loading the device specific MIBs. and loading or creating device specific Trap Definition Files. The current product MIBs contain keywords embedded in comments that can be used by some network management platforms to automatically generate Trap Definitions. Otherwise, the descriptions may be used as a template for Trap Definitions.

If individual option card port and slot identification is required, it is present in the four byte adProdPhysAddress field of the trap packet. The first two bytes are the Unit ID of the base controller (least significant byte first). The next two bytes are port and slot number. This field is the second object identifier in all traps sent from TSU / HSU products. For traps from the ISU 512, the Unit ID is the first object identifier. See the product MIBs for more information

Definitions for Poll Link Up / Down traps are included in the Agent Card MIB file: TSUAGENT.MIB.

SNMP MIB BROWSER CONFIGURATION

The following are typical steps required to configure Network Manager MIB variable access through the Agent Card:

4. 1. Load the desired product MIBs on the network management station. If, for example, the administrator is managing TSU 100 and ISU 512 devices, load TSU 100.MIB, ISU512.MIB, and RFC1406.MIB.
5.
6. 2.Create device entries in the NMS database for all units that are to be managed through the Agent Card. The host unit should be configured as the Proxy agent for the external units. The IP address or host name used for the proxy designation is that of the Agent Card.
7.
8. 3.Set community names in the devices entries for external units to the Agent Card's community name with the device Unit ID appended as defined in the previous section *AGENT CARD SNMP ACCESS*.
9.
10. 4.Set the device timeout for all device entries in the NMS device database to five seconds, including the host unit.
11.
12.

SNMP MIB FILES

The Agent Card supports several standard MIBs including MIB-II (RFC-1213), the DS1 T1 / E1 MIB (RFC-1406), and the Ethernet MIB (RFC-1643). It also supports several ADTRAN enterprise specific MIBs including the ADTRAN Product MIB (ADTRAN.MIB), the ADTRAN DS1 extensions MIB (ADS1.MIB), and all TSU / HSU Enterprise MIBs, such as TSU 100.MIB.

The standard MIB files are usually included with most SNMP network management software. The latest version of the ADTRAN enterprise specific MIBs are available from the ADTRAN anonymous ftp site (ftp.adtran.com), or by dial-up from the BBS (205 -971-8169).

Appendix C
Network Pinouts

WIRING

Network

On the rear panel of the TSU 600e is an eight-position modular jack labeled NETWORK. This connector is used for connecting to the network. See Table 2-A for the pinout for the network connector.

Connections

The network connections are as follows:

Connector type (USOC) RJ-48C
Part number AMP# 555164-2

Table 2-A
Network Pinouts

PIN	NAME	DESCRIPTION
1	R1 RXDATA-RING	Receive data from the network
2	T1 RXDATA-TIP	Receive data from the network
3	UNUSED	
4	R1 TXDATA-RING	Send data toward the network
5	T TXDATA-TIP	Send data toward the network
6,7,8	UNUSED	

Control In/Chain In

This is used as an RS-232 port for connection to a computer or modem (Control In) or to another TSU 600e or TSU 100 (Chain In). See Table 2-B for the pinout for the control/chain in connector.

Connections

The chain in connections are as follows:

Connector type RJ-48
Part number AMP# 555164-2

Table 2-B
Control In/Chain In Pinout

PIN	NAME	DESCRIPTION
1	GND	Ground - connected to unit chassis
2	RTS	Request to send - flow control
3	RXDATA	Data received by the TSU 600e
4	UNUSED	
5	TXDATA	Data transmitted by the TSU 600e
6,7	UNUSED	
8	CTS	Clear to send - flow control

Chain Out

This is used to connect to another TSU 600e Chain In connector. See Table 2-C for the pinout for the chain out connector.

Connections

The chain out connections are as follows:

Connector type	RJ-48
Part number	AMP# 555164-2

Table 2-C
Chain Out Pinout

PIN	NAME	DESCRIPTION
1	GND	Ground - connected to unit chassis. Connected to GND of next unit (pin 10).
2	UNUSED	
3	TX DATA	Data transmitted to chained units by the TSU 600e. Connect to RX DATA of the next unit (chain in pin 3).
4	UNUSED	
5	RX DATA	Data received from chained units by the TSU 600e. Connect to TX DATA of the next unit (chain in pin 5).
6,7,8	UNUSED	

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