BLACK BOX®
NETWORK SERVICES

Stat-4, Stat-8, and Stat-24

STAT-4 MAIN 1 2 3 4 SYNC ERR OVF TEST RESET POWER

STAT-8 MAIN 1 2 3 4 5 6 7 8 SYNC ERR OVF TEST RESET POWER

STAT-24 POWER MAIN 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 SYNC ERROR OVF TEST RESET

**FEDERAL COMMUNICATIONS COMMISSION
AND
INDUSTRY CANADA
RADIO FREQUENCY INTERFERENCE STATEMENTS**

This equipment generates, uses, and can radiate radio-frequency energy, and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

INSTRUCCIONES DE SEGURIDAD (Normas Oficiales Mexicanas Electrical Safety Statement)

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.

2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.

3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.

4. Todas las instrucciones de operación y uso deben ser seguidas.

5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..

6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.

7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.

8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.

9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.

13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.

14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.

15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.

16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.

17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.

18. Servicio por personal calificado deberá ser provisto cuando:

    A: El cable de poder o el contacto ha sido dañado; u

    B: Objectos han caído o líquido ha sido derramado dentro del aparato; o

    C: El aparato ha sido expuesto a la lluvia; o

    D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o

    E: El aparato ha sido tirado o su cubierta ha sido dañada.

TRADEMARKS USED IN THIS MANUAL

Any trademarks mentioned in this manual are acknowledged to be the property of the trademark owners.

Contents

1. Specifications

Multiplexor Type: Statistical TDM

User Channels: MX864A: 4; MX866A: 8; MX868A: 24

Speed: Channel: MX864A, MX866A: 300 bps to 19.2 kbps; MX868A: 75 bps to 38.4 kbps;
   Composite: All models: Up to 19.2 kbps

Flow Control: Hardware: DTR/CTS for end-to-end, RTS/CTS for sub-channel to device;
   Software: X-ON/X-OFF

Diagnostics: Local and remote loopback on channels and composite

User Controls: (3) internal jumpers: INIT/NOR, PIN 21 ON-OFF, and GND

Interface: Channel: RS-232, async; Composite: RS-232, sync

Connectors: MX864A: Channel: (4) RJ-45, Composite: (1) DB25 male (DTE);
MX866A: Channel: (8)RJ-45, Composite: (1) DB25 male (DTE);
MX868A: Channel: (24) RJ-45, (1) DB25 male (DTE)

Indicators: MX864A: (9) LEDs: (1) Power, (4) Port numbered 1 through 4, (1) Sync, (1) Err, (1) OVF, (1) Test;
MX866A: (13) LEDs: (1) Power, (8) Port numbered 1 through 8, (1) Sync, (1) Err, (1) OVF, (1) Test;
MX868A: (29) LEDs: (1) Power, (24) Port numbered 1 through 24, (1) Sync, (1) Err, (1) OVF, (1) Test

Temperature Tolerance: 32 to 122°F (0 to 50°C)

Relative Humidity: Up to 95%, noncondensing

Power: 115 VAC, 47 to 63 Hz

Size: MX864A, MX866A: 1.7"H x 8.5"W x 9.5"D (4.3 x 21.6 x 24.1 cm);
MX868A: 1.7"H x 17.2"W x 9.6"D (4.3 x 43.7 x 24.4 cm)

Weight: MX864A: 3.1 lb. (1.4 kg);
MX866A: 3.5 lb. (1.6 kg);
MX868A: 5.7 lb. (2.6 kg)

2. Introduction

2.1 Functional Description

The Stat-4, Stat-8, and Stat-24 are advanced, full-function compact statistical multiplexors. They're capable of multiplexing asynchronous data sub-channels at data rates of 75 to 38,400 bps onto a single composite synchronous channel operating at up to 19,200 bps. The Stat-4 has four sub-channels, the Stat-8 has eight sub-channels, and the Stat-24 has 24 sub-channels. An external clock signal automatically determines the composite channel rate, and you select sub-channel characteristics and other system features via configuration menus. All units are available in desktop versions, which also install in 19" racks with rack adapter kits.

The Stat-4, Stat-8, and Stat-24 use a dynamic data buffer management technique to allocate available buffer capacity according to sub-channel activity. Error-free end-to-end data transmission is ensured by powerful and efficient error detection and automatic retransmission, completely transparent to the user.

The muxes provide independent hardware and software flow control for each sub-channel, both end-to-end flow control (DTE to DTE) and terminal flow control (DCE to DTE). For compatibility with most applications, choose from among several software flow-control characters.

The Stat-4, Stat-8, and Stat-24 permit full system configuration (including configuration downloading from the local stat mux to the remote stat mux, and vice-versa) from any sub-channel port. The stat mux uses a password to prevent unauthorized configuration changes.

You can configure the mux with any standard cathode-ray terminal (CRT), using a simple, menu-driven facility. Configuration parameters are stored in non-volatile memory and are immediately available upon power-up.

To facilitate initial system configuration, the multiplexors store—in addition to the user-selected configuration—a set of default configuration parameters (factory setting), that you can select via a jumper, to provide a common starting point for any stat mux.

The Stat-4, Stat-8, and Stat-24 have comprehensive diagnostics functions, including automatic self-test upon power-on, local and remote sub-channel loopback, and local and remote composite channel loopback. Front-panel indicators show the condition of each sub-channel and composite link synchronization status. In addition, the muxes control the V.54 pins (pins 18 and 21) of the RS-232 interface serving the composite link, thereby allowing control of analog and remote digital loopback functions of the modem connected to the stat mux.

2.2 Available Models

The following models are available:

Model Number	Name	Ports
MX864A	Stat-4	(4) RJ-45, (1) DB25
MX866A	Stat-8	(8) RJ-45, (1) DB25
MX868A	Stat-24	(24) RJ-45, (1) DB25

2.3 Typical Applications

Figure 2-1 shows a typical application that uses a Stat-24 to multiplex the data lines used to connect a large number of asynchronous terminals (up to 24) to the host computer. The data lines use various data rates. The Stat-24 statistically multiplexes sub-channel data to form a composite data stream having a rate much smaller than the arithmetical sum of the individual sub-channel rates. The required composite link rate depends on the Stat-24's buffer capacity versus sub-channel traffic statistics and allowable delay.

The composite data is sent via modems to the remote Stat-24, where it is demultiplexed and distributed to the local users at their nominal rate (that may differ from the nominal host transmission rate).

Reliable operation of any statistical multiplexor requires the equipment connected to its sub-channels to use some form of flow control. One of the main advantages of the Stat-4, Stat-8, and Stat-24 is that the flow-control method used at each of the two sub-channel ends can differ (for example, hardware control at one end, software control at the other end), and the conversion is transparently performed by the stat muxes.
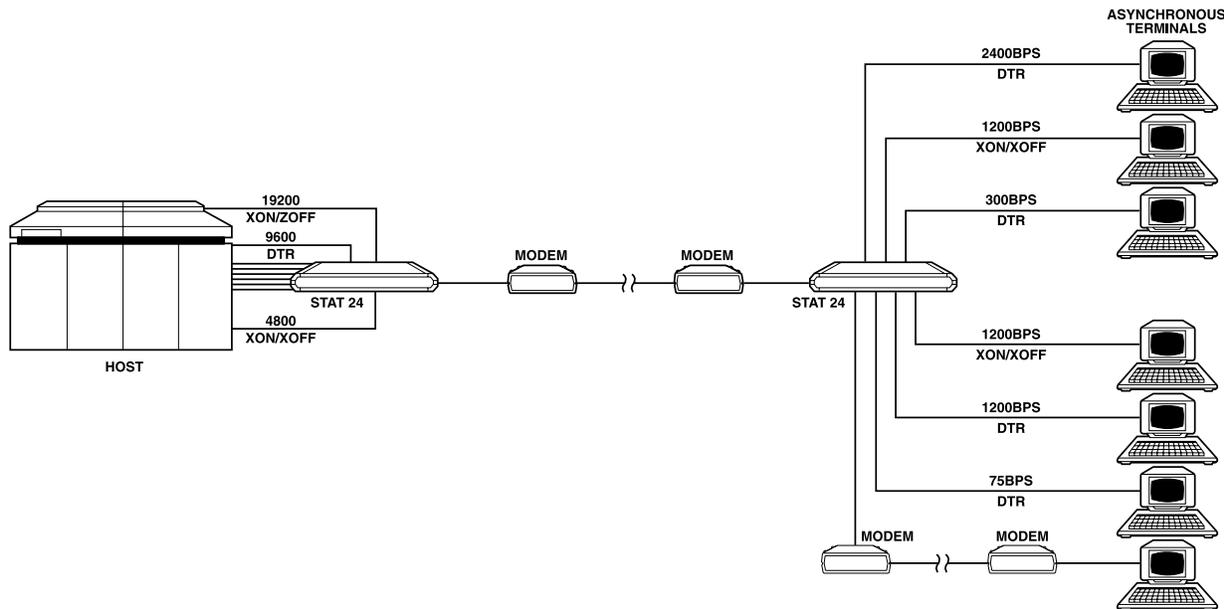

Figure 2-1. Typical stat mux application.

3. Installation

3.1 General

The Stat-4, Stat-8, and Stat-24 are delivered completely assembled. Install each mux on top of a bench or shelf, or optionally mount it in a 19" rack (via rack adapter kits). Mechanical and electrical installation procedures appear in the following paragraphs.

After installing the mux, refer to **Section 3.8** for system configuration information and procedures (including sub-channel bit rate, data format, and flow-control mode selection).

If you encounter a problem, refer to **Chapter 5** for test and diagnostic instructions.

3.2 Site and Power Requirements

Power. Install within 5 feet (1.5 m) of a grounded AC outlet capable of furnishing 115 VAC or 230 VAC, according to the nominal supply voltage of the unit.

Ambient Requirements. The stat mux will operate properly in any ambient conditions suitable for operation of electronic computer equipment and peripherals. The stat mux, however, can operate without performance degradation over a wide range of temperatures 32 to 122°F (0 to 50°C) at relative humidities up to 95%, non-condensing.

Grounding. The stat muxes have a rear ground screw, which is used for grounding all the metal parts of the chassis.

3.3 Description of Internal Jumpers

WARNING

Avoid electrical shock! Always turn the power switch off and disconnect the power cable from mains before opening the stat mux.

General. The Stat-4, Stat-8, and Stat-24 have three internal jumpers. Refer to Figure 3-1 for Stat-4 and Stat-8 and to Figure 3-2 for Stat-24, and use the following description.

1. INIT/NOR jumper. Use this jumper to select the default set of configuration parameters stored in the stat mux. The jumper has two positions:

   • NOR: Normal operation. The stat mux uses parameters selected by the user during the last configuration session.

   • INIT: Initialization. The stat mux uses the default configuration (determined by factory and common to all stat mux units). To select the default configuration, set the jumper to INIT, then apply power to the stat mux, or press the RESET button while the stat mux is powered. The default configuration is loaded during power-up.

Factory setting is NOR.

When delivered, the non-volatile memory of the stat mux is already loaded with the default configuration, so the stat mux is configured in accordance with the factory settings. You may have to select again the default configuration (INIT) again in the following cases:

- After an error during the configuration session, which either prevents communication between the control terminal and the stat mux, or is difficult to trace and correct.

- The description of the configuration loaded into the stat mux has been lost, so it's not possible to enter the configuration mode in the NOR mode. To avoid this inconvenience, always keep a record of the last configuration parameters (a typical record form is shown in **Appendix B**).

After you load the default configuration by setting the jumper to INIT and powering up or resetting the stat mux, the default configuration becomes the current stat mux configuration. Return the jumper to the NOR position to allow configuration.

2. PIN 21 ON-OFF jumper. Pin 21 of the standard RS-232 interface can serve either as a signal quality indication (SQ) line, or as a remote loopback command line. The actual function depends on the specific model of modem you're using, and a jumper allows adapting the stat mux to the modem connected to the composite (main) link connector.

The jumper has two positions:

- PIN 21 ON: Set the jumper to this position when the modem uses pin 21 as a remote loopback command line. This connects the internal stat mux pin 21 driver to this pin, and allows you to control this modem function using the diagnostics screen.

- PIN 21 OFF: Set the jumper to this position when the modem uses pin 21 as a signal quality indication output. Use this position whenever in doubt about the actual function of the pin in the specific modem model you use. When the jumper is in this position, you no longer have control of the modem's remote loopback function from the diagnostics screen. The factory setting is OFF.

3. GND jumper. This jumper controls the connection between the signal ground lines to the chassis ground lines. The installation manager determines the appropriate position.

The jumper has two positions:

- C (connect)—signal ground connected to chassis ground.

- D (disconnect)—signal ground disconnected from chassis ground.

Factory setting is D (Disconnect).

3.4 How to Set the Jumpers

WARNING

Avoid electric shock! Always turn the power switch off and disconnect the power cable from mains before opening the stat mux.

Follow these steps to set the jumpers:

1. Access the printed circuit board of the stat mux by opening the screw (or screws) fastening the top cover to the case, and remove the top cover.

2. Refer to Figure 3-1 or 3-2 and identify jumper locations and settings. Change the settings as required.

3. Reinstall the stat mux cover, and install and tighten the screws.
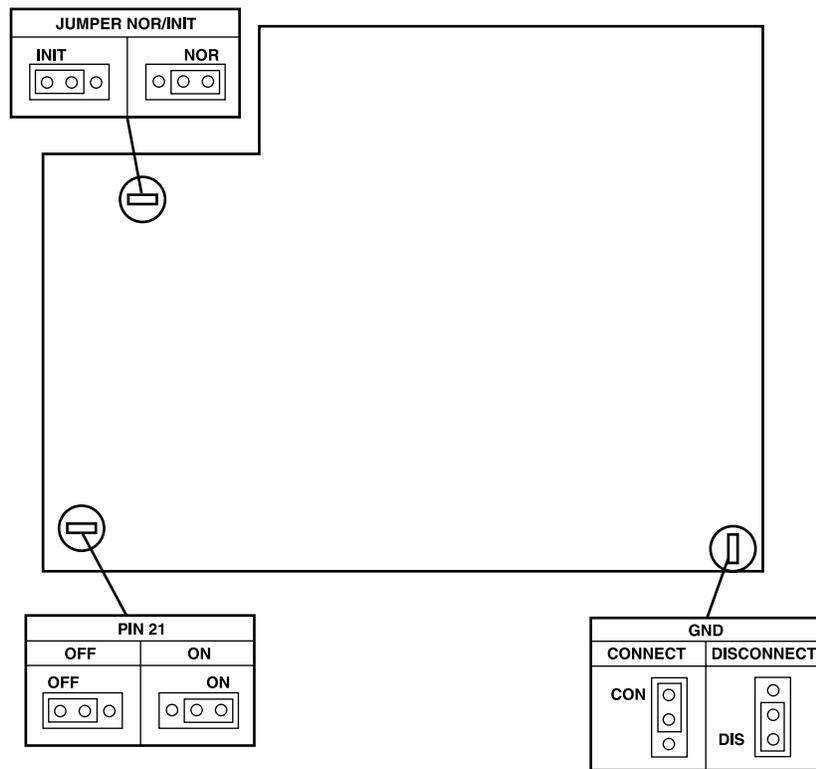
Figure 3-1. Stat-4 and Stat-8 internal jumpers.
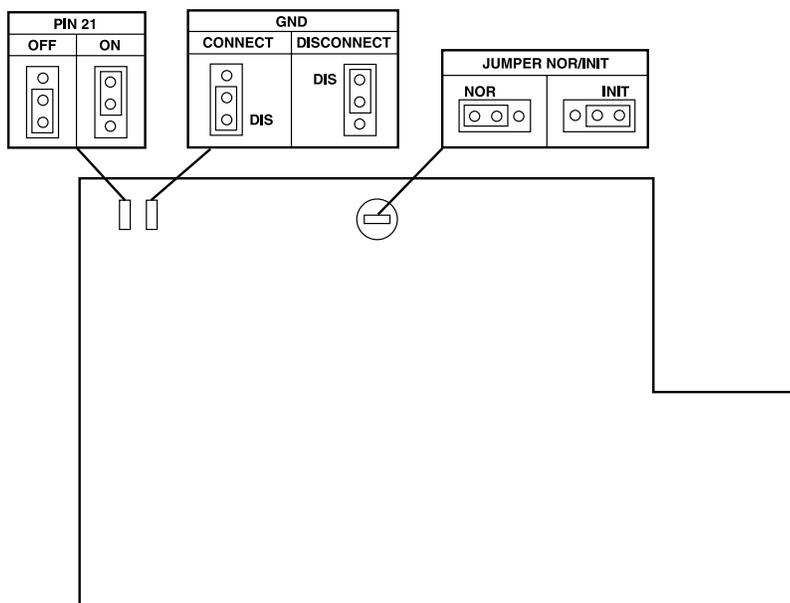
Figure 3-2. Stat-24 internal jumpers.

3.5 Installing the Mux in 19" Racks

Install the stat muxes in 19" racks. Rack height is 1U (1.75"). The width of the Stat-8 is slightly less than half of the available mounting width, and Stat-24 width is equal to the available width. Two rack adapter kits are available for the Stat-8; one kit provides the hardware you need to install a single mux, and the other provides the hardware you need to install two muxes, side-by-side. Another rack adapter kit is available for the Stat-24. Call Technical Support for details.

WARNING
Disconnect the units from AC power while performing the following procedures.

3.5.1 INSTALLING A SINGLE STAT-8

The rack adapter kit for single-mux installation includes one short bracket and one long bracket. Fasten the brackets via screws to the two side walls of the case, as shown in Figure 3-3.

To prepare the mux for rack installation, attach the two brackets to the side walls of the mux. Each bracket fastens via two screws (with flatwashers), which you insert into the two front holes on the side wall (nuts are already in place, on the inner side of the wall). After attaching the brackets, the mux is ready to install in the 19" rack. Fasten the brackets to the side rails of the 19" rack via four screws (not included in the kit), two on each side.
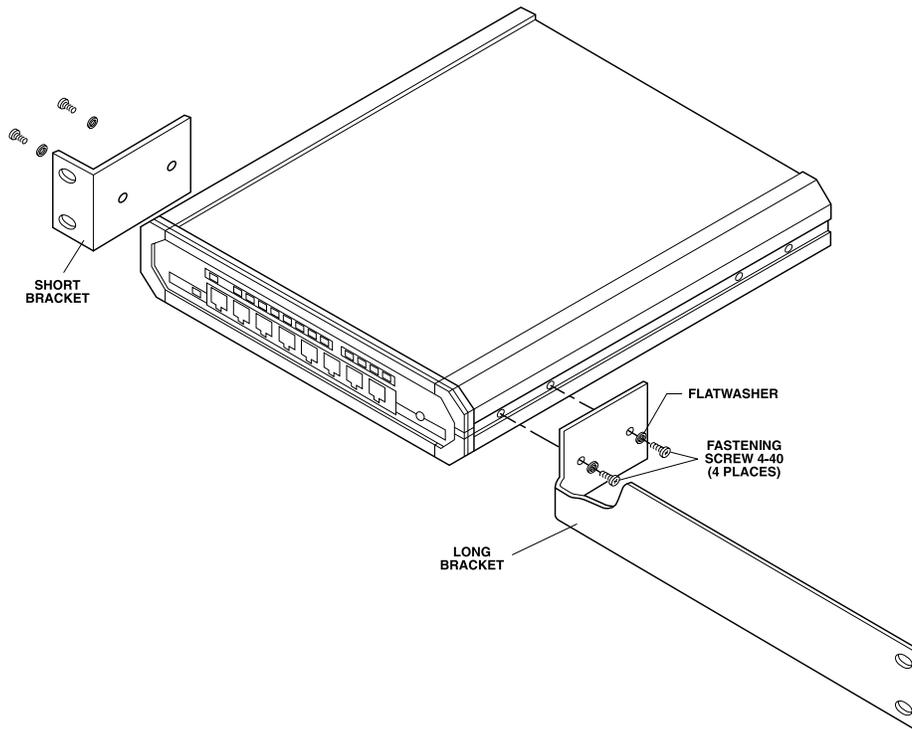
Figure 3-3. Installing a single Stat-8 in a 19" rack.

3.5.2 INSTALLING TWO STAT-8 MUXES

The adapter kit includes two adapter brackets (and various hardware) for attaching the two muxes side by side. Refer to Figure 3-4 and follow these steps:

1. Remove the cover from the mux that will be on the right-hand side of the rack.

2. Position one of the two U brackets supplied in the kit on the slots inside of the inner left-hand wall, and align its holes with the holes on the wall.

3. Insert the flat washers over one pair of long screws and screw them through the U bracket into the holes on the wall.

4. Repeat steps 2 and 3 above for the other U bracket.

5. Hold the second mux close to the left wall of the opened rack, and using a screwdriver, drive the four screws until their ends emerge from the left wall and engage the holes on the right side of the second mux. Tighten each screw one turn at a time—do not tighten one screw completely before moving on to the next. Continue to tighten the screws until their heads rest against the U bracket and the two muxes are in contact.

6. Reinstall the cover over the right-side mux.

7. Fasten one adapter bracket (7A) to the side wall of each mux. Use the four short screws (7B) and flat washers (7C) supplied in the kit.

8. You can now fasten the assembled units to the side rails of the 19" rack with four screws (not included in the kit), two on each side.

SHORT BRACKET

A.

PUSH TOGETHER

U BRACKET (2 PLACES)

FLATWASHER (4 PLACES)

LONG SCREW (4 PLACES)

COVER

FLATWASHER (7C) (4 PLACES)

SHORT SCREW (7B) (4 PLACSE)

ADAPTER BRACKET (7A)

B.
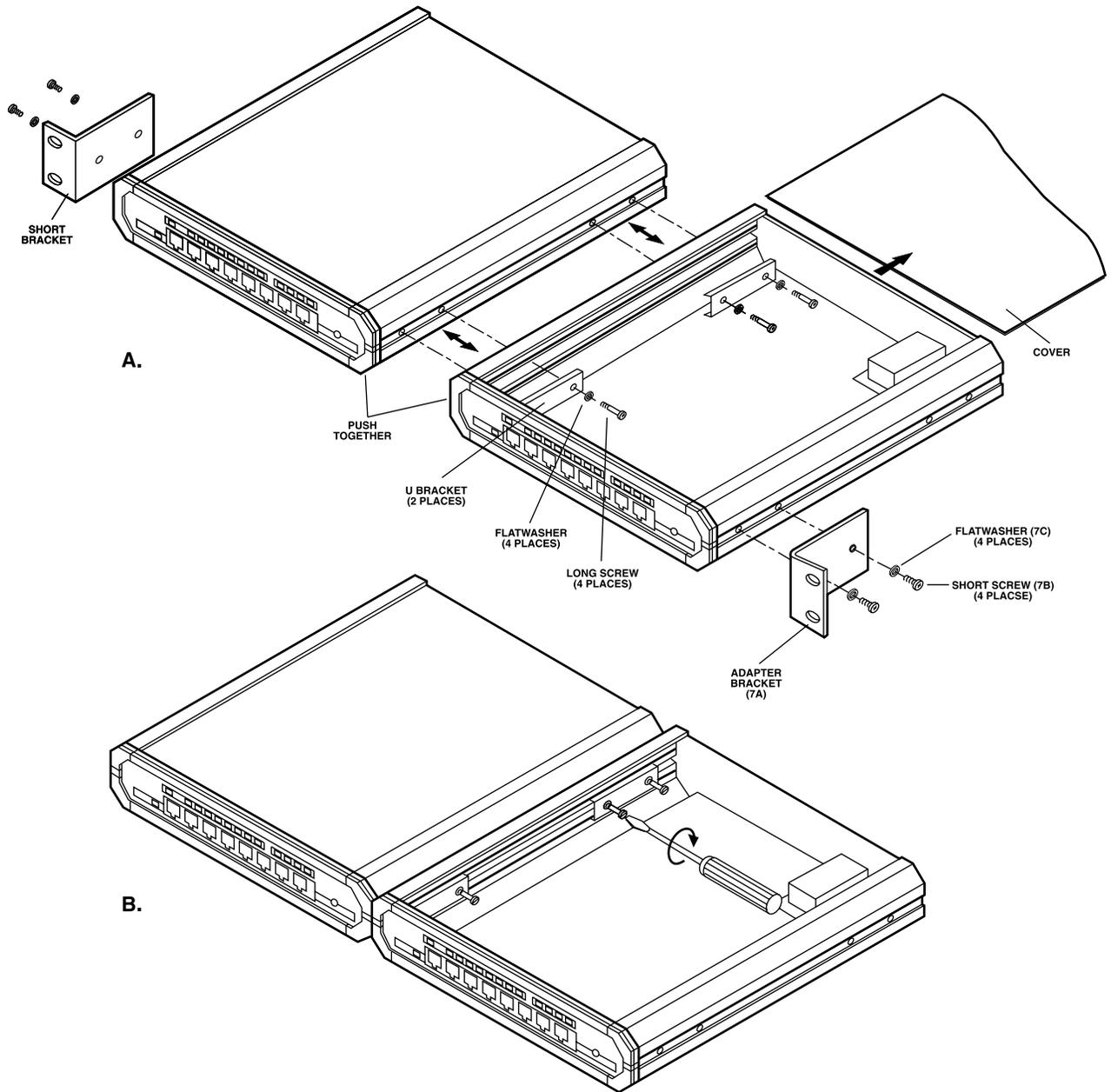
Figure 3-4. Installing two Stat-8 muxes side by side.

3.5.3 INSTALLING THE STAT-24

The rack adapter kit for Stat-24 rack installation includes two short brackets. The brackets are fastened via screws to the two side walls of the case, as shown in Figure 3-5. To prepare the mux for rack installation, attach the two brackets to the side walls of the mux. Each bracket is fastened with two screws (with flatwashers), which are inserted into the two front holes on the side wall (nuts are already in place, on the inner side of the wall). After attaching the brackets, the mux is ready to install in the 19" rack. Fasten the brackets to the side rails of the 19" rack with four screws (not included in the kit), two on each side.


BRACKETS

WASHER
(4 PLACES)

FASTENING
SCREWS
(4 PLACES)
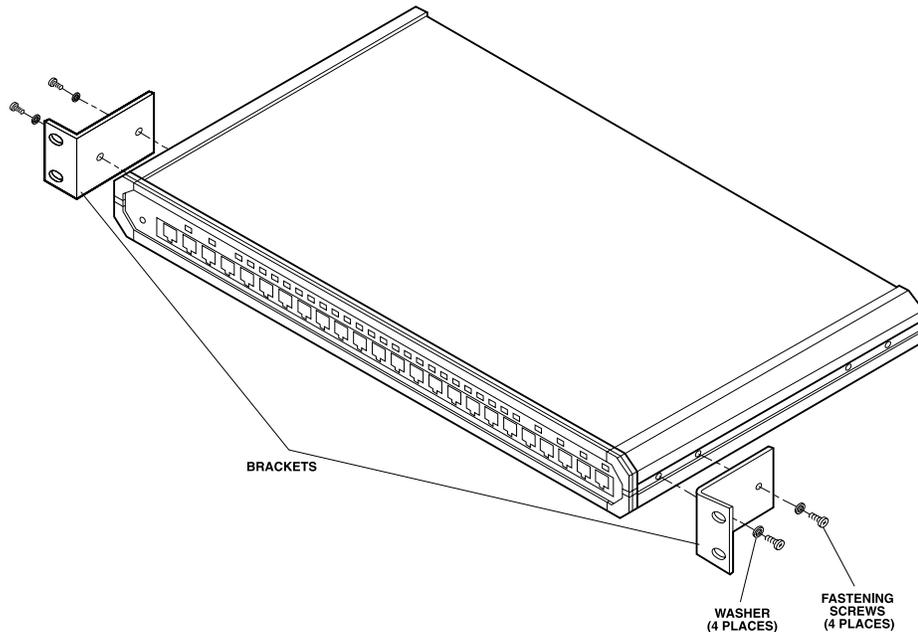
Figure 3-5. Installing the Stat-24 in a 19" rack.

3.6 Cable Connections

3.6.1 GENERAL

The Stat-4, Stat-8, and Stat-24 have one standard DB25 connector, serving the main channel, located on the rear panel, and RJ-45 connectors, located on the front panel, for the sub-channels.

3.6.2 SUB-CHANNEL CONNECTIONS

Stat mux sub-channel interfaces are configured as data communication equipment (DCE) interfaces, allowing you to connect the mux, via RS-232 port cables, directly to data terminal equipment (DTE). When you use modems to extend range (tail-end circuits), you need crossover cables. Sub-channel interfaces are asynchronous, so clock signals are not supported, or required. **Appendix A** lists pin allocation in stat mux sub-channel connectors and provides typical wiring diagrams for straight-through and crossover cables.

3.6.3 MAIN (COMPOSITE) CHANNEL CONNECTION

The stat mux's composite channel interface is configured as a DTE interface. It connects to a synchronous modem providing the clock signal that determines the stat mux's composite channel data rate. **Appendix A** also lists the pin allocation for the stat mux's composite channel connector.

3.6.4 POWER CONNECTION

The Stat-4, Stat-8, and Stat-24 have standard IEC three-prong connectors with an integral fuse.

3.7 Powering On the Mux

Connect the power cable between the AC mains connector on the rear panel and a standard grounded AC outlet, then set the rear-panel POWER switch to On. The front-panel PWR indicator should light.

After you turn on the mux, the SYNC indicator should light. If the link to the far stat mux is still not operational, the SYNC indicator will flash. Check that after a few seconds (during which the stat mux performs a self-test), the ERR indicator goes out. For additional information on stat mux indicators, refer to **Chapter 4**.

3.8 Stat Mux Configuration Information

3.8.1 INTRODUCTION

The stat mux can operate in three modes:

1. Normal operation mode, described in detail in **Chapter 4**.

2. Parameter configuration mode. Allows user to set up parameters of local and remote stat mux units. This mode provides two types of functions:

   • Parameter-selection functions.

   • System-management functions, used to save (store) selected parameters, transfer configurations between the local and remote units, activate new configurations, and select passwords.

3. Diagnostics mode. Stat mux diagnostic functions include local and remote loops on each sub-channel and on the composite channel, and modem loops (analog and optionally remote digital loopback). Refer to **Chapter 5** for additional details.

Activate the parameter configuration mode and the diagnostics mode from the command terminal, using the stat mux configuration program. This paragraph outlines the configuration parameters available to you. **Section 3.9** provides step-by-step instructions on starting configuration and diagnostics sessions. **Section 3.10** provides in-depth information on each menu and the purpose of each parameter or diagnostics screen.

3.8.2 CONFIGURATION INFORMATION

The stat mux has two types of configuration parameters:

1. System parameters, which affect both stat mux units connected in a link and also affect all their sub-channels. Table 3-1 lists system parameters.

2. Sub-channel parameters, which affect only the operation of a single sub-channel. Table 3-2 lists sub-channel parameters.

Table 3-1. STM system parameters and factory settings.

No.	Parameter	Function	Available Selections	Factory Setting
1	PASSWORD	Controls access to configuration	Any two characters except those used as X-ON and X-OFF control characters	RD (capital letters)
2	X-ON CONTROL CHARACTER	When using software flow control, causes the receiving terminal to start data transfer	11H (DC1) 12H (DC2) 13H (DC3) 14H (DC4) 91H 92H 93H 94H	11H
3	X-OFF CONTROL CHARACTER	When using software flow control, causes the receiving terminal to stop transfer of data	Same range as for X-ON, but the selected character must be different from the X-ON character	13H

Table 3-2. Sub-channel parameters and factory settings.

No.	Parameter	Function	Available Selections	Factory Setting
1	BAUD RATE	Sub-channel data rate	75, 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400 bps	9600
2	DATA BITS	Number of data bits in sub-channel data frame	5, 6, 7, 8	8
3	PARITY	Type of parity used in sub-channel data frame	Odd, Even Space, Mark, None	None
4	STOP BITS	Number of stop bits in sub-channel data frame	1, 1.5, 2	1
5	STAT-MUX-TO-DTE SOFTWARE FLOW CONTROL	Controls software flow-control function at the local end of the sub-channel. When on, see also Table 3-1, No. 2, 3.	On Off	On
6	END-TO-END SOFTWARE FLOW CONTROL	Activates end-to-end software flow control. When on, see also Table 3-1, No. 2, 3.	On Off	On
7	END-TO-END DTR FLOW CONTROL	Activates end-to-end hardware flow control (via DTR line)	On Off	On
8	RTS CONTROL PASS	Enables the transfer of the RTS state to the remote DCD line	On Off	Off

3.8.3 OUTLINE OF CONFIGURATION PROGRAM

The organization tree of the configuration program is shown in Figure 3-6.
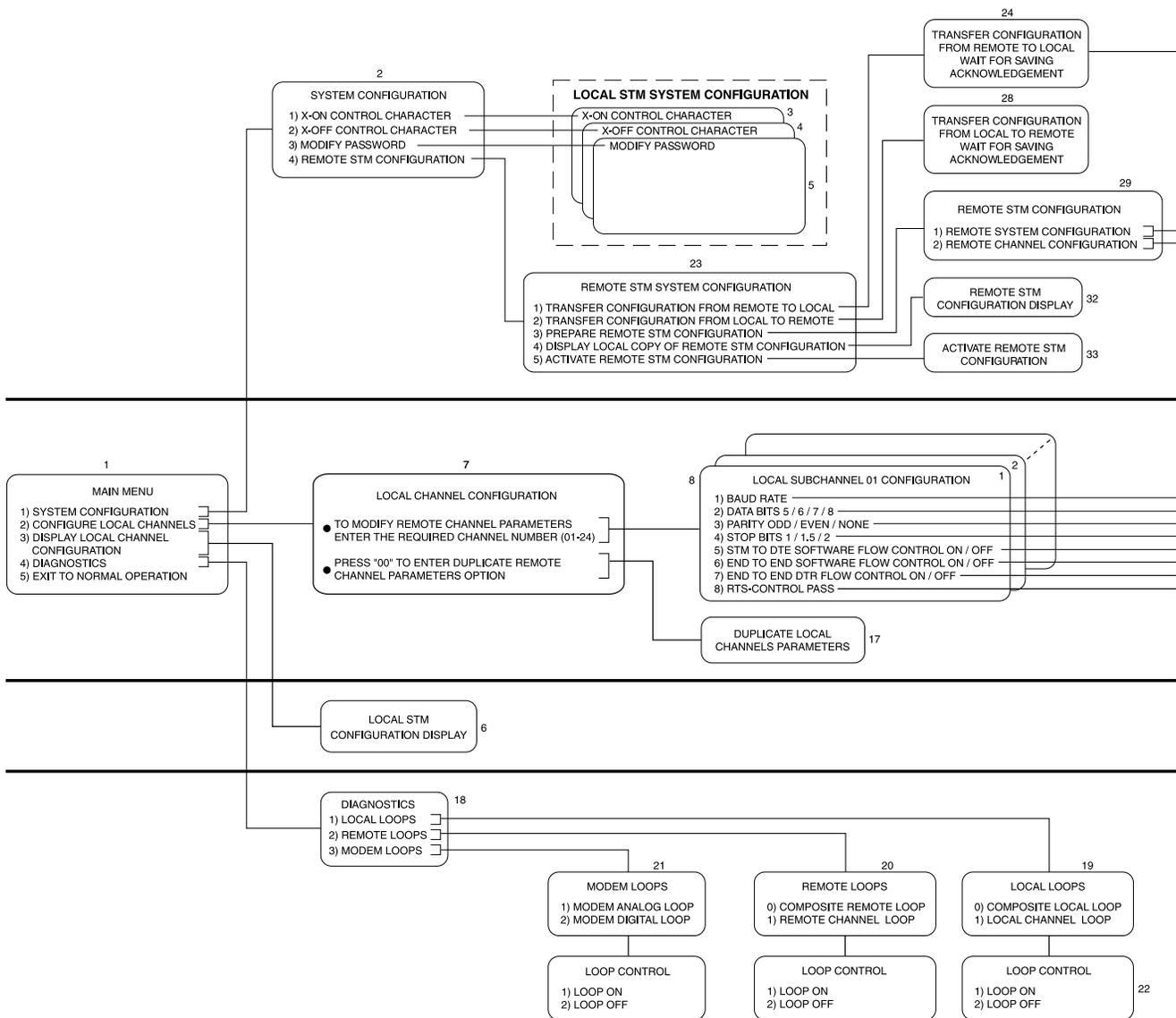
Figure 3-6. Configuration tree.

25

REMOTE MS-4 CONFIGURATION

1) EXAMINE
2) SAVE IN LOCAL STM

REMOTE STM
CONFIGURATION DISPLAY   26

REMOTE CONFIGURATION
HAS BEEN SAVED ON
LOCAL STM   27

30

REMOTE SYSTEM CONFIGURATION

1) X-ON CONTROL CHARACTER
2) X-OFF CONTROL CHARACTER
3) MODIFY PASSWORD

REMOTE STM SYSTEM CONFIGURATION

X-ON CONTROL CHARACTER
X-OFF CONTROL CHARACTER
MODIFY PASSWORD

31

REMOTE CHANNEL CONFIGURATION

TO MODIFY REMOTE CHANNEL PARAMETERS
ENTER THE REQUIRED CHANNEL NUMBER (01-24)

PRESS "00" TO ENTER DUPLICATE REMOTE
CHANNEL PARAMETERS OPTION

4
3
2
SUBCHANNEL 01 CONFIGURATION   1

1) BAUD RATE
2) DATA BITS 5 / 6 / 7 / 8
3) PARITY ODD / EVEN / NONE
4) STOP BITS 1 / 1.5 / 2
5) STM TO DTE SOFTWARE FLOW CONTROL ON / OFF
6) END TO END SOFTWARE FLOW CONTROL ON / OFF
7) END TO END DTR FLOW CONTROL ON / OFF
8) RTS-CONTROL PASS

BAUD RATE   9
DATA BITS   10
PARITY MENU   11
STOP BITS   12
STM TO   13
END TO END..........................   14
END TO END..........................   15
RTS CONTROL PASS

16

DUPLICATE LOCAL
CHANNELS PARAMETERS

REMOTE CHANNEL CONFIGURATION

LOCAL CHANNEL CONFIGURATION

BAUD RATE   9
DATA BITS   10
PARITY MENU   11
STOP BITS   12
MS-4 TO   13
END TO END..........................   14
END TO END..........................   15
RTS CONTROL PASS

16

LOCAL CHANNEL CONFIGURATION DISPLAY

DIAGNOSTIC FUNCTIONS

3.9 Starting the Configuration Session

3.9.1 USING THE STAT MUX CONFIGURATION PROGRAM

The stat mux configuration program is used to configure the stat mux for operation in your particular system. The configuration programs for the Stat-4, Stat-8, and Stat-24 are similar, except for the number of sub-channels. You can run the configuration program on any standard CRT terminal, connected to any sub-channel port. It's a simple menu-driven program that guides you through the various configuration steps:

1. At each step, a screen that shows all available selections appears, and when applicable, also shows the current selections.

2. The mux uses a standard selection procedure throughout: the available options are marked with numbers; indicate your selection by typing the option number.

3. To leave the current screen, type Q. This returns you to the previous screen.

The program checks your entries and does not accept invalid entries. For example, if the program expects a numerical entry in a certain range, but you press a key outside this range, the program ignores your entry and waits for a valid response. After a valid response is provided, it is immediately executed by the local stat mux. As you will see later, when you prepare the configuration for the remote stat mux, three different stages are used: preparing for configuration, transferring to remote stat mux, and activating transferred configuration.

When changing parameters related to the communication format of the sub-channel used to configure the stat mux, you must immediately change terminal communication format as well. However, if you make a mistake and lose communication with the stat mux, you can always quit the configuration program and start again from the default configuration. (Set the INIT/NOR jumper to INIT; see **Section 3.3** for instructions).

You can always stop the configuration session at any point, by pressing the ESC(ape) key of the terminal; however, any changes you make before you press the ESC key remain in effect.

3.9.2 PREPARING FOR CONFIGURATION SESSION

1. Turn the stat mux on and establish communication with the remote stat mux.

2. Select one of the terminals connected to stat mux sub-channels as a command (configuration) terminal, or connect a CRT terminal to one of the stat mux ports.

3. When a new terminal is connected to the stat mux sub-channel selected as the command port, program the communication parameters of this terminal according to those of the selected stat mux port (factory setting is 9600 bps, 8 data bits, 1 stop bit, no parity bit).

3.9.3 STARTING THE CONFIGURATION PROGRAM

The configuration program requires you to enter a password before proceeding any further. If you enter an incorrect password, the stat mux immediately returns to normal operation, and you must start again the configuration session.

NOTES

1. The following examples assume that the command mode is activated via sub-channel 1.

2. Stat mux commands requiring alphanumeric inputs are case-sensitive: observe use of lower-case and upper-case letters in the following examples.

1. To start the configuration session, allow an idle period of at least one second, type @@@, then wait at least one second and type S (typing any other character after the @@@ string returns the stat mux to the normal mode, and you will see the message STM IS IN NORMAL MODE).

2. After correctly typing the starting command, the stat mux stops data transfer through the sub-channel used by your terminal, its TEST indicator lights, and the opening screen (Figure 3-7) appears.

NOTE

Remember that any change in the communication parameters of a sub-channel takes effect immediately. If you intend to change these parameters, notify the users of the other sub-channels of the impeding changes.

```
COMMAND MODE IS ACTIVATED VIA CH1

STM COMMAND MODE

REV X.Y




ENTER STM PASSWORD
```

Figure 3-7. Stat mux opening screen.

3. Enter the password, correctly using upper and lower-case characters. The password is not echoed to the screen (factory setting is RD).

4. If the mux rejects the password, you will see the screen shown in Figure 3-8 and you must repeat step 1 again.

```
COMMAND MODE IS ACTIVATED VIA CH1

WRONG PASSWORD



STM IS IN NORMAL MODE
```

Figure 3-8. Password rejection screen.

5. If the mux accepts the password, it sends the main menu, shown in Figure 3-9.

```
              COMMAND MODE IS ACTIVATED VIA CH1

                        MAIN MENU

        1) SYSTEM CONFIGURATION
        2) CONFIGURE LOCAL CHANNELS
        3) DISPLAY LOCAL CHANNEL CONFIGURATION
        4) DIAGNOSTICS
        Q) EXIT TO NORMAL OPERATION
        SELECT YOUR CHOICE (1-4)
```

Figure 3-9. Main menu.

You can now start the actual configuration session. From this point on, whenever you want to end the configuration session, press Q as many times as necessary to obtain the following message, or press ESC.

```
                  EXIT COMMAND MODE

                  STM IS IN NORMAL MODE
```

3.10 Configuration Procedure

The following paragraphs present the menus and the data entry screens contained in the configuration program. Table 3-3 lists the available menus and screens and their index numbers.

Table 3-3. Stat mux configuration program.

1. Main Menu

Purpose: Select the configuration task.

Table 3-4. Configuration description via the main menu.

Code	Item	Description
1	SYSTEM CONFIGURATION	Used for selection of system-wide parameters (see **Section 3.8.2**): - Select X-ON and X-OFF flow control characters. - Change password. - Prepare remote stat mux configuration.
2	CONFIGURE LOCAL CHANNELS	Used to select local sub-channel parameters (see **Section 3.8.2**). Always change the parameters of the command sub-channel as the last item.
3	DISPLAY LOCAL CHANNELS CONFIGURATION	Used to display information regarding local stat mux configuration. For Stat-24, the information appears on three consecutive screens.
4	DIAGNOSTICS	Used to control the various test loops that can be controlled by the stat mux (**Section 5.2**).
Q	EXIT TO NORMAL OPERATION	Ends the current configuration session.

Procedure:

To select a configuration task, type the corresponding code number. The stat mux will switch to the corresponding screen. To end the configuration session, type Q. The TEST indicator will turn off, and you will receive the message:

```
                    EXIT COMMAND MODE

                  STM IS IN NORMAL MODE
```

2. System-Configuration Menu

Purpose: Select the parameters that affect the whole system: X-ON and X-OFF characters, password, and remote stat mux configuration.

Table 3-5. System Configuration menu.

Code	Item	Description
0	X-ON CONTROL CHARACTER	Used to display X-ON character selection screen
1	X-OFF CONTROL CHARACTER	Used to display X-OFF character selection screen
2	MODIFY PASSWORD	Used to display password changing screen
3	REMOTE STM CONFIGURATION	Used to display the main menu used for remote STM configuration
Q	EXIT	Used to return to the main menu

Procedure: To select a configuration task, type the corresponding code number: the stat mux will switch to the corresponding screen. Type Q to return to the main menu.

3. X-ON Control Character Screen

Purpose: View the character currently used to start data transfer when using software flow control, and select another character if desired.

Description:

Code numbers 1 through 8 present the various characters that you can use as X-ON control characters: 11H (DC1), 12H (DC2), 13H (DC3), 14H (DC4), 91H, 92H, 93H, or 94H.

The CURRENT STATE line shows the X-ON character now in use.

Procedure:

To change the current selection, type the code number corresponding to the desired character; always check that this character is different from the current X-OFF control character. The CURRENT STATE line reflects the change.

To exit with or without change, type Q. You will return to the System Configuration menu (2 above).

4. X-OFF Control Character Screen

Purpose: View the character currently used to stop data transfer when using software flow control, and select another character, if desired.

Description:

Code numbers 1 through 8 present the various characters that you can use as X-OFF control characters: 11H (DC1), 12H (DC2), 13H (DC3), 14H (DC4), 91H, 92H, 93H, or 94H. The current state line shows the X-OFF character now in use.

Procedure:

To change the current selection, type the code number corresponding to the desired character: always check that this character is different from the X-ON control character. To exit with or without change, type Q. You will return to the System Configuration menu (2).

5. Modify Password Screen

Purpose: Select a new password. The new password is activated after you verify it.

Description:

The screen prompts you to enter the new password (any two characters, except the characters serving as X-ON and X-OFF flow-control characters), or exit to the System Configuration menu.

Procedure:

  a. Type the desired password. You will receive the following message:

```
                 ENTER NEW PASSWORD AGAIN FOR VERIFICATION
```

  b. Type the same characters again.

    1. If the mux finds no difference between the passwords, it accepts the new password and you receive the following message:

```
 NEW PASSWORD HAS BEEN ACTIVATED    ENTER ANOTHER PASSWORD (two characters)
                            OR PRESS Q TO EXIT
```

    If you do not need to change the password again, press Q to return to the System Configuration menu. Otherwise, repeat the password entry procedure.

    2. If the two passwords differ, no change is made, and the following screen is presented:

```
            INCORRECT VERIFICATION, PASSWORD HAS NOT BEEN CHANGED

           ENTER NEW PASSWORD (two characters) OR PRESS Q TO EXIT
```

    You can now repeat the procedure or quit.

6. Local Stat Mux Configuration Display Screen

Purpose: Display the information regarding local stat mux configuration, after selecting item 3 on the MAIN Menu screen.

Description:

The screen displays the parameters selected for the local stat mux sub-channels. For the Stat-24, the information is presented on three consecutive screens. To scroll between the screens, press N.

Procedure:

No action is required on this screen. After the local configuration information display is no longer required, you can end it by pressing Q. This will return you to the MAIN Menu screen.

7. Local Channel Configuration Screen

Purpose: Select a local sub-channel for configuration or select local sub-channel parameters duplication option.

Description:

Configure the local stat mux by selecting the parameters of each local stat mux sub-channel. However, you can also use the duplication function to copy the parameters of any particular sub-channel to any group of other sub-channels. Screen selections are as follows: enter 00 to select the local sub-channel parameters duplication option. To select a local sub-channel for configuration, enter the number of the required sub-channel. Press Q to return to the Main Menu.

Procedure:

1. To select the parameters of any particular sub-channel, type the number of the required sub-channel: enter the two digits of the sub-channel number (for example, 02 for sub-channel 2, 14 for sub-channel 14). The stat mux will display the LOCAL SUB-CHANNEL CONFIGURATION screen (8).

2. To select sub-channel parameters duplication option, type 00. The stat mux will display the DUPLICATE LOCAL CHANNELS PARAMETERS screen.

3. Type Q to return to the MAIN Menu screen.

8. Local Sub-Channel Configuration Screen

Purpose: View the current values of the sub-channel parameters. This screen is used to enter specific sub-channel parameter configuration screens when changes are needed. The various parameters that you can select are explained in **Section 3.8.2**.

Description:

The screen displays the current values of the selected sub-channel parameters. In addition, the header shows the number of the sub-channel whose parameters are displayed.

Code numbers 1 through 8 list the various sub-channel parameters that you can change: sub-channel data rate, number of data bits in sub-channel data frame, type of parity used in sub-channel data frame, number of stop bits in sub-channel data frame, software flow control function at the local end of the sub-channel, end-to-end software flow control, end-to-end hardware flow control (by means of DTR line), and transfer of RTS status to DCD control line.

Type Q to return to the LOCAL CHANNEL CONFIGURATION screen (7).

The Current Configuration line lists the current parameter values.

Procedure:

Select the desired configuration action by typing its code number, or type Q to return to the LOCAL CHANNEL CONFIGURATION screen (7).

9. Baud Rate Screen

Purpose: View the current sub-channel baud rate and select a new rate, if desired. Description Codes 1 through 9, A and B list the available sub-channel rates: 75, 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19,200 and 38,400 bps. Type Q to return to the LOCAL SUB-CHANNEL CONFIGURATION screen (8).

The CURRENT STATE line shows the current sub-channel rate.

Procedure:

To change sub-channel rate, type the appropriate code number. The new selection appears in the CURRENT STATE line. If you changed the rate of the command sub-channel (the sub-channel you are now connected to), reprogram your terminal for the new rate, so that you will be able to continue. After completing the required actions, type Q to return to the LOCAL SUB-CHANNEL CONFIGURATION screen (8).

10. Data Bits Screen

Purpose: View the current number of data bits used on this sub-channel and select a new value, if desired.

Description:

Code numbers 1 through 4 list the available selections of data bits number: 5, 6, 7, or 8. Type Q to return to the Local Sub-Channel Configuration screen (8).

The Current State line shows the current number of data bits.

Procedure:

To change the number of data bits, type the appropriate code number. The new selection appears in the Current State line. If you changed the number of data bits on the command sub-channel (the sub-channel you are now connected to), reprogram your terminal for the new value so that you will be able to continue.

After completing the required actions, type Q to return to the Local Sub-Channel Configuration screen (8).

11. Parity Screen

Purpose: View current parity used by the sub-channel and select, if desired, a new type.

Description:

Code numbers 1 through 5 list the available parity types: even, odd, space, mark, or no parity.

Type Q to return to the Local Sub-Channel Configuration screen (8).

The Current State line shows the current type of parity.

Procedure:

To change the type of parity, type the appropriate code number. The new selection appears in the Current State line. If you changed the type of parity on the command sub-channel (the sub-channel you are now connected to), reprogram your terminal for the new value, so that you will be able to continue. After completing the required actions, type Q to return to the Local Sub-Channel Configuration screen (8).

12. Stop Bits Screen

Purpose: View the current number of stop bits used by the sub-channel and select a new value, if desired.

Description:

Code numbers 1 through 3 list the different number of stop bits you can select: 1, 1.5, or 2. Type Q to return to the Local Sub-Channel Configuration screen (8).

The Current State line shows the current number of stop bits.

Procedure:

To change the number of stop bits, type the appropriate code number. The new selection appears in the Current State line.

If you changed the number of stop bits on the command sub-channel (the sub-channel you are now connected to), reprogram your terminal for the new value, so that you will be able to continue.

After completing the required actions, type Q to return to the Local Sub-Channel Configuration screen (8).

13. Stat Mux-to-DTE Software Flow Control Screen

Purpose: View the current status of software flow control used on this sub-channel and select, if desired, a new status.

Description:

The stat mux must be able to command the DTE connected to it to interrupt the flow of data when stat mux buffers fill, and restart the flow when the stat mux can accept new data for transmission. This function is mandatory whenever you use statistical multiplexors, and is additional to the end-to-end flow-control function (see 14 and 15).

Some DTEs can stop data flow when receiving a special character, X-OFF, and renew data flow when receiving another character, X-ON (see 3 and 4). This capability is termed "software data flow control," and you can program the stat mux to use this capability by selecting the ON option on this screen.

If the DTE cannot recognize the X-ON and X-OFF characters, you must select the Off option. In this case, the control of data flow between the stat mux and the DTE connected to it is performed via the CTS control line contained in the RS-232 interface.

Screen selections are as follows:

Code numbers 1 and 2 list the available selections of software flow control status: on or off.

Type Q to return to the Local Sub-Channel Configuration screen (8). The Current State line shows the current status of software flow control used on this sub-channel.

Procedure:

To change the status of software flow control, type the appropriate code number. The new selection appears in the Current State line.

Type Q to return to the Local Sub-Channel Configuration screen (8).

14. End-to-End Software Flow Control Screen

Purpose: View the current status of end-to-end software flow control used on this sub-channel and select a new status, if desired.

Description:

In addition to the stat mux-to-DTE control function (13), the stat mux provides a DTE-to-DTE (or end-to-end) flow-control function. This function allows a receiving DTE to command the remote transmitting DTE to interrupt data flow, because temporarily it cannot accept new data, and then send a request for continuing data flow. The stat mux transmits the flow control commands to the other end and simultaneously executes the required action on the local sub-channel. This avoids problems that could be caused by the link transmission delay. This is done by selecting the ON option on this screen. The stat mux is then configured to recognize the two special characters (selected via the screens presented in 3 and 4): X-OFF conveys local DTE "stop flow" command, and X-ON conveys local DTE "restart flow" command.

The detected X-ON/X-OFF commands are sent to the remote stat mux, which converts them to flow-control commands for the remote DTE connected to it. When the stat mux receives an X-OFF command from the local DTE, the local stat mux interrupts immediately the transfer of received data to the local DTE. The additional data sent by the remote DTE during the time it takes to transfer the X-OFF command accumulates in stat mux buffers. Similarly, when the stat mux receives an X-ON command from the local DTE, the local stat mux immediately starts the transfer of received data (accumulated as explained before).

The flow-control commands supplied to the remote DTE depend on the stat mux-to-DTE flow control mode selected at the remote DTE: the same X-ON/X-OFF characters, or use of CTS line handshaking (see 13).

When the local stat mux does not have software flow control capability, the stat mux "end-to-end software flow control" must be configured as OFF, to prevent the stat mux from responding to the X-ON and X-OFF characters. In this case, see also 15.

Screen selections are as follows: Code numbers 1 and 2 list the available selections of end-to-end software flow control status: on or off. Type Q to return to the Local Sub-Channel Configuration screen (8 above). The Current State line shows the current status of end-to-end software flow control used on this sub-channel.

Procedure:

To change the status of end-to-end software flow control used on this sub-channel, type the appropriate code number. The new selection appears in the Current State line. Type Q to return to the Local Sub-Channel Configuration screen (8).

15. End-to-End DTR Flow Control Screen

Purpose: View the current status of end-to-end hardware flow control (by means of DTR line) used on this sub-channel and select a new status, if desired.

Description:

There are applications in which you cannot use end-to-end (DTE-to-DTE) software flow-control, but the end-to-end flow control function described in 14 is nevertheless essential. In these applications, the stat mux can be configured to use the "end-to-end" DTR flow control by setting ON in this screen. In this mode, the stat mux monitors the DTR line contained in the standard RS-232 interface and transmits the status of this line to the remote stat mux. The remote stat mux then supplies to the DTE connected to it the flow-control commands according to the stat mux-to-DTE flow-control modes selected at the remote stat mux.

Selecting OFF on this screen disables the transmission of flow-control commands to the remote stat mux when the DTR line changes state.

Screen selections are as follows: Code numbers 1 and 2 list the available selections of end-to-end hardware flow control status: on or off.

Type Q to return to the Local Sub-Channel Configuration screen (8). The Current State line shows the current status of end-to-end hardware flow control.

Procedure:

To change the status of end-to-end hardware flow control used on this sub-channel, type the appropriate code number. The new selection appears in the Current State line.

Type Q to return to the Local Sub-Channel Configuration screen (8).

16. RTS Control Pass Screen

Purpose: View the current status of the RTS-to-DCD control function used on this sub-channel, and select a new status, if desired.

Description:

The stat muxes can transfer end-to-end (in both directions), one RS-232 interface control signal per channel: when this function is enabled, the condition of the RTS line is copied to the remote DCD line.

Screen selections are as follows: Code numbers 1 and 2 list the available selections of the RTS-to-DCD transfer status: on or off.

Type Q to return to the Local Sub-Channel Configuration screen (8). The Current State line shows the current status of the RTS-to-DCD transfer.

Procedure:

To change the status of the RTS-to-DCD transfer for this sub-channel, type the appropriate code number. The new selection appears in the Current State line.

Type Q to return to the Local Sub-Channel Configuration screen (8).

17. Duplicate Local Channel Parameters Screen

Purpose: Copy the parameters of any desired local sub-channel to a group of other local sub-channels.

Description:

To initiate the duplication, enter the number of the required source sub-channel, and then enter numbers of the first and last sub-channels of the target sub-channels group.

If you want to perform more than one duplication, always start from the lowest target sub-channel range; for example, start with the 02 through 10 sub-channels group before duplicating on the 11 through 20 sub-channels group.

After the mux completes the required duplication, you can continue with the duplication of other sub-channels by entering the number of another source channel. Type Q to return to the Local Channel Configuration screen.

Procedure:

1. Type the number of the required source sub-channel (two digits, for example, 02 for sub-channel 2).

2. Type the two-digit numbers of the first and last sub-channels of the desired target sub-channels group (range). If you specify the range incorrectly, you will see a message that explains your error. After reading the message, enter again the correct values.

3. If you want to perform an additional duplication, enter again the number of a source sub-channel. After its number, you will be prompted for the numbers of the target group.

4. After ending sub-channel parameters duplication, type Q to return to the LOCAL CHANNEL CONFIGURATION screen (7).

18. Diagnostics Menu

Purpose: Select the control screens for the various test loops that you can activate from the local stat mux, for diagnostic purposes. See **Chapter 5** for a description of the test loops.

Description:

Use Code numbers 1 through 3 to select the desired test loop type: local loop, remote loop, and modem loop. Type Q to return to the Main menu screen. When you first enter the Diagnostics menu, the Current State line shows:

```
ALL TESTS ARE IN OFF STATE.
```

Procedure:

Type the code number corresponding to the desired test loop type.

Type Q to return to the MAIN Menu screen.

19. Local Loops Screen

Purpose: View the current status of the individual local sub-channel and composite channel loops and go to the control screen for any of these loops.

Description:

The screen requires you to enter a number that defines the channel you want to modify: 00 for the composite channel, or a sub-channel number (01 to 24).

Type Q to return to the DIAGNOSTICS screen.

The Current State line shows the current status of the local loops: on or off. For the Stat-24, the sub-channels are arranged on three lines.

Procedure:

To change the condition of any test loop, type the appropriate code number, to go to the loop control screen (the typical screen is explained in 22).

If you type an incorrect number, the following message will be displayed:

```
WRONG CHANNEL NUMBER ENTER THE REQUIRED CHANNEL NUMBER AGAIN (01-24)
                         OR Q TO EXIT:
```

After reading the message, enter again the correct value. After completing the required actions, type Q to return to the DIAGNOSTICS screen.

20. Remote Loops Screen

Purpose: View the current status of the individual remote sub-channel and composite channel loops and go to the control screen for any of these loops (see 22). Its functions are similar to those of the Local Loops screen, described in 19.

NOTE

Remote digital loopback is performed by toggling pin 21 to the modem connected to the local stat mux. This forces the modem to transmit a command to the remote modem.

Before attempting to perform loopback, make sure that:

1. The local and remote modems do have V.54 remote loopback capability.

2. Pin 21 of the local modem is configured to accept loop command.

3. Jumper PIN 21 of the stat mux is set to ON.

21. Modem Loops Screen

Purpose: View the current status of the loops on the modem serving the main (composite) channel and go to the control screen for any of these loops (see 22). Its functions are similar to those of the Local Loops screen, described in 19.

22. Loop Control Screens

Purpose: Change the current status of the test loop selected on one of the loop selection screens (19, 20, or 21 above).

Description:

Code numbers 1 and 2 list the two possible conditions of the selected loop: on or off. Type Q to return to the loop selection screen, from which this screen was accessed.

The Current State line shows the current loop status.

Procedure:

To change the condition of the test loop, type the appropriate code number.

After completing the required actions, type Q to return to the loop selection screen, from which this screen was accessed.

23. Remote Stat Mux Configuration Menu

Purpose: Select screens that provide system management functions, including configuration tasks, related to the remote stat mux.

Table 3-6. Description of the Remote STM Configuration menu.

<u>Code</u>	<u>Item</u>	<u>Description</u>
1	TRANSFER CONFIGURATION FROM REMOTE TO LOCAL	Used to initiate transfer of current remote stat mux configuration to the local stat mux. After remote configuration is received by the local stat mux, it can be examined using the terminal connected to the local stat mux. As an additional convenience, remote stat mux configuration can be stored in the local stat mux as a backup that can be downloaded again to the remote stat mux in case that unit is replaced.
2	TRANSFER & CONFIGURATION FROM LOCAL TO REMOTE	Similar to Item 1 except that it is used to initiate transfer of current local stat mux configuration to the remote stat mux.
3	PREPARE REMOTE STM CONFIGURATION	Used to initiate preparation of remote stat mux configuration, using the terminal connected to the local stat mux.
4	DISPLAY LOCAL COPY OF REMOTE STM CONFIGURATION	Used to display the "local copy" of the remote stat mux configuration. This copy was transferred from the remote stat mux and is now stored in the local stat mux.
5	ACTIVATE REMOTE STM CONFIGURATION	Used after item 3 to transfer and activate the configuration prepared for the remote stat mux. Remote stat mux is reset.
Q	EXIT	Return to System Configuration menu.

Procedure:

Type the code number corresponding to the desired function. Type Q to return to the System Configuration menu.

24. Transfer Configuration from Remote to Local Screen

Purpose: Provide an indication that the stat mux executes the required actions after selecting Item 1 on the Remote Stat Mux Configuration menu (23).

Description:

This screen is displayed after selecting Item 1 on the Remote STM Configuration menu, while the remote configuration information is transmitted to the local stat mux. In most cases, the screen is displayed for a very short interval; however, under certain traffic conditions, you may become aware of the transmission delay, so this screen is used to notify that the required action is being carried out:

```
TRANSFER CONFIGURATION FROM REMOTE TO LOCAL
       WAIT FOR SAVING ACKNOWLEDGEMENT
```

If you want to exit, press Q.

No action is required on this screen, and after the stat mux receives the remote configuration information, the Remote STM Configuration menu shown in 25 below, is automatically displayed. However, the screen does provide you with the option to abort the operation by pressing Q; this will return you to the Remote Stat Mux Configuration menu (23).

25. Remote Stat Mux Configuration Screen

Purpose: Define the action to be performed on the information about the configuration of the remote stat mux.

Table 3-7. Description of the Remote STM Configuration screen.

<u>Code</u>	<u>Item</u>	<u>Description</u>
1	EXAMINE	Used to display the received configuration: this action should be performed after saving the received configuration (item 2 below).
2	SAVE IN LOCAL STM	Used to save (store permanently) the received configuration in the local stat mux.
Q	EXIT	Return to REMOTE STM CONFIGURATION menu.

Procedure:

Type the code number corresponding to the desired function. Type Q to return to the Remote STM Configuration menu.

26. Remote Stat Mux Configuration Display Screen

Purpose: Display the information regarding remote stat mux configuration, received by selecting item 1 on the Remote STM Configuration menu (23).

Description:

The screen displays the parameters selected for the remote stat mux sub-channels. For the Stat-24, the information is presented on three consecutive screens. To scroll between the screens, press N.

Procedure:

No action is required on this screen, and after the remote configuration information display is no longer

required, you can press Q to return to the Remote STM Configuration menu (25).

27. Save in Local Stat Mux Screen

Purpose: Notify the user that a copy of the configuration of the remote stat mux has been permanently stored in the local stat mux. To do this, select Item 1) on the Remote STM Configuration menu (23).

NOTE
The remote configuration does not override the local configuration: it is only stored for receiving and backup purposes.

```
         REMOTE CONFIGURATION HAS BEEN SAVED ON LOCAL STM
```

Press Q to exit

Typing Q on this menu will return you to the Remote Stat Mux Configuration menu (25).

28. Transfer Configuration from Local to Remote Screen

Purpose: Show that the stat mux is executing the required actions after selecting Item 2 on the Remote STM Configuration menu (23).

Description:

This screen is displayed after selecting item 2 on the Remote STM Configuration menu (23), while the configuration of the local stat mux is transmitted to the remote stat mux, for viewing it there, or for back-up purposes. In most cases, the screen is displayed for a very short interval; under certain traffic conditions, you may become aware of the transmission delay, so this screen is used to notify that the required action is being carried out:

```
         TRANSFER CONFIGURATION FROM LOCAL TO REMOTE
               WAIT FOR SAVING ACKNOWLEDGEMENT
```

If you want to exit, press Q. No action is required on this screen, and after the remote configuration information is received, the acknowledgement screen shown below is automatically displayed:

```
         LOCAL CONFIGURATION HAS BEEN SAVED
                     ON REMOTE STM
```

Press Q to exit.

However, the screen does provide you with the option to leave without seeing the acknowledgement message; press Q to return to the Remote STM Configuration menu (23) while configuration transfer is being performed.

29. Prepare Remote Stat Mux Configuration Menu

Purpose: This menu is used to select the configuration task to be carried out on the remote stat mux.

Description:

Menu functions are similar to the corresponding functions of the Main menu (1).

Typing Q on this screen will return you to the Remote STM Configuration menu (23).

30. Remote Stat Mux System Configuration Menu

Purpose: Select the X-ON and X-OFF characters and change the password used by the remote stat mux.

Description:

Menu functions are similar to the corresponding functions of the System Configuration menu (2), except that the selections made from this screen affect only the remote stat mux.

Typing Q on this screen will return you to the Prepare Remote STM Configuration screen (29).

31. Remote Channel Configuration Screen

Purpose: View and select the current parameter values of the remote stat mux sub-channels.

Description:

Configuration screens are identical to the local sub-channel configuration screen described in 7. The only difference is in the identification of the sub-channel displayed on the screen.

Typing Q on this screen will return you to the Prepare Remote STM Configuration screen (29).

32. Local Copy of Remote Stat Mux Configuration Screen

Purpose: Display the information regarding remote stat mux configuration, saved (stored) permanently in the local stat mux, by selecting 2) on the Remote STM Configuration screen (25).

Description:

The screen displays the "local copy" of the parameters selected for the remote stat mux sub-channels. For Stat-24, the information is presented on three consecutive screens. To scroll between the screens, press N.

Procedure: No action is required on this screen. After the remote configuration information display is no longer required, you can end it by pressing Q to return to the REMOTE STM CONFIGURATION menu (23).

33. Activate Remote Stat Mux Configuration Screen

Purpose: Transfer the remote stat mux configuration prepared on the local stat mux (item 3 on the Remote STM Configuration menu [23]) and activate it.

Description:

This screen is displayed after selecting Item 5 on the Remote STM Configuration menu (23). Usually, you first prepare the remote stat mux configuration using Item 3 of that menu, and then select the Activate item. After you select Item 5, the following message is displayed:

```
ACTIVATE REMOTE STM CONFIGURATION
```

Press Q to exit.

No action is required on this screen. After you see this message, press Q to return to the Remote STM Configuration menu (23).

4. Operation

4.1 Controls, Indicators, and Connectors

4.1.1 STAT-4 AND STAT-8

Table 4-1 lists the functions of the Stat-4 and Stat-8 indicators and connectors. The numbers under the heading "Item" refer to the identification numbers in Figure 4-1. The Stat-4 has the same front panel as the Stat-8, except that the Stat-4 has only 4 RJ-45 ports and the Stat-8 has 8 RJ-45 ports.
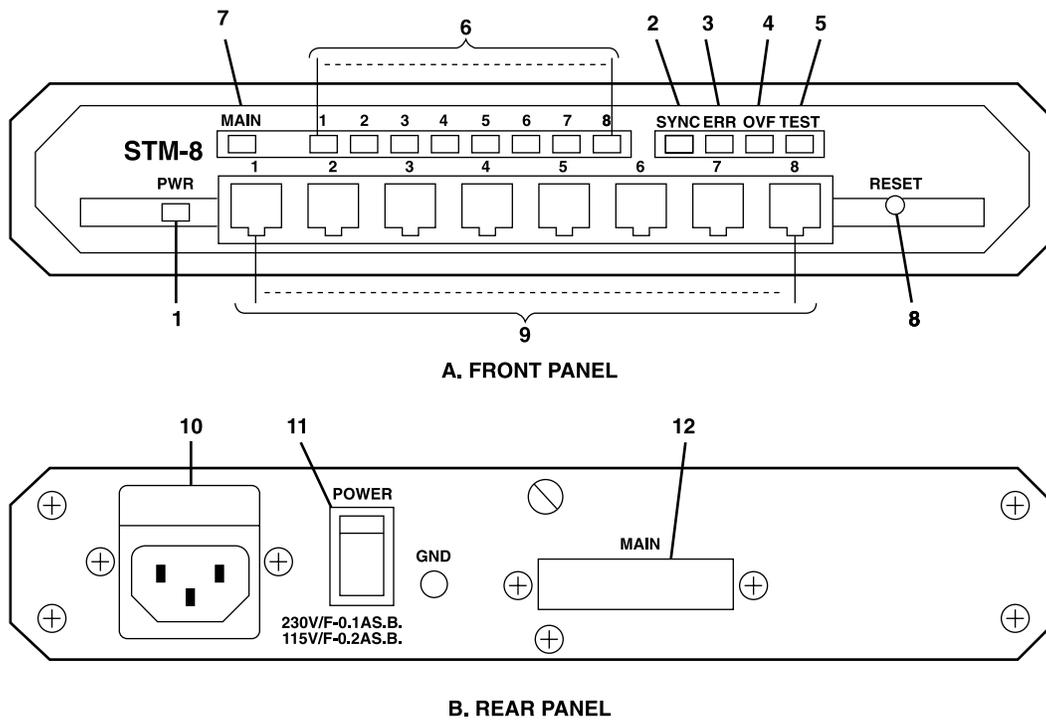
Figure 4-1. Stat-8 controls, indicators, and connectors.

Table 4-1. Stat-8 controls, indicators and connectors.

Item	Control, Indicator, or Connector	Function
1	PWR indicator	Lights when the STM is powered.
2	SYNC indicator	Indicates stat mux synchronization status Condition — Indication Off — Stat mux not powered. On — Stat mux powered and synchronized with the remote. Flashing (Continuous) — Stat mux powered, but not synchronized with the remote. Flashing (Intermittent) — Stat mux retransmits data frame upon request of remote stat mux (usually because a noisy line causes errors in the data received by the remote stat mux).
3	ERR indicator	Lights when a hardware malfunction was detected during the self-test automatically performed upon power-up, or after pressing the RESET button
4	OVF indicator	Lights when STM buffers are full. In a properly designed system, this condition usually indicates that one of the DTE units connected to the stat mux does not respond to configured flow-control commands
5	TEST indicator	Lights to indicate that the stat mux is in the diagnostics mode (one of the test loops active) or in the command mode. In either case, traffic is interrupted
6	Sub-channel activity indicators	Indicators, one for each sub-channel, light when corresponding sub-channel is active (receives or transmits data)
7	Main (composite) channel activity indicator	Light when the main channel is active (receives or transmits data)
8	Reset button	Resets stat mux internal circuits (including the data buffers) and initiates the power-up self-test
9	Sub-channel connectors	Connections to stat mux sub-channels (one for each sub-channel)
10	Power connector	AC power connector with integral fuse

Table 4-1 (continued). Stat-8 controls, indicators and connectors.

Item	Control, Indicator, or Connector	Function
11	Power switch	Turns the stat mux on
12	Main (composite) channel connector	Connection to main (composite channel)

4.1.2 STAT-24

The Stat-24 is similar to the Stat-8, except it has 24 sub-channels. The functions of the Stat-24 controls, indications and connectors are similar to those of the Stat-8, listed in Table 4-1. Figure 4-2 shows the Stat-24 front panel. The Stat-24 rear panel is similar to the Stat-8 rear panel, except for its width.
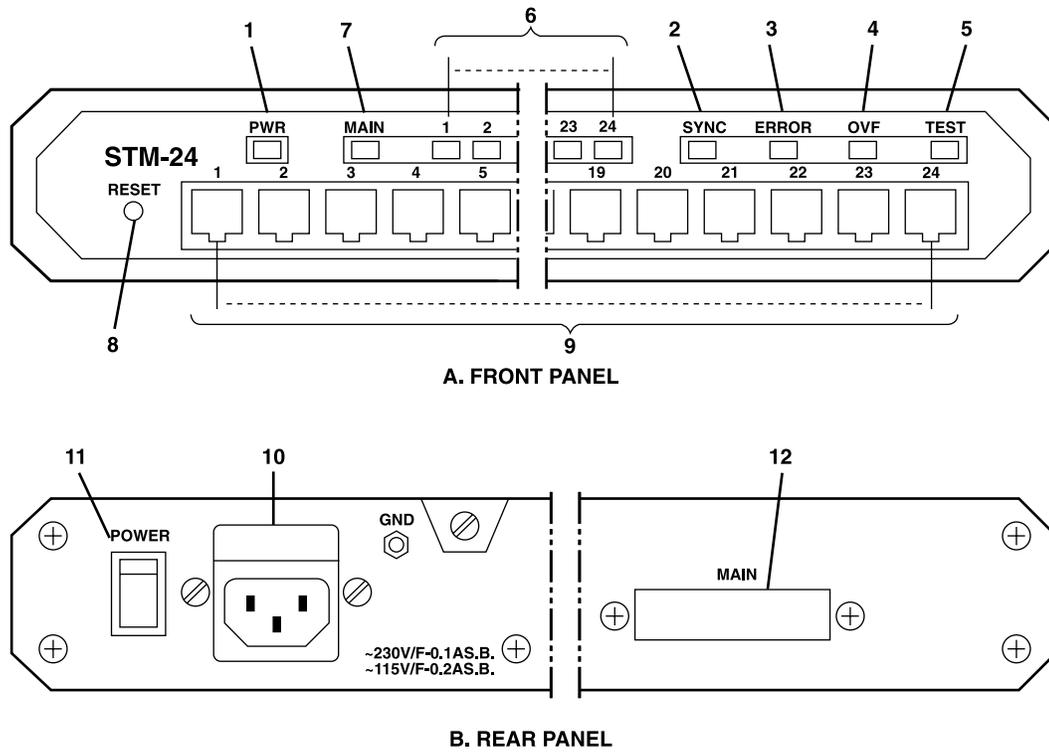
Figure 4-2. Stat-24 controls, indicators, and connectors.

4.2 Operating Instructions

4.2.1 GENERAL

After preparing for operation as explained in **Sections 3.3** through **3.6**, the stat mux normally operates unattended. Operator intervention is only required when the stat mux is set up for the first time or must be adapted to new operational requirements. The stat mux configuration is stored in a non-volatile memory and is not affected when power is turned off.

4.2.2 POWERING ON THE STAT MUX

Connect the power cable to the stat mux rear power connector, then set the power switch to ON. The PWR indicator should light.

Check that after a few seconds (during which the stat mux runs a self-test), the ERR indicator goes out.

If the link to the far stat mux is not yet operational, the SYNC indicator will flash. Wait until the link becomes operational, and check that the SYNC indicator stops flashing and lights continuously.

4.2.3 NORMAL OPERATION

During normal operation, the PWR (when present), SYNC, and MAIN indicators should light continuously, and the TEST and ERR indicators must remain off. Sub-channel activity indicators flash according to the traffic load and go out when the sub-channel is idle. When the TEST indicator lights, traffic is interrupted, even if all other indications are normal. On noisy links, the SYNC indicator may flash from time to time: this indicates automatic retransmission of a data frame. Automatic retransmission occurs when the remote stat mux requests it, when errors are detected in the received data, and it ensures that only valid data is transmitted.

4.2.4 POWERING OFF THE STAT MUX

To turn the stat mux off, set the power switch to off.

4.3 What To Do in Case of Malfunction

Here is a list of actions that will help you return to normal operation in case a problem occurs. Additional information on stat mux diagnostics appears in **Chapter 5**.

4.3.1 PRELIMINARY CHECKS

1. Check that the stat mux is powered (when powered, the PWR indicator lights).

2. Check that cables are properly connected.

3. Check that the equipment connected to the stat mux is powered and operates normally.

4.3.2 CHECK STAT MUX INDICATIONS

Check the configuration of local and remote stat mux and make sure it corresponds to the requirements of the equipment connected to its sub-channels.

Table 4-2. Stat mux indications.

No.	Indication	Probable Cause	Action
1	ERR lit	Stat mux problem	Turn the stat mux off, then turn it on again or press RESET. If ERR indicator remains lit, replace the stat mux.
2	TEST lit	1. Stat mux in command mode 2. Stat mux in diagnostics mode	Check whether the stat mux is being configured, and wait until configuration is completed (at any time, only one sub-channel can be in the command mode). Enter command mode. Select the DIAGNOSTICS item to see whether one of the test loops is on. If a test loop is on but is no longer needed, disconnect it.
3	MAIN not lit (SYNC may also flash)	Problems in communication link to remote STM	Check whether communication equipment is powered and properly connected, then use the diagnostics function described in **Chapter 5** to find the fault.
4	SYNC flashes continuously (MAIN indicator lights)	1. Remote stat mux operational 2. Problems in communication link to the remote stat mux	Check whether the remote stat mux is powered on, and operates normally. Check whether communication equipment is powered and properly connected, then use the diagnostics function described in **Chapter 5** to find the fault.
5	OVF lights	Stat mux buffers full	One of the DTE units connected to the stat mux does not respond to flow-control commands. Check that all the DTEs do have a flow-control option, and that stat mux flow control is properly configured.
6	One or more sub-channel indicators are permanently off	1. No traffic on sub-channel 2. Stat mux problem	If traffic is expected, but no activity is indicated, check the DTE equipment and its connections. Press the RESET pushbutton, or turn the stat mux off, then on again. If the ERR indicator lights, replace the stat mux.

5. Diagnostics

5.1 General

The stat mux diagnostics functions use a full set of test loops and front-panel indicators to provide you with the tools required for rapid identification of faults that affect system operation. The test loops available for diagnostics and test purposes are:

a. Local Loops:

    1. Local sub-channel loop.

    2. Local composite channel loop.

b. Remote Loops:

    1. Remote sub-channel loop.

    2. Remote composite channel loop.

c. Modem Loops:

    1. Analog loop.

    2.   Remote digital loop (option—depends on characteristics of the composite channel modem).

The various test loops are identified in Figure 5-1.

To find a problem in the system, either press the RESET button or turn the stat mux off and on again. The mux will go through its power-up self-test. If the ERR indicator goes off as usual, try the test loops in the order given above. (If the ERR indicator stays on, the mux will probably have to be replaced.)

The next section describes the use of the test loops. Refer to **Section 3.10** for detailed instructions on loop activation.
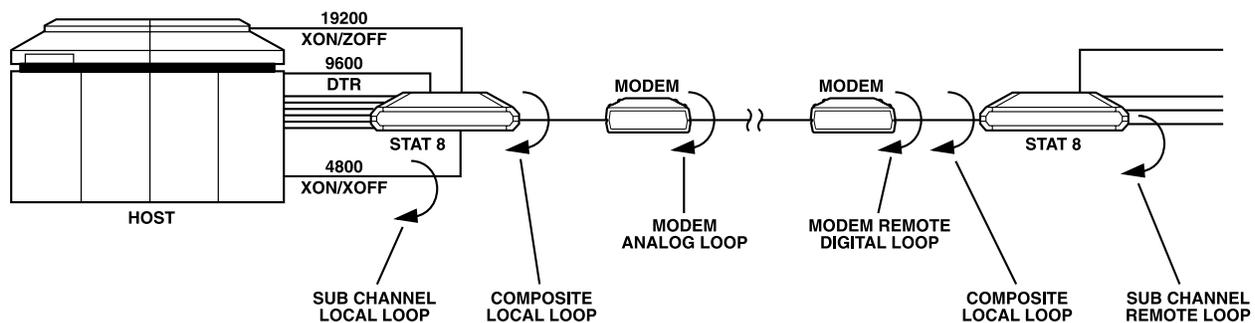

Figure 5-1. Identifying test loops.

5.2 Description of Test Loops

Whenever a test loop is on, the TEST indicator will light and traffic will be disrupted.

5.2.1 LOCAL LOOPS

1. *Local composite channel loop.* When the local composite channel loop is connected, the composite channel data transmitted by the local stat mux is applied to the receive line of the local stat mux, and the communication link is disconnected (this causes the remote stat mux to lose frame synchronization). All the data arriving from the remote stat mux while this loop is connected is lost. This loop tests the complete local stat mux.

   As long as the loop is connected, the MAIN and SYNC indicators of the local stat mux must light continuously. If they do not, this indicates a local stat mux problem.

   Sub-channel activity indicators light according to traffic; the lighting of the OVF indicator means that stat mux buffers are full because of flow-control problems caused by the equipment connected to one of the local sub-channels.

2. *Local sub-channel loop.* When a local sub-channel loop is connected, the local transmit data is returned as receive data on the same sub-channel. The local data is also multiplexed into the transmit data stream sent to the remote stat mux. All the data arriving from the remote stat mux sub-channel while this loop is connected is lost. As long as the loop is connected, the sub-channel activity indicator lights according to traffic. The equipment connected to the sub-channel must receive its own transmit data without errors. Failure to do so usually indicates problems with the sub-channel connection cable or with equipment connected to that sub-channel.

5.2.2 REMOTE LOOPS

1. *Remote composite channel loop.* When the remote composite channel loop is connected, the composite channel data transmitted by the local stat mux is returned from the remote stat mux after regeneration but without any other processing. Any data transmitted from the remote stat mux sub-channels is lost during loop connection.

   This loop tests the complete transmission path, including the local stat mux and the communication link. As long as the loop is connected, the MAIN and SYNC indicators of the local stat mux must light continuously; failure to do so, after the local stat mux has performed satisfactory on the local composite channel loop, indicates a problem in the communication link. For example, intermittent flashing of the SYNC indicator indicates a high error rate on the link. Sub-channel activity indicators light according to traffic; the lighting of the OVF indicator means that the stat mux buffers are full because of flow control problems caused by the equipment connected to one of the local sub-channels.

2. *Remote sub-channel loop.* When a remote sub-channel loop is connected, the local transmit data is transmitted to the remote stat mux. It's returned to the local stat mux sub-channel instead of the transmit data connected to the remote stat mux sub-channel. All the data arriving from the remote stat mux sub-channel while this loop is connected is lost. As long as the loop is connected, sub-channel activity indicator lights according to traffic. The equipment connected to the sub-channel must receive its own transmit data without errors. Failure to do so, after the local stat mux performed satisfactory on the local sub-channel loop, usually indicates a problem in the remote stat mux.

5.2.3 MODEM LOOPS

1. *Analog modem loop.* When the analog modem loop is connected, the composite channel data transmitted by the local stat mux is returned to the receive line of the local stat mux after passing through the local modem, and the communication link is disconnected. All the data arriving from the remote stat mux while this loop is connected is lost.

   This loop tests the complete local stat mux, its composite channel connection cable, and the local modem. As long as the loop is connected, the MAIN and SYNC indicators of the local stat mux must light continuously; failure to do so, after the local stat mux performed satisfactory on the local composite channel loop, indicates a problem in the composite channel connection cable and/or in the local modem.

2. *Remote digital modem loop.* When the remote digital modem loop is connected, the composite channel data transmitted by the local stat mux is returned from the remote modem (after passing through the communication link and the local modem) to the receive line of the local stat mux. Any data transmitted from the remote stat mux is lost during loop connection.

   This loop tests the complete transmission path, including the local stat mux, its composite channel connection cable, the communication link, and the local and remote modems. As long as the loop is connected, the MAIN and SYNC indicators of the local stat mux must light continuously. Failure to do so, after satisfactory performance in the analog modem loop, usually indicates a problem in the communication channel and/or in the remote modem.

Appendix A: Interface Pinouts

A.1 Main (Composite) Channel Interface

The stat mux main (composite) channel interface is configured as a synchronous DTE RS-232 interface, with a male DB25 connector. Table A-1 lists the pinouts.

Table A-1. Main (composite) channel connector.

CCITT V.24 Circuit Number	EIA RS-232C Line	Pin	Signal Name	Description
101	AA	1	Protective Ground	Chassis ground (may be isolated from signal ground or connected to it—refer to **Section 3.3**
102	AB	7	Signal Ground	Common signal and DC power supply ground
103	BA	2	Transmit Data	Serial digital transmit data from the stat mux
104	BB	3	Receive Data	Receive data from modem
105	CA	4	Request to Send	Continuous positive level from stat mux
109	CF	8	Data Carrier Detect	Data carrier detect indication from modem
114	DB	15	Transmitter Signal Element Timing	Transmit clock from modem
115	DD	17	Receiver Signal Element Timing	Receive clock from modem
141	—	18	Loop 3 Test Command	Control signal from stat mux: positive level commands the modem to enter analog loopback

Table A-1 (continued). Main (composite) channel connector.

CCITT V.24 Circuit Number	EIA RS-232C Line	Pin	Signal Name	Description
108	CD	20	Data Terminal Ready	Continuous positive level from stat mux
140	—	21	Loop 3 Test Command	Control signal from stat mux to modem. Positive level commands attached modem to send a remote loopback command to the remote modem. If the attached modem uses pin 21 as a signal quality indication output, set pin 21 to OFF, thereby disabling this function—refer to **Section 3.3**.

A.2 Sub-Channel Interface

Stat mux sub-channel interfaces are configured as synchronous DCE RS-232 interfaces. The sub-channel connectors have RJ-45 sockets. Table A-2 lists pin allocations.

Table A-2. Sub-channel connectors.

CCITT V.24 Circuit	EIA RS-232C Line	RJ-45 Pin	Signal Name	Description
101	AA	1	Protective Ground	Chassis ground (may be isolated from signal ground or connected to it—refer to **Section 3.3**)
102	AB	7	Signal Ground	Common signal and DC power supply ground
103	BA	5	Transmit Data	Serial digital transmit data from a terminal or other source
104	BB	3	Receive Data	Receive data provided by stat mux receiver
105	CA	2	Request to Send	Continuous positive level received by the stat mux from DTE, controls DCD at remote side

Table A-2 (continued). Sub-channel connectors.

CCITT V.24 Circuit	EIA RS-232C Line	RJ-45 Pin	Signal Name	Description
106	CB	8	Clear to Send	A positive level from the stat mux indicates that the terminal is allowed to send data. This pin is used for hardware flow control. Computers or terminals which do not support this pin (they send data even if CTS is negative) must have software flow-control ability.
109	CF	4	Data Carrier Detect	Positive level from stat mux when the local and remote stat mux are synchronized
108	CD	6	Data Terminal Ready	Used for end-to-end flow control

Sub-channel connection cables depend on application: a port (straight-through) cable is generally used to connect the stat mux to a DTE, and a modem (crossover) cable is used to connect the stat mux to a tail-end modem (see Figure A-1).
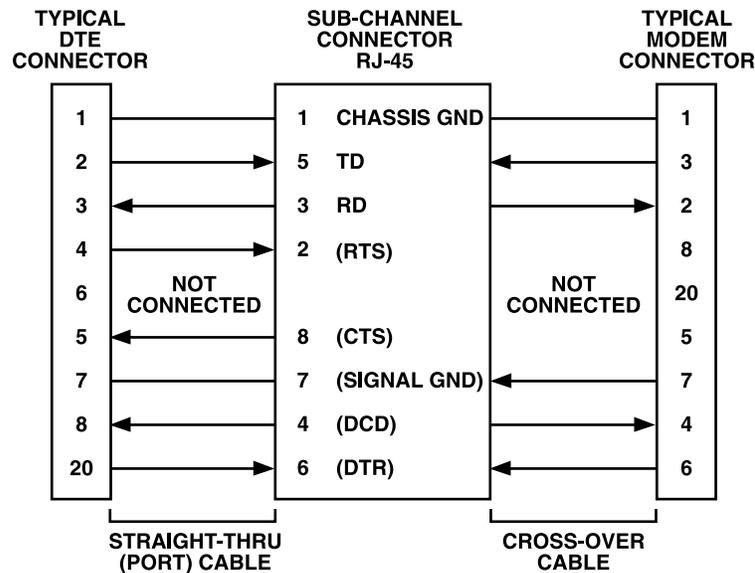

Figure A-1. Typical sub-channel cable wiring.

Appendix B: Stat Mux Configuration Record

This appendix contains a typical configuration record form. You can use this form as a worksheet when you plan your system configuration and as a permanent record of the actual configuration.

Stat-4/Stat-8/Stat-24 Configuration Record

Date: ____/____/____   Prepared by:_____

Sheet ____of____

Location:_____ Other Location:_____

Stat-4/Stat-8/Stat-24 Serial No._____

System Password _____   _____

Data X-On Character _____   _____

X-Off Character _____   _____

Local Configuration

Sub-Channel	Word Format				Flow Control		
	Data Rate	Data Bits	Parity	Stop Bits	Stat Mux-to-Software DTE	End-to-End Software DTE	RTS-DCD Transfer
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							

Local Configuration

Sub-Channel	Word Format				Flow Control		
	Data Rate	Data Bits	Parity	Stop Bits	Stat Mux-to-Software DTE	End-to-End Software DTE	RTS-DCD Transfer
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							

Appendix C: Quick Start Guide

C.1 How to Use This Appendix

This guide provides concise instructions for preparing stat mux configuration. It is intended for users already familiar with the stat mux, and for experienced users who have a good basic understanding of data communication principles and applications and characteristics of statistical multiplexers. Use this guide with the configuration tree shown in Figure 3-6. Once you start the configuration program, the stat mux will guide you through the configuration.

C.2 What You Need

Configure the stat mux from a data terminal connected to one of the stat mux sub-channels. The terminal communication parameters must match the parameters of the selected sub-channel. If you do not know what these parameters are, or you just received a new stat mux, use the following default parameters:

Baud Rate=9600 bps

Format of Data Word=8 data bits, no parity bit, 1 stop bit

To initialize the stat mux:

- Turn the stat mux off.

- Set its internal INIT/NOR jumper to INIT.

- Turn the stat mux on again.

- Return the INIT/NOR jumper to NOR, then close the stat mux cover.

Whenever the stat mux is already installed in a link, establish communication with the remote stat mux before starting. In this way, you will be able to configure the two units from the terminal connected to the local stat mux.

C.3 Configuration Instructions

NOTE

Pay attention to the use of capital letters in the configuration commands. The mux will not recognize lower-case letters.

C.3.1 LOCAL CONFIGURATION

1. Power up the stat mux and connect your terminal to one of the sub-channels. Check terminal communication parameters.

2. Allow an idle period of at least one second, type @@@, wait at least one second, and type S.

3. The stat mux enters the command mode. Enter the password.

NOTE

The default password is RD. If you do not know the password, initialize the stat mux via the INIT/NOR jumper.

4. The stat mux displays the Main Menu. Use Figure 3-6 to plan your configuration actions. Record the configuration on the form given in **Appendix B**. Keep the filled-out form for reference.

IMPORTANT

Each configuration change takes effect immediately. Each time you change one of the communication parameters of the sub-channel you use now, you must immediately change the corresponding communication parameter of your terminal to the same value. If you don't, you lose communication with the stat mux. If you make an error that you cannot correct, initialize the stat mux again with the INIT/NOR jumper and start again.

C.3.2 TRANSFER CONFIGURATION TO THE REMOTE STAT MUX

The following actions require an operating link to the remote stat mux. In addition, the INIT/NOR jumper of the remote stat mux must not be in the INIT position.

1. Transfer the local configuration to the remote stat mux to make it available to the remote operator whenever necessary. Use **Transfer Configuration from Local to Remote**, selected from the Remote STM Configuration menu.

2. Prepare the configuration for the remote stat mux on the local terminal. Use **Prepare Remote STM Configuration**, selected from the Remote STM Configuration menu.

3. Transfer the remote stat mux configuration to the remote stat mux and activate it. Use **Activate Remote STM Configuration**, selected from the Remote STM Configuration menu.

4. To check the remote stat mux configuration, transfer it to the local stat mux. Use **Transfer Configuration from Remote to Local**, selected from the Remote STM Configuration menu, then select **Examine**. If everything is OK, store the remote configuration in the local stat mux, using **Save in Local STM**.

C.3.3 ENDING THE CONFIGURATION ACTIVITIES

1. Modify the password if required. If you initialized the stat mux, you must enter the desired password again. Record the password.

2. Exit the command mode by typing Q on the MAIN Menu.

Appendix D: Stat Mux Configuration Transfer Facilities

D.1 Scope

This appendix explains the facilities for stat mux configuration transfer and their use during configuration management activities.

D.2 Configuration Storage and Transfer

Figure D-1 shows the organization of the main stat mux configuration storages.

D.2.1 DESCRIPTION OF CONFIGURATION STORAGES

Each stat mux unit includes temporary and permanent (non-volatile) configuration storages.

The stat mux's non-volatile configuration storage includes two sections, one for its own (local) configuration, and another for the configuration of the remote stat mux. The temporary storages are part of the RAM (working) memory serving the internal stat mux microcomputer, where the microcomputer can easily access them to read and modify the configuration parameters. The mux uses a section of temporary storage for local configuration preparation. The mux uses another section to store the remote stat mux configuration and work on it. You can use this temporary storage to examine the remote configuration on the local terminal and as a scratch memory for preparing a new configuration for the remote stat mux.

As indicated in Figure D-1, you can load the default configuration into the working configuration memory when you reset the stat mux while the INIT/NOR jumper is set to INIT (this is explained in **Chapter 3**: you reset the stat mux when you turn it on, and also under specific commands).
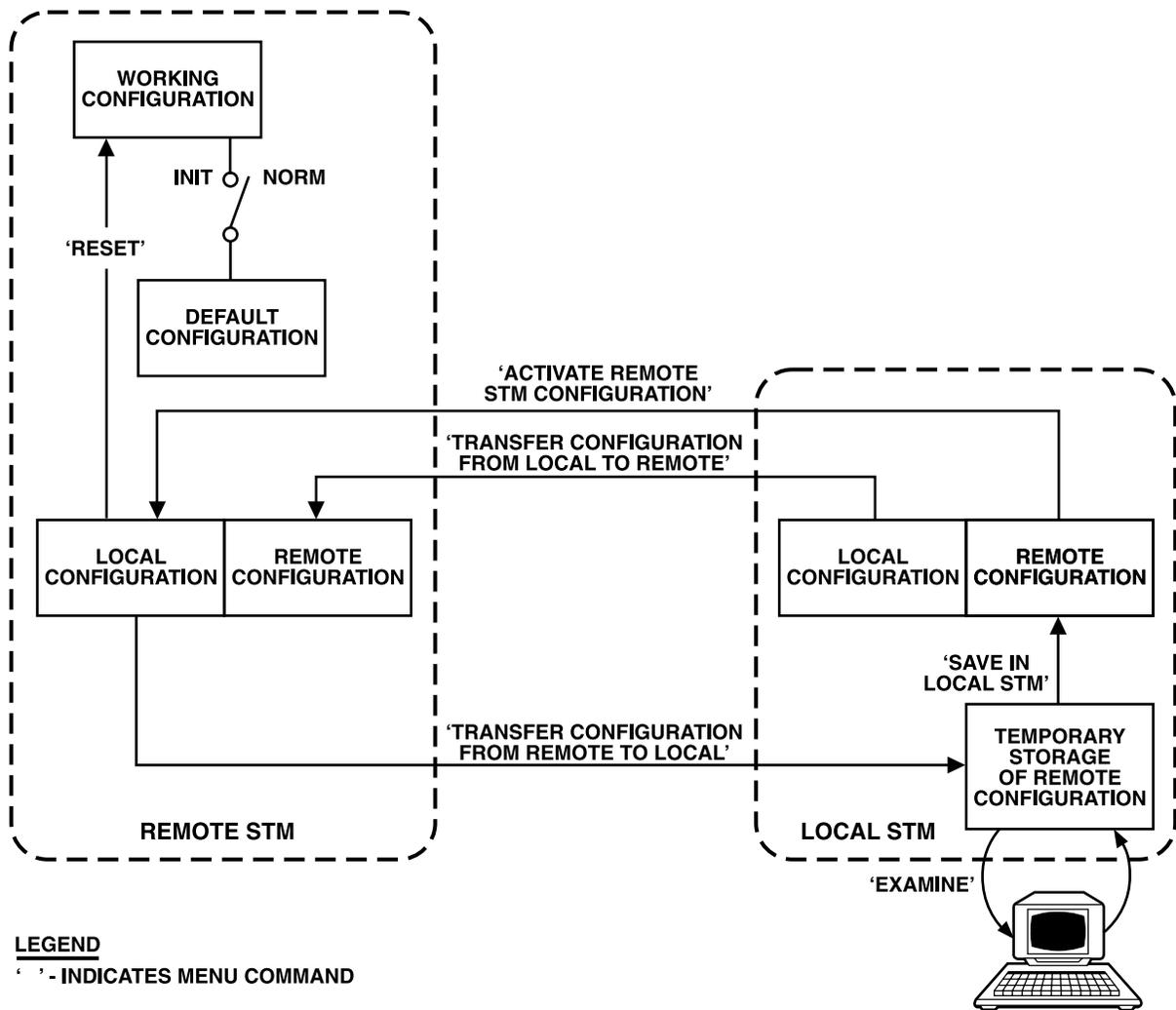
Figure D-1. Stat mux configuration storages.

D.2.2 MANAGING THE CONFIGURATION STORAGES

1. You can send the current configuration of the local stat mux to the remote stat mux and store it there in the non-volatile remote-configuration storage. This action is initiated by the Transfer Configuration from Local to Remote command.

2. You can transfer the current configuration of the remote stat mux to the temporary remote configuration storage of the local stat mux. This action is initiated by the Transfer Configuration from Remote to Local command.

3. The local operator can view the local copy of the remote stat mux configuration using the Examine command.

4. You can use the Save in Local STM command to store the remote stat mux configuration in the local non-volatile remote configuration storage.

5. You can prepare a new configuration for the remote STM locally, using the temporary storage. You can transfer this configuration to the remote stat mux (where it is stored in its non-volatile local storage) and activate it there with the Activate Remote STM Configuration command.

IMPORTANT

Activating the new configuration always involves automatically resetting the stat mux. After resetting, the configuration is loaded into the working configuration memory, which is the memory actually used by the stat mux microcomputer. If the INIT/NOR jumper of the remote stat mux is at INIT while the ACTIVATE command is received, the remote stat mux will load the default configuration—not the configuration sent by the local stat mux.

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