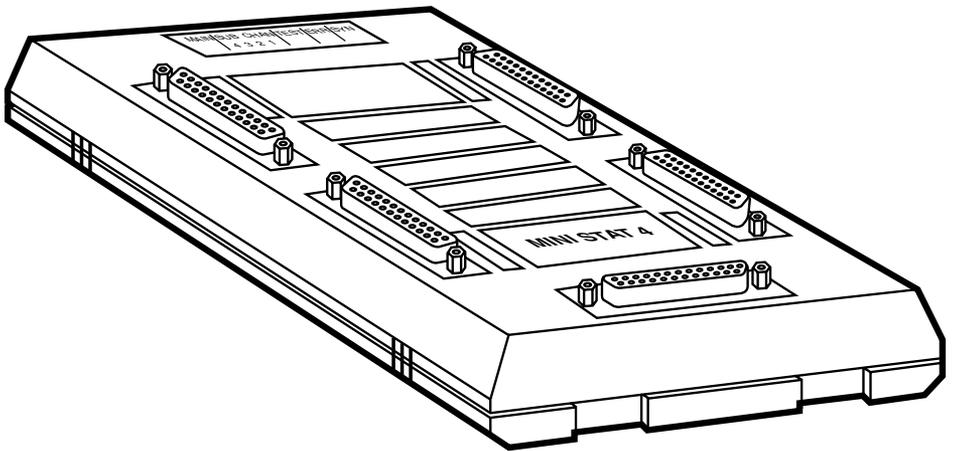




MiniStat-Four



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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.

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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.

NORMAS OFICIALES MEXICANAS (NOM) ELECTRICAL SAFETY STATEMENT

INSTRUCCIONES DE SEGURIDAD

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..
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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.
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11. El aparato eléctrico deberá ser conectado 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 física 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 líneas de energía.
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 objetos líquidos 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: Objetos 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.

QUICK SETUP GUIDE

If you are familiar with the operation of the MiniStat-Four and only need a quick reference to get the unit operational, refer to Appendix C.

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1. Specifications

Compliance: FCC Part 15 Class A; IC Class/classe A

Protocols:

Subchannels: Asynchronous;
Composite: Synchronous with proprietary variant of HDLC framing as defined in CCITT X.25 level 2

Clock Source: Composite: External

Data Format:

Subchannels: 5, 6, 7, or 8 data bits; 1, 1.5, or 2 stop bits; even, odd, or no parity;
Composite: HDLC frames

Flow Control:

Subchannels:
Hardware: DTR/CTS, end-to-end (DTE-to-DTE);
Software: X-ON/X-OFF, either end-to-end (DTE-to-DTE) or subchannel-to-DTE (user-selectable); users can choose any extended-ASCII characters from 11 hex (DC1) to 14 hex (DC4) or 91 hex to 94 hex to be the X-ON and X-OFF characters

Operation: Point-to-point

Data Rate:

Subchannels: 19,200, 14,400, 9600, 7200, 4800, 2400, 1200, 600, or 300 bps (user-selectable);
Composite: Up to 19,200 bps (depends on external clock rate)

Maximum Distance: 50 ft. (15.2 m) from the MiniStat-Four to any attached device

User Controls:

(3) Internal jumpers: Normal/initialization, Pin 21 enable/disable, and grounds connect/disconnect;
Menu-driven configuration program accessible from a PC or terminal attached to any subchannel port; configuration can be downloaded across the composite line from either MiniStat-Four to the other

Diagnostics: Local and remote subchannel and composite loopback tests; when the composite line passes through a modem pair, local analog and remote digital loopback tests

Control Signals Supported:

Subchannel: RTS, CTS, DSR, RLSD (DCD), DTR;
Composite: RTS, CTS, RLSD (DCD), DTR, analog loopback
(pin 18), remote digital loopback or signal quality (user-selectable,
pin 21)

Interface: TIA RS-232 (ITU-TSS V.24):

Subchannels: DCE;
Composite: DTE

Connectors:

(5) Top-mounted DB25 female: (4) subchannel, (1) composite;
(1) Side-mounted miniature jack for power

Indicators: (8) Rear-mounted LEDs: SYNC (power/synchronization), ERR
(error), TEST, (4) subchannel activity; composite activity

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

Humidity Tolerance: Up to 95%, non-condensing

Power: External power supply:

Input: 120 VAC at 60 Hz;

Output: 9 to 12 VDC, 300 mA, tip positive/ring (sleeve) negative

Size: 1.2"H x 4"W x 7.3"D (3 x 10.2 x 18.5 cm)

Weight: 12 oz. (340 g)

2. Introduction

2.1 Functional Description

The MiniStat-Four is an advanced, full-function miniature statistical multiplexor. It multiplexes four asynchronous data sub-channels at data rates of 300 to 19,200 bps onto a single composite synchronous channel. An external clock signal automatically determines the composite channel rate, but you select sub-channel characteristics and other system features using a menu-driven configuration function.

The mux uses dynamic data-buffer management to allocate available buffer capacity according to sub-channel activity. Powerful and efficient error detection and automatic retransmission, which are completely transparent to the user, ensure error-free end-to-end data transmission.

Independent hardware and software flow control are used 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 several software flow-control characters.

From any sub-channel port, the mux provides for full system configuration (including configuration downloading from the local MiniStat-Four to the remote MiniStat-Four, and vice-versa). Password protection prevents unauthorized configuration changes.

Configure the mux from any standard PC or CRT terminal, using a simple, menu-driven facility. Nonvolatile memory contains configuration parameters, which are immediately available upon power-up.

To make initial system configuration easier, the MiniStat-Four stores—in addition to the user-selected configuration—a set of default configuration parameters (factory settings) that you can select via a jumper.

The mux gives you comprehensive diagnostics functions, including automatic self-test upon power-on, local and remote sub-channel loopback, and local and remote composite-channel loopback. LED indicators show the condition of each sub-channel and composite-link synchronization status. In addition, the MiniStat-Four can 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 mux.

2.2 Typical Applications

Figure 2-1 shows a typical application. The MiniStat-Four concentrates data coming into its sub-channels at various rates from a host computer. It then statistically multiplexes sub-channel data to form a composite data stream with a rate much smaller than the arithmetical sum of the individual sub-channel rates.

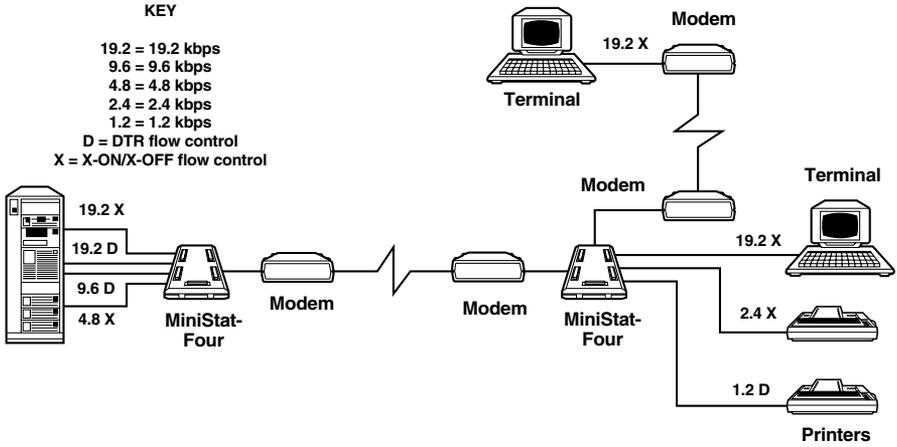


Figure 2-1. Typical MiniStat-Four application.

The required composite link rate depends on MiniStat-Four buffer capacity versus sub-channel traffic statistics and allowable delay. The composite data is sent through modems to the remote MiniStat-Four, where it is demultiplexed and distributed to the local users at their nominal rate (which may differ from the nominal transmission rate).

NOTE

Reliable operation of any statistical multiplexor requires the equipment connected to its sub-channels to use some form of flow control. However, the flow-control method used at each of the two sub-channel ends can differ (hardware control at one end, software control at the other end), and the conversion is transparently performed by the MiniStat-Four.

3. Installation

3.1 General

The MiniStat-Four is delivered completely assembled. It's designed for installation on a desktop. Mechanical and electrical installation procedures for the MiniStat-Four are provided in the following sections.

After installing the mux, refer to **Chapter 4** 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 6** for test and diagnostic instructions.

3.2 Site and Power Requirements

The MiniStat-Four is powered by an external power supply of 9 to 12 V/250 mA. Use a miniature wallmount power supply to provide the required power. The power supply connects to the mux by a cable ending in a miniature phone jack (tip positive, sleeve ground). The MiniStat-Four does not contain fuses, so the power supply must include a fuse of the appropriate rating.

The mux operates properly in any ambient conditions suitable for operation of electronic computer equipment and peripherals. It operates without performance degradation over a wide range of temperatures (32 to 122°F [0 to 50°C]) at relative humidities up to 95%, noncondensing.

3.3 Setting the Internal Jumpers

The MiniStat-Four has three internal jumpers. Refer to Figure 3-1 and to the following descriptions.

3.3.1 INIT/NOR JUMPER

This jumper selects which default set of configuration parameters the MiniStat-Four loads at power-up. The jumper has two positions:

- NOR (normal operation, the factory-default setting) — The MiniStat-Four loads the user-selected parameters most recently saved in nonvolatile RAM.
- INIT (initialization) — The MiniStat-Four loads its factory-default configuration (permanently set at the factory and common to all MiniStat-Four units).

When you receive your MiniStat-Four, its “normal” configuration will be the same as the factory-default configuration.

You might have to select the factory-default configuration (INIT) in the future if either of the following situations occurs:

- An error is made during the configuration session, which either prevents communication between the control terminal and the MiniStat-Four or proves difficult to trace and correct.
- The description of the configuration loaded into the MiniStat-Four (including any passwords) is lost, and it is therefore 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 the default configuration loads, it becomes the current MiniStat-Four configuration; return the jumper to the NOR position so that, once you change the configuration back to what it’s supposed to be and save it in NVRAM, the MiniStat-Four will load it at its next power-up.

3.3.2 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 in use, and a jumper adapts the MiniStat-Four to the modem connected to the composite 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 MiniStat-Four pin 21 driver to this pin, and lets you control this modem function using the diagnostics screen.
- PIN 21 OFF (the factory-default setting) — Set the jumper to this position when the modem uses pin 21 as a signal-quality-indication output. Use this position whenever you are in doubt about the actual function of the pin in the modem you use. In this position, you no longer have control of the modem’s remote-loopback function from the diagnostics screen.

3.3.3 GND JUMPER

This jumper controls the connection between the signal-ground lines (pin 7 in all MiniStat-Four RS-232 connectors) to the chassis-ground lines (pin 1). The installation manager determines the appropriate position.

The jumper has two positions:

- C (connect) — Pins 1 and 7 connected
- D (disconnect, the factory-default setting) — Pins 1 and 7 not connected

Jumper-Setting Procedure

WARNING

Only qualified service personnel should access the inside of the MiniStat-Four.

Avoid electric shock! Always disconnect the power cable from the utility (mains) outlet before opening the MiniStat-Four.

To set the jumpers:

1. Disconnect all cables connected to the MiniStat-Four, including the power cable.
2. Find the four screws (located on the bottom of the mux) that secure the MiniStat-Four's cover. Unscrew them, then remove the cover.
3. Refer to Figure 3-1 on the next page and identify the jumper locations and settings. Change the settings of your mux's jumpers as required.
4. Reinstall the MiniStat-Four's cover and refasten the screws. (Do *not* overtighten these screws.)

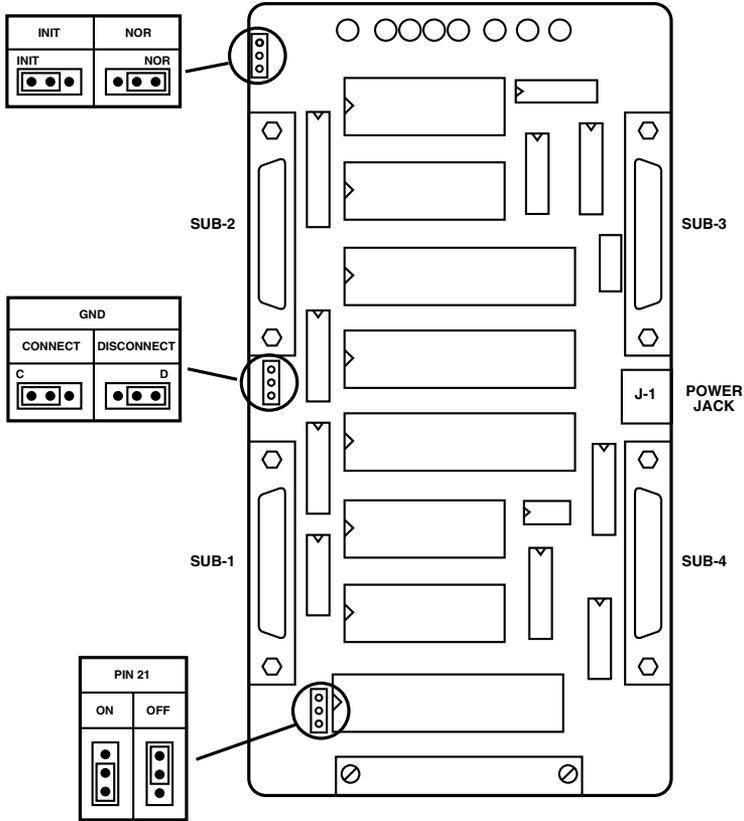


Figure 3-1. Identification of internal jumpers.

3.4 Cable Connections

The MiniStat-Four has five top-mounted standard DB25 connectors. Main-channel and sub-channel cables connect directly to these connectors.

3.4.1 SUB-CHANNEL CONNECTIONS

MiniStat-Four sub-channel interfaces are configured as data communication equipment (DCE) interfaces, so they connect directly to data terminal equipment (DTE) via RS-232 port cables. When modems extend range (as in tail-end circuits), crossover cables are required. Sub-channel interfaces are asynchronous, so clock signals are not required or supported.

Appendix A lists the pinouts of the MiniStat-Four's sub-channel connectors and provides typical wiring diagrams for straight-through and crossover cables with DB25 connectors.

3.4.2 MAIN (COMPOSITE) CHANNEL CONNECTION

The MiniStat-Four's composite-channel interface is configured as a DTE interface; it connects to a synchronous modem that provides the clock signal to determine the MiniStat-Four's composite-channel data rate. **Appendix A** lists the pinout of the MiniStat-Four's composite-channel connector.

3.4.3 POWER CONNECTION

Power connects to a miniature jack (tip: positive; sleeve: negative and ground).

3.5 Power-On Procedure

To power the MiniStat-Four on, connect the power cable to its power jack, then plug the power supply into the AC wall outlet. The SYNC indicator should light. If the link to the remote MiniStat-Four is still not operational, the SYNC indicator will flash.

Check that after a few seconds (during which the MiniStat-Four performs a self-test), the ERR indicator goes out.

For additional information on MiniStat-Four indications, refer to **Chapter 5**.

4. Configuration

The MiniStat-Four operates in any of three modes:

1. Normal operation mode.
2. Parameter-configuration mode. Allows you to set parameters of local and remote MiniStat-Four 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. MiniStat-Four diagnostic functions include local and remote loops on each sub-channel and on the composite channel, and modem loops (analog and optional remote digital loopback). Refer to **Chapter 5** for additional details.

The parameter-configuration mode and the diagnostics mode are activated by you from the command terminal, using the MiniStat-Four's configuration program. If you're already acquainted with the MiniStat-Four, see the Quick Setup Guide in **Appendix C**.

This chapter provides an outline of the configuration parameters. **Section 4.4** provides step-by-step instructions for starting configuration and diagnostics sessions. **Section 4.5** provides in-depth information on each menu, and the purpose of each parameter or diagnostics screen.

You determine the MiniStat-Four's operation mode, using the mux's configuration program. **Section 4.1** provides concise configuration information, and **Sections 4.2** through **4.5** provide detailed step-by-step configuration instructions.

4.1 Configuration Information

The MiniStat-Four has two types of configuration parameters:

1. System parameters that affect both MiniStat-Four units connected in a link and also affect all their sub-channels. System parameters are listed in Table 4-1.

2. Sub-channel parameters that affect only the operation of a single sub-channel. Sub-channel parameters are listed in Table 4-2.

Set these parameters with the MiniStat-Four’s configuration program. Sections 4.2 through 4.5 tell you how to use this program; the organization tree for the program is shown in Figure 4-1.

Table 4-1. MiniStat-Four system parameters and factory settings.

No.	Parameter	Function	Available Selections	Factory Setting
1	PASSWORD	Controls access to configuration as X-ON and X-OFF	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; however, the selected character must be different from the X-ON character	13H

Table 4-2. Sub-channel parameters and factory settings.

No.	Parameter	Function	Available Selections	Factory Setting
1	BAUD RATE	Sub-channel data rate	300, 600, 1200, 1800, 2400, 4800, 7200, 9600, 14400, and 19200 bps	9600
2	DATA BITS	Number of data in sub-channel data frame	5, 6, 7, 8	8
3	PARITY	Type of parity used in sub-channel data frame	Odd Even None	None
4	STOP BITS	Number of stop bits in sub-channel data frame	1, 1.5, 2	1
5	MINISTAT-FOUR TO DTE SOFTWARE FLOW CONTROL	Controls software flow control function at the local end of the sub-channel. When on, see also Table 4-1, Nos. 2 and 3.	On Off	On

Table 4-2 (continued). Sub-channel parameters and factory settings.

No.	Parameter	Function	Available Selections	Factory Setting
6	END-TO-END SOFTWARE FLOW CONTROL	Activates end-to-end software flow control. When on, see also Table 4-1, Nos. 2 and 3.	On Off	Off
7	END-TO-END DTR FLOW CONTROL	Activates end-to-end hardware flow control (via DTR line)	On Off	On

4.2 Using the MiniStat-Four's Configuration Program

Use the MiniStat-Four's configuration program to configure the MiniStat-Four for operation in your particular system.

The configuration program runs from any standard PC (in terminal-emulator mode) or CRT terminal connected to any sub-channel port. It's a simple menu-driven program that guides you through the various configuration steps. At each step, a screen that shows all available selections appears, and when applicable, also shows the current selections. Use a standard selection procedure throughout: the available options are marked with numbers; indicate your selection by typing the option number. To leave the current screen, type Q to return to the previous screen, except at the main menu, where you must type 6 to exit the program.

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 you provide a valid response, the local MiniStat-Four immediately executes it. (As you will see later, when you prepare the configuration for the remote MiniStat-Four, three different stages are used: preparing configuration, transferring to remote MiniStat-Four, and activating transferred configuration.)

When changing parameters related to the communication format of the sub-channel used to configure the MiniStat-Four, immediately change your PC's or terminal's communication format as well. However, if you make a mistake and lose communication with the MiniStat-Four, you can always quit the configuration program and start again from the default configuration (see **Section 3.3** for instructions).

To stop the configuration session at any point, press the PC's or terminal's ESC (escape) key; however, any changes you made prior to pressing the ESC key remain in effect.

4.3 Preparation for Configuration Session

Power the MiniStat-Four on. Wherever possible, establish communication with the remote MiniStat-Four. However, configuration can usually be done without connection to the remote mux.

Select a PC or terminal connected to any of the MiniStat-Four's sub-channels as a command (configuration) terminal, or connect a PC or CRT terminal to one of the MiniStat-Four's sub-channel ports. (When a new terminal is connected to the MiniStat-Four sub-channel selected as the command port, program the communication parameters of this terminal according to those of the selected MiniStat-Four port; its factory-default setting would be 9600 bps, 8 data bits, 1 stop bit, and no parity bits.)

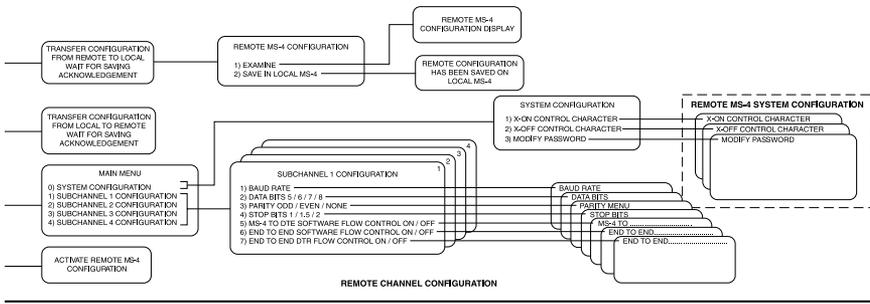
4.4 Starting the Configuration Program

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

NOTES

1. The following examples assume that the command mode is activated through sub-channel 1.
2. The MiniStat-Four commands requiring alphanumeric inputs are case-sensitive: observe use of lower-case and upper-case letters in the following examples.

- STEP 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 MiniStat-Four to the normal mode, and you will see the message `MINISTAT-FOUR IN NORMAL MODE`.
- STEP 2. After correctly typing the starting command, the MiniStat-Four stops normal operation, its TEST indicator lights, and the opening screen (Figure 4-2) appears.



```
COMMAND MODE IS ACTIVATED VIA CH1

MINISTAT-FOUR MSF
BLACK BOX CORPORATION
MSF COMMAND MODE
REV 0.0

ENTER MSF PASSWORD
```

Figure 4-2. MiniStat-Four opening screen.

- STEP 3. Enter the password, carefully observing the correct use of upper- and lower-case characters. The password is not echoed to the screen. (The factory-default password is RD.)
- STEP 4. If the password is rejected, you will see the screen on the next page (Figure 4-3) and you will have to repeat STEP 1 again.

```
COMMAND MODE IS ACTIVATED VIA CH1

WRONG PASSWORD

MSF IS IN NORMAL MODE
```

Figure 4-3. Password-rejection screen.

- STEP 5. If the password is accepted, the MiniStat-Four sends the main menu (See Figure 4-4).
- STEP 6. You can now start the actual configuration session.

```
COMMAND MODE IS ACTIVATED VIA CH

MAIN MENU

0) SYSTEM CONFIGURATION
1) SUBCHANNEL 1 CONFIGURATION
2) SUBCHANNEL 2 CONFIGURATION
3) SUBCHANNEL 3 CONFIGURATION
4) SUBCHANNEL 4 CONFIGURATION
5) DIAGNOSTICS
6) EXIT TO NORMAL OPERATION

SELECT YOUR CHOICE (0-5)
```

Figure 4-4. Main menu.

From this point on, whenever you want to end the configuration session, press Q as many times as necessary, or press ESC (escape), to obtain the following message:

```
EXIT COMMAND MODE

MINISTAT-FOUR IN NORMAL MODE
```

4.5 Configuration Procedure

The following subsections present the menus and the data-entry screens contained in the configuration program. These subsections describe menu and screen purpose, explain how to fill in the desired data, and present any supplementary information that may be required.

Table 4-3 lists the available menus and screens, as well as their index numbers to aid you in locating them in the text that follows each screen.

Table 4-3. MS-4 configuration program.

Index No.	Menu/Data Entry Screen
1	MAIN Menu
2	SYSTEM-CONFIGURATION Menu
3	X-ON CONTROL CHARACTER Screen
4	X-OFF CONTROL CHARACTER Screen
5	MODIFY PASSWORD Screen
6	SUB-CHANNEL 1/2/3/4 CONFIGURATION Screen
7	BAUD RATE Screen
8	DATA BITS Screen
9	PARITY Screen
10	STOP BITS Screen
11	MS-4-TO-DTE SOFTWARE FLOW CONTROL Screen
12	END-TO-END SOFTWARE FLOW CONTROL Screen
13	END-TO-END DTR FLOW CONTROL Screen
14	DIAGNOSTICS Menu
15	LOCAL LOOPS Screen

Table 4-3 (continued). MS-4 configuration program.

Index No.	Menu/Data Entry Screen
16	REMOTE LOOPS Screen
17	MODEM LOOPS Screen
18	Loop Control Screens
19	REMOTE MINISTAT-FOUR CONFIGURATION Menu
20	TRANSFER CONFIGURATION FROM REMOTE TO LOCAL Screen
21	REMOTE MINISTAT-FOUR CONFIGURATION Screen
22	EXAMINE REMOTE MS-4 CONFIGURATION Screen
23	SAVE IN LOCAL MINSTAT-FOUR Screen
24	TRANSFER CONFIGURATION FROM LOCAL TO REMOTE Screen
25	PREPARE REMOTE MS-4 CONFIGURATION Menu
26	REMOTE MS-4 SYSTEM CONFIGURATION Menu
27	REMOTE SUB-CHANNEL 1,2,3,4 SYSTEM CONFIGURATION Screens
28	ACTIVATE REMOTE MS-4 CONFIGURATION Screen

1. MAIN Menu

Purpose: Select the configuration task to be carried out.

Description:

Code	Item	Description
0	SYSTEM CONFIGURATION	Used for selection of system-wide parameters: <ul style="list-style-type: none">• Select X-ON and X-OFF flow-control characters.• Change password.• Prepare remote MiniStat-Four configuration.
1	SUBCHANNEL 1 CONFIGURATION	These four items are used to select local sub-channel parameters. Always change the parameters of the command sub-channel as the last item.
2	SUBCHANNEL 2 CONFIGURATION	
3	SUBCHANNEL 3 CONFIGURATION	
4	SUBCHANNEL 4 CONFIGURATION	
5	DIAGNOSTICS	Used to control the various test loops that can be controlled by the MiniStat-Four.
6	EXIT TO NORMAL OPERATION	Ends the current configuration session.

Procedure:

To select a configuration task, type the corresponding code number; the MiniStat-Four 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:

Type Q to return to the main menu.

EXIT COMMAND MODE

MS-4 IN NORMAL MODE

2. SYSTEM-CONFIGURATION Menu

Purpose: Select the parameters that affect the whole system: X-ON and X-OFF characters, change password, and prepare the remote MiniStat-Four configuration.

Description:

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 MINISTAT-FOUR CONFIGURATION	Used to display the main menu used for remote MiniStat-Four configuration.
Q	EXIT	Used to return to the main menu.

Procedure:

To select a configuration task, type the corresponding code number; the MiniStat-Four 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, if desired, another character.

Description:

Code numbers 1 through 8 present the various hexadecimal characters that can be used as X-ON control characters: 11H (ASCII 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.

4. X-OFF CONTROL CHARACTER Screen

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

Description:

Code numbers 1 through 8 present the various hexadecimal characters that can be used as X-OFF control characters: 11H (ASCII 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.

5. MODIFY PASSWORD Screen

Purpose: Select a new password. The new password is activated after its verification.

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:

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

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

2. Type the same characters again.
3. If no difference is found, the new password is accepted and you will receive the following message:

```
NEW PASSWORD HAS BEEN ACTIVATED
```

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

4. If the password need not be changed again, press Q to return to the SYSTEM CONFIGURATION menu. Otherwise, repeat the password-entry procedure.
5. If the two passwords differ, no change is made, and the following message is presented:

```
INCORRECT VERIFICATION, PASSWORD HAS NOT BEEN CHANGED
```

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

You will have to either repeat the procedure or quit.

6. SUB-CHANNEL 1/2/3/4 CONFIGURATION Screen

Purpose: Select and view the current values of the parameters of the sub-channel whose number appears in the screen header, and enter the corresponding sub-channel parameter configuration screens when changes are needed. The various parameters that can be selected are explained in Table 4-2.

Description:

Code numbers 1 through 7 list the various sub-channel parameters that can be changed: (1) sub-channel data rate, (2) number of data bits in sub-channel data frame, (3) type of parity used in the frame, (4) number of stop bits in the frame, (5) software flow-control function at the local end of the sub-channel, (6) end-to-end software flow-control, and (7) end-to-end hardware flow control (by means of DTR line).

Code Q is used to return to the SYSTEM CONFIGURATION screen.

The CURRENT CONFIGURATION line lists the current parameter values.

Procedure:

Type the code number corresponding to the desired configuration action.

Type Q to return to the SYSTEM CONFIGURATION screen.

7. BAUD RATE Screen

Purpose: View the current sub-channel data rate ("baud rate") and select, if desired, a new rate.

Description:

Code characters 1 through A list the available sub-channel rates in bps (bits per second): (1) 300, (2) 600, (3) 1200, (4) 1800, (5) 2400, (6) 4800, (7) 7200, (8) 9600, (9) 14400, and (A) 19200 bps. Code Q is used to return to the SUB-CHANNEL CONFIGURATION screen.

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

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 to which you are now connected), 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 SUB-CHANNEL CONFIGURATION screen.

NOTE

If you made an error and lost communication with the MiniStat-Four being programmed, select the default configuration described in Section 3.3 and start again.

8. DATA BITS Screen

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

Description:

Code numbers 1 through 4 list the available selections for the number of data bits: (1) five, (2) six, (3) seven, or (4) eight. Code Q is used to return to the SUB-CHANNEL CONFIGURATION screen.

The CURRENT STATE line shows the code for 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 to which you are now connected), 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 SUB-CHANNEL CONFIGURATION screen.

9. PARITY Screen

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

Description:

Code numbers 1 through 3 list the available parity types: (1) odd, (2) even, or (3) none. Code Q is used to return to the SUB-CHANNEL CONFIGURATION screen.

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 to which you are now connected), 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 SUB-CHANNEL CONFIGURATION screen.

10. STOP BITS Screen

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

Description:

Code numbers 1 through 3 list the available selections of the number of stop bits: (1) one, (2) 1.5, or (3) two.

Code Q is used to return to the SUB-CHANNEL CONFIGURATION screen.

The CURRENT STATE line shows the code for 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 to which you are now connected), 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 SUB-CHANNEL CONFIGURATION screen.

11. MINISTAT-FOUR-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 MiniStat-Four must be able to command the DTE connected to it to interrupt the flow of data when the MiniStat-Four's buffers fill, and restart the flow when the MiniStat-Four can accept new data for transmission. This function is mandatory whenever statistical multiplexors are used, in addition to the end-to-end flow-control function (see subsections 12 and 13).

Some DTEs have the capability to stop data flow when receiving a special character, X-OFF, and renew data flow when receiving another character, X-ON (see subsections 3 and 4). This capability is termed "software flow control," and the MiniStat-Four can be programmed to use it by selecting the ON option at this screen.

When 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 MiniStat-Four and the DTE connected to it is performed via the dedicated handshaking lines contained in any RS-232 interface.

NOTE

The CTS line of the MiniStat-Four is always active, regardless of the selection made on this screen.

Screen selections are as follows:

Code numbers 1 and 2 list the available selections for software flow-control status: (1) ON or (2) OFF.

Code Q is used to return to the SUB-CHANNEL CONFIGURATION screen.

The CURRENT STATE line shows the current status for software flow control 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 SUB-CHANNEL CONFIGURATION screen.

12. 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, if desired, a new status.

Description:

In addition to the MiniStat-Four-to-DTE control function (subsection 11), the MiniStat-Four provides a DTE-to-DTE (or “end-to-end”) flow-control function. This function allows a receiving DTE that temporarily cannot accept new data to command the remote transmitting DTE to interrupt data flow, and then send a request to continue data flow.

By selecting the ON option on this screen, the MiniStat-Four is configured to recognize the two special characters (selected by means of the screens presented in subsections 3 and 4): X-OFF, which conveys the local DTE’s “stop flow” command, and X-ON, which conveys the local DTE’s “restart flow” command.

The detected X-ON/X-OFF commands are sent to the remote MiniStat-Four, which converts them to flow-control commands for the remote DTE connected to it. When an X-OFF command is received from the local DTE, the local MiniStat-Four immediately interrupts 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 mux buffers. Similarly, when an X-ON command is received from the local DTE, the local mux immediately starts the transfer of any accumulated received data.

The flow-control commands supplied to the remote DTE depend on the MiniStat-Four-to-DTE flow control mode selected at the remote DTE: the same X-ON/X-OFF characters, or use of CTS line (see subsection 11).

When the local MiniStat-Four does not have software flow-control capability, the MiniStat-Four “end-to-end software flow control” must be configured as OFF, to prevent the MiniStat-Four from responding to the X-ON and X-OFF characters. In this case, see also subsection 13.

Screen selections are as follows:

Code numbers 1 and 2 list the available selections for end-to-end software flow-control status: (1) ON or (2) OFF.

Code Q is used to return to the SUB-CHANNEL CONFIGURATION screen.

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 SUB-CHANNEL CONFIGURATION screen.

13. 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, if desired, a new status.

Description:

There are applications in which end-to-end (DTE-to-DTE) software flow control cannot be used, but the end-to-end flow-control function described in subsection 12 is nevertheless essential. In these applications, the MiniStat-Four can be configured to use “end-to-end” DTR flow control by setting it ON at this screen. In this mode, the MiniStat-Four monitors the DTR line contained in the standard RS-232 interface, and transmits the status of this line to the remote MiniStat-Four. The remote MiniStat-Four then sends the remote DTE flow-control commands according to the MiniStat-Four-to-DTE flow control modes selected at the remote MiniStat-Four.

Selecting OFF at this screen disables the transmission of flow-control commands to the remote MiniStat-Four when the DTR line changes state.

Screen selections are as follows:

Code numbers 1 and 2 list the available selections for end-to-end hardware flow-control status: (1) ON or (2) OFF.

Code Q is used to return to the SUB-CHANNEL CONFIGURATION screen.

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 SUB-CHANNEL CONFIGURATION screen

14. DIAGNOSTICS Menu

Purpose: Select the control screens for the various test loops that can be activated from the local MiniStat-Four for diagnostic purposes. See **Chapter 6** for a description of the test loops.

Description:

Code numbers 1 through 3 are used to select the desired test loop type: (1) local loop, (2) remote loop, and (3) modem loop.

When you first enter the DIAGNOSTICS menu, the CURRENT STATE line shows: ALL TESTS IN THE OFF STATE.

Code Q is used to return to the MAIN MENU screen.

Procedure:

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

Type Q to return to the MAIN MENU screen.

15. LOCAL LOOPS Screen

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

Description:

Code numbers 1 through 5 list the available local loops: composite loop and loops for each sub-channel.

Code Q is used to return to the DIAGNOSTICS screen.

The CURRENT STATE line shows the current status of the available local loops: ON or OFF.

Procedure:

To change the condition of any test loop, type the appropriate code number to go to the loop-control screen (a typical screen is explained in subsection 18).

After completing the required actions, type Q to return to the DIAGNOSTICS screen.

16. REMOTE LOOPS Screen

Purpose: View the current status of the remote sub-channel and composite channel loops and go, if desired, to the control screen for any of these loops (see subsection 18). Its functions are similar to those of the LOCAL LOOPS screen, described in subsection 15.

NOTE

Remote digital loopback is performed by toggling pin 21 to the modem connected to the local MiniStat-Four. 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 MiniStat-Four is set to ON.

17. MODEM LOOPS Screen

Purpose: View the current status of the modem loops and go, if desired, to the control screen for any of these loops (see subsection 18). Its functions are similar to those of the LOCAL LOOPS screen, described in subsection 15.

18. Loop Control Screens

Purpose: Change the current status of the test loop selected on one of the loop-selection screens (see subsections 15, 16, or 17).

Description:

Code numbers 1 and 2 list the two possible conditions of the selected loop: ON or OFF.

Code Q is used 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.

19. REMOTE MINISTAT-FOUR CONFIGURATION Menu

Purpose: Select screens that provide system-management functions, including configuration tasks, related to the remote MiniStat-Four.

Description:

Code	Item	Description
1	TRANSFER CONFIGURATION FROM REMOTE TO LOCAL	Used to initiate transfer of current remote MiniStat-Four configuration to the local MS-4. After remote configuration is received by the local MS-4, it can be examined using the terminal connected to the local MS-4. The configuration data in the local unit serves as a backup that can be down-loaded back to the remote MiniStat-Four 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 the current local MiniStat-Four configuration to the remote MiniStat-Four.

Code	Item	Description
3	PREPARE REMOTE MINISTAT-FOUR CONFIGURATION	Used to initiate preparation of remote MiniStat-Four configuration, using the terminal connected to the local MiniStat-Four.
4	ACTIVATE REMOTE MINISTAT-FOUR CONFIGURATION	Used to restart the remote MiniStat-Four; if a new configuration was transferred from the local MiniStat-Four to the remote MiniStat-Four, this command will activate the new configuration.
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.

20. TRANSFER CONFIGURATION FROM REMOTE TO LOCAL Screen

Purpose: Provide an indication that the MiniStat-Four executes the required actions after selecting item 1 on the REMOTE MiniStat-Four CONFIGURATION menu (see subsection 19).

Description:

This screen is displayed after selecting item 1 on the REMOTE MINISTAT-FOUR CONFIGURATION menu, while the remote configuration information is transmitted to the local MiniStat-Four.

In most cases, the screen is displayed for a very short interval; however, under certain traffic conditions, you might notice the transmission delay, so this screen notifies you that the required action is being carried out:

TRANSFER CONFIGURATION FROM REMOTE TO LOCAL

WAIT FOR SAVING ACKNOWLEDGE

If you want to exit, press Q.

No action is required on this screen, and after the remote configuration information is received, the REMOTE MINISTAT-FOUR CONFIGURATION menu shown in subsection 21 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 MINISTAT-FOUR CONFIGURATION menu (see subsection 19).

21. REMOTE MINISTAT-FOUR CONFIGURATION Screen

Purpose: Define the action to be performed on the information regarding remote MiniStat-Four configuration, just received after selecting item 1 on the REMOTE MINISTAT-FOUR CONFIGURATION menu (see subsection 19).

Description:

Code	Item	Description
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 MINISTAT-FOUR	Used to save (store permanently) the received configuration in local - MiniStat-Four.
Q	EXIT CONFIGURATION	Return to remote - MiniStat-Four menu.

Procedure:

Type the code number corresponding to the desired function.

Type Q to return to the REMOTE MINISTAT-FOUR CONFIGURATION menu.

22. EXAMINE REMOTE MINISTAT-FOUR CONFIGURATION Screen

Purpose: Display the information regarding remote MiniStat-Four configuration, received by selecting item 1 on the REMOTE MINISTAT-FOUR CONFIGURATION menu (see subsection 19).

No action is required on this screen, and after the remote configuration information display is no longer required, you can end it by pressing Q; this will return you to the REMOTE MINISTAT-FOUR CONFIGURATION menu (see subsection 19).

23. SAVE IN LOCAL MINISTAT-FOUR Screen

Purpose: Notify the user that the required action has been performed; in this case, that action is saving (permanently storing) in the local MiniStat-Four a copy of the configuration of the remote MiniStat-Four, received by selecting item 1 on the REMOTE MINISTAT-FOUR CONFIGURATION menu (see subsection 19).

NOTE

Note that the remote configuration does not override the local configuration; it is only stored for receiving and backup purpose.

This message appears:

REMOTE CONFIGURATION HAS BEEN SAVED ON LOCAL MINISTAT-FOUR

Press Q to exit.

Typing Q on this menu will return you to the REMOTE MINISTAT-FOUR CONFIGURATION menu (see subsection 19).

24. TRANSFER CONFIGURATION FROM LOCAL TO REMOTE Screen

Purpose: Provide an indication that the MiniStat-Four executes the required actions after selecting item 2 on the REMOTE MINISTAT-FOUR CONFIGURATION menu (see subsection 19).

Description:

This screen is displayed after selecting item 2 on the REMOTE MINISTAT-FOUR CONFIGURATION menu (see subsection 19), while the configuration of the local MiniStat-Four is transmitted to the remote MiniStat-Four, for viewing it there, or for backup purposes.

In most cases, the screen is displayed for a very short interval; however, under certain traffic conditions, you might notice the transmission delay, so this screen is used to notify you that the required action is being carried out:

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

If you want to exit, press Q.

No action is required on this screen, and after the remote configuration information is received, the acknowledgment message shown below is automatically displayed:

```
LOCAL CONFIGURATION HAS BEEN SAVED ON REMOTE MINISTAT-FOUR  
  
Press Q to exit
```

However, the screen does provide you with the option to leave without seeing the acknowledgment message, by pressing Q; this will return you to the REMOTE MINISTAT-FOUR CONFIGURATION menu (see subsection 19) while configuration transfer is being performed.

25. PREPARE REMOTE MINISTAT-FOUR CONFIGURATION Menu

Purpose: The main menu is used to select the configuration task to be carried out on the remote MiniStat-Four.

Description:

Menu functions are similar to the corresponding functions of the main menu (see subsection 1).

Typing Q on this screen will return you to the REMOTE MINISTAT-FOUR CONFIGURATION menu (see subsection 19).

26. REMOTE MINISTAT-FOUR SYSTEM CONFIGURATION Menu

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

Description:

Menu functions are similar to the corresponding functions of the SYSTEM CONFIGURATION menu, except that the selections made from this screen affect only the remote MiniStat-Four.

Typing Q on this screen will return you to the PREPARE REMOTE MINISTAT-FOUR CONFIGURATION menu.

27. REMOTE SUB-CHANNEL 1, 2, 3, 4 CONFIGURATION Screens

Purpose: View and select the current parameter values of remote MiniStat-Four sub-channels.

Description:

Configuration screens are identical to the sub-channel 1 configuration screen described in subsection 6. 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 MINISTAT-FOUR CONFIGURATION menu (see subsection 25).

28. ACTIVATE REMOTE MINISTAT-FOUR CONFIGURATION Screen

Purpose: Provide an indication that the MiniStat-Four executes the required action after selecting item 4 on the REMOTE MINISTAT-FOUR CONFIGURATION menu (see subsection 19).

Description:

This screen is displayed after selecting item 4 on the REMOTE MINISTAT-FOUR CONFIGURATION menu (see subsection 19) after the remote configuration information is transmitted from the local MiniStat-Four to the remote MiniStat-Four using item 1 on that menu, and it carries the message:

```
ACTIVATE REMOTE MINISTAT-FOUR CONFIGURATION
```

Press Q to exit.

No action is required on this screen, and after being displayed, press Q to return to the REMOTE MINISTAT-FOUR CONFIGURATION menu (see subsection 19).

5. Operation

5.1 Front-Panel Indicators and Connectors

Table 5-1 below and on the following pages lists the functions of the MiniStat-Four indicators and connectors. The numbers under the heading “Item” refer to the identification numbers in Figure 5-1.

Table 5-1. MiniStat-Four indicators and connectors.

Item	Indicator or Connector	Function		
1	SYNC Indicator	Indicates that the MiniStat-Four operates and shows the synchronization status.		
		<u>Condition</u>	<u>Indication</u>	
		Off	MiniStat-Four not powered.	
		On	MiniStat-Four powered and synchronized with the remote MiniStat-Four.	
		Constant flashing	MiniStat-Four powered, but not synchronized with the remote Mini-Stat-Four.	

Table 5-1 (continued). MiniStat-Four indicators and connectors.

Item	Indicator or Connector	Function	
1	SYNC Indicator (continued)	Sporadic flashing	MiniStat-Four retransmits data frame upon request of remote MiniStat-Four (usually because a noisy line causes errors in the data received by the remote MiniStat-Four).
2	ERR Indicator	Indicates MiniStat-Four operational status and the results of the self-test automatically performed upon power-up.	
		<u>Condition</u> Off	<u>Indication</u> Normal condition: MiniStat-Four successfully passed the self-test and its buffers are not full.
		On	Hardware malfunction detected during self-test.

Table 5-1 (continued). MiniStat-Four indicators and connectors.

Item	Indicator OR Connector	Function	
2	ERR Indicator (continued)	Flashing	MiniStat-Four operates normally but buffers are full. In a properly designed system, this condition usually indicates that one of the DTE units connected to the MiniStat-Four does not respond to configured flow-control commands.
3	TEST Indicator	Lights to indicate that the MiniStat-Four is in the diagnostics mode (one of the test loops active) or in the command mode. In either case, traffic is interrupted.	
4 through 7	Sub-Channel Activity	Four indicators, one for each sub-channel, light when corresponding sub-channel is active (receives or transmits data).	
8	Main (Composite) Channel Activity indicator	Lights when the main channel is active (receives or transmits data).	
9	Sub-Channel 2 Connector	Connection to sub-channel 2.	

MINISTAT-FOUR

Table 5-1 (continued). MiniStat-Four indicators and connectors.

Item	Indicator OR Connector	Function
10	Sub-Channel 3 Connector	Connection to sub-channel 3 connector
11	Sub-Channel 1 Connector	Connection to sub-channel 1.
12	Main (Composite) Channel Connector	Connection to main (composite) channel.
13	Sub-Channel 4 Connector	Connection to sub-channel 4.
14	Power Jack	DC power connection.

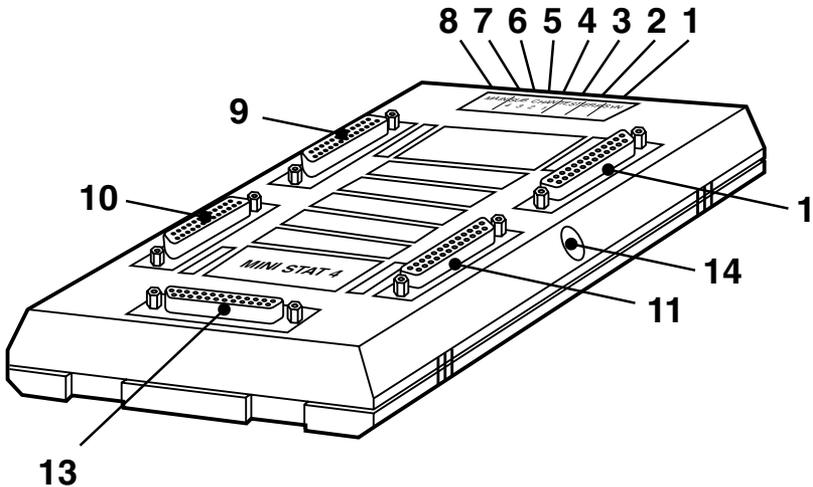


Figure 5-1. The MiniStat-Four's external components.

5.2 Operating Instructions

After being prepared for operation as explained in **Chapter 4**, the MiniStat-Four normally operates unattended. Operator intervention is required only when the MiniStat-Four is set up for the first time or when your system configuration changes. MiniStat-Four configuration is stored in nonvolatile memory and is not affected when power is turned off.

5.2.1 POWERING ON THE UNIT

To turn the MiniStat-Four on, connect the power cable to the MiniStat-Four jack, then plug the power supply unit into the utility (mains) outlet. The SYNC indicator should light.

If the link to the far MiniStat-Four is still not operational, the SYNC indicator will flash. Wait until the link becomes operational, and check that the SYNC indicator stops flashing and lights continuously.

Check that after a few seconds (during which MiniStat-Four performs its self-test), the ERR indicator is extinguished.

5.2.2 NORMAL OPERATION

During normal operation, the 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.

NOTE

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 MiniStat-Four requests it. The request is sent when errors are detected in the received data, and it ensures that only valid data is transmitted.

5.2.3 POWERING OFF THE UNIT

To turn the MiniStat-Four off, disconnect the wallmount power supply from the utility (mains) outlet, then disconnect, if required, the power cable from MiniStat-Four jack.

5.3 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 MiniStat-Four diagnostics appears in **Chapter 6**.

5.3.1 PRELIMINARY CHECKS

Take these steps first:

1. Check that the MiniStat-Four is powered (SYNC indicator lights or flashes).
2. Check that cables are properly connected.
3. Check that the equipment connected to the MiniStat-Four is powered and operates normally.

5.3.2 CHECK MINISTAT-FOUR INDICATIONS

Refer to Table 5-2 as an aid in diagnosing problems with the MiniStat-Four.

5.3.3 CHECK CONFIGURATION

Check the configurations of the local and remote MiniStat-Fours and make sure they correspond to the requirements of the equipment connected to the two muxes' sub-channels.

Table 5-2. MiniStat-Four indications.

Indication	Probable Cause	Action
ERR lit	MiniStat-Four problem	Turn the MiniStat-Four off, then turn it on again. If ERR indicator remains lit, replace MiniStat-Four.

Table 5-2 (continued). MiniStat-Four indications.

Indication	Probable Cause	Action
TEST lit	MiniStat-Four is in the command mode	Check whether the MiniStat-Four is being configured, and wait until configuration is completed (at any time, only one sub-channel can be in the command mode).
	MiniStat-Four is in the diagnostics 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.
MAIN not lit (SYNC may flash)	Problems in the communication link to remote MiniStat-Four	Check whether link to remote is powered and properly connected, then use the diagnostics function described in Chapter 6 to identify fault location.
	MiniStat-Four problem	Turn the MiniStat-Four off, then turn it on again. If ERR indicator lights, replace the MiniStat-Four.

Table 5-2 (continued). MiniStat-Four indications.

Indication	Probable Cause	Action
<p>SYNC flashes continuously</p>	<p>Remote Mini Stat-Four not operational</p>	<p>Check whether the remote MiniStat-Four is powered on and operates normally.</p>
	<p>Problems in communication link to remote MiniStat-Four</p>	<p>Check whether communication equipment is powered and properly connected, then use the diagnostics function described in Chapter 6 to identify fault location.</p>
<p>ERR flashes</p>	<p>MiniStat-Four buffers full</p>	<p>One of the DTE units connected to the MiniStat-Four does not respond to flow-control commands; check that all the DTEs do have a flow-control option, and that MiniStat-Four flow control is properly configured.</p>
<p>One or more sub-channel indicators do not light</p>	<p>No traffic on sub-channel</p>	<p>If traffic is expected on the sub-channel but no activity is indicated, check DTE equipment and its connections.</p>
	<p>MiniStat-Four problem</p>	<p>Turn the MiniStat-Four off, then on again. If ERR indicator lights, replace the MiniStat-Four.</p>

6. Troubleshooting

6.1 Overview

The MiniStat-Four diagnostics functions use a full set of test loops and the front-panel indicators to rapidly identify faults that affect system operation.

The test loops available for diagnostics and test purposes are:

- Local loops:
 1. Local sub-channel loop.
 2. Local composite channel loop.
- Remote loops:
 1. Remote sub-channel loop.
 2. Remote composite channel loop.
- Modem loops:
 1. Analog loop.
 2. Remote digital loop (available if supported by composite-channel modem).

The various test loops are identified in Figure 6-1 on the next page and are described in detail in **Section 6.2**.

If the problem is still unidentified after you perform these loops, see **Section 6.3**.

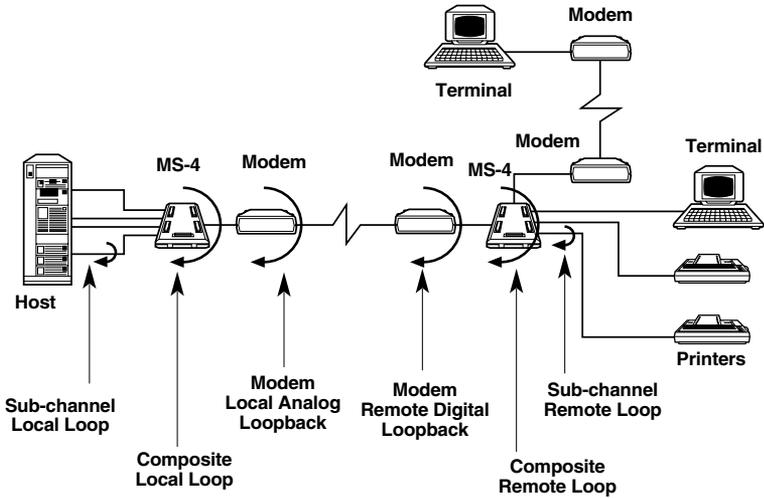


Figure 6-1. Identification of MiniStat-Four test loops.

The recommended procedure for locating a problem in the system is to first power the MiniStat-Fours off and then on again. This obtains their self-test results (that is, to see whether the ERR indicator lights or stays dark). Then perform test loops in the order they are listed on the previous page.

All the test loops are initiated from the DIAGNOSTICS screen, which can be accessed from the main menu.

The next section describes how to use the test loops; refer to **Section 6.2** for detailed instructions on loop activation.

6.2 Description of Test Loops

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

6.2.1 LOCAL LOOPS

Local composite-channel loop

When the local composite-channel loop is connected, the composite-channel data transmitted by the local MiniStat-Four is applied to the receive line of the local MiniStat-Four, and the communication link is disconnected (this causes the remote MiniStat-Four to lose frame synchronization). All the data arriving from the remote MiniStat-Four while this loop is connected is lost.

This loop tests the complete local MiniStat-Four.

As long as the loop is connected, the SYNC indicator of the local MiniStat-Four must light continuously. If it doesn't, this indicates a local MiniStat-Four problem.

Sub-channel activity indicators light according to traffic; a flashing ERR indicator means that the MiniStat-Four buffers are full because of flow-control problems stemming from the equipment connected to one of the local sub-channels.

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 MiniStat-Four. All the data arriving from the remote MiniStat-Four 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.

6.2.2 REMOTE LOOPS

Remote composite channel loop

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

This loop tests the complete transmission path, including the local MiniStat-Four and the communication link.

As long as the loop is connected, the SYNC indicator of the local MiniStat-Four must light continuously; failure to do so, after the local MiniStat-Four performed satisfactorily 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; a flashing ERR indicator means that the MiniStat-Four buffers are full because of flow-control problems stemming from the equipment connected to one of the local sub-channels.

Remote sub-channel loop

When a remote sub-channel loop is connected, the local transmit data is transmitted to the remote MiniStat-Four. It's returned to the local MiniStat-Four sub-channel instead of the transmit data connected to the remote MiniStat-Four sub-channel. All the data arriving from the remote MiniStat-Four 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, after the local MiniStat-Four performed satisfactorily on the local sub-channel loop, usually indicates a problem in the remote MiniStat-Four.

6.2.3 MODEM LOOPS

Analog modem loop

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

This loop tests the complete local MiniStat-Four, its composite-channel connection cable, and the local modem.

As long as the loop is connected, the SYNC indicator of the local MiniStat-Four must light continuously; failure to do so, after the local MiniStat-Four performed satisfactorily on the local composite channel loop, indicates a problem in the composite-channel connection cable and/or in the local modem.

Remote digital modem loop

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

This loop tests the complete transmission path, including the local MiniStat-Four, its composite channel connection cable, the communication link, and the local and remote modems.

As long as the loop is connected, the SYNC indicator of the local MiniStat-Four 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.

NOTE

The MAIN indicator may or may not be on (depending on data activity) during all tests.

6.3 Calling Black Box

If you determine that a MiniStat-Four is malfunctioning, do not attempt to alter or repair the unit. It is not user-serviceable. Contact Black Box Technical Support at 724-746-5500. The problem might be solvable over the phone.

Before you do, make a record of the history of the problem. We will be able to provide more efficient and accurate assistance if you have a complete description, including:

- the nature and duration of the problem.
- when the problem occurs.
- the components involved in the problem.
- any particular application that, when used, appears to create the problem or make it worse.
- the results of any tests you might already have performed.

6.4 Shipping and Packaging

If you need to transport or ship your MiniStat-Four:

- Package it carefully. We recommend that you use the original container.
- Before you ship the MS-4 for repair or return, contact Black Box to get a Return Authorization (RA) number.

Appendix A: Interface Pinouts

A.1 Main (Composite) Channel Interface

The MiniStat-Four main (composite) channel interface is configured as a synchronous RS-232 interface, pinned as DTE, with a female DB25 connector. The pinout (“pin allocation”) is listed in Table A-1.

Table A-1. Pinout of the main (composite) channel connector.

CCITT V.24 CIRCUIT NUMBER	TIA RS-232C LINE	PIN	SIGNAL NAME	DESCRIPTION
101	AA	1	Protective Ground	Chassis ground (may be isolated from signal ground or connected to it).
102	AB	7	Signal Ground	Common ground for signal leads and DC power supply.
103	BA	2	Transmit Data	Serial digital transmit data from the MiniStat-Four.
104	BB	3	Receive Data	Receive data from modem.
105	CA	4	Request to Send	Continuous positive level from the MiniStat-Four.
109	CF	8	Data Carrier Detect	Data-carrier detection signal from modem.

Table A-1 (continued). Pinout of the main (composite) channel connector.

CCITT V.24 CIRCUIT NUMBER	TIA RS-232C LINE	PIN	SIGNAL NAME	DESCRIPTION
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 MiniStat-Four. Positive level commands the modem into analog loopback.
108.2	CD	20	Data Terminal Ready	Continuous positive level from MiniStat-Four.
140	—	21	Loop 3 Test Command	Control signal from MiniStat-Four to modem. Positive level commands attached modem to send a remote-loopback command to the remote modem.
				If attached modem uses Pin 21 as a signal-quality-indication output, set the Pin 21 jumper to OFF, thereby disabling this function.

A.2 Sub-Channel Interface

The MiniStat-Four’s sub-channel interfaces are configured as asynchronous RS-232C interfaces, pinned as DCE, with female DB25 connectors. The pinout (“pin allocation”) of these interfaces is listed in Table A-2.

What type of sub-channel connection cables you use depends on what type of devices you’re attaching: use a port (“straight-through”) cable to connect the MiniStat-Four to a DTE; use a modem (“crossover”) cable to connect the MiniStat-Four to a tail-end modem. See Figure A-1.

Table A-2. Sub-channel connectors.

CCITT V.24 CIRCUIT NUMBER	TIA RS-232C LINE	PIN	SIGNAL NAME	DESCRIPTION
101	AA	1	Protective Ground	Chassis ground (may be isolated from signal ground or connected to it).
102	AB	7	Signal Ground	Common ground for signal leads and DC power supply.
103	BA	2	Transmit Data	Serial digital transmit data from the attached device.
104	BB	3	Receive Data	Receive data provided by MiniStat-Four receiver.

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

CCITT V.24 CIRCUIT NUMBER	TIA RS-232C LINE	PIN	SIGNAL NAME	DESCRIPTION
106	CB	5	Clear to Send	A positive level from the MiniStat-Four indicates that the terminal is allowed to send data. This pin is used for hardware flow control. Computers or terminals that do not support this pin (that send data even if CTS is negative) must have software flow-control ability.
107	CC	6	Data Set Ready	The MiniStat-Four sends positive level to DTE when it is powered.
109	CF	8	Data Carrier Detect	Positive level from the MiniStat-Four when the local and remote MiniStat-Four are synchronized.
108.2	CD	20	Data Terminal Ready	Used for end-to-end flow control.

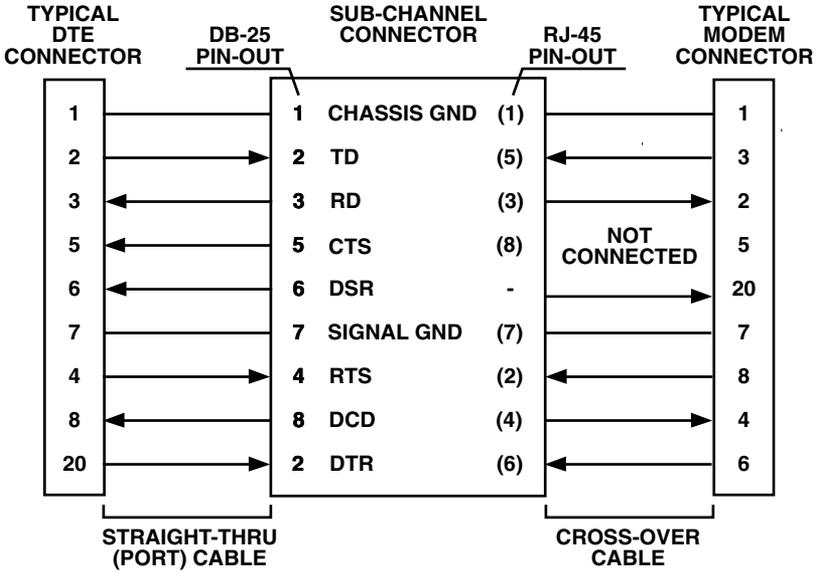


Figure A-1. Typical sub-channel cable wiring.

Appendix B: MiniStat-Four Configuration Record

This appendix presents a typical configuration record form (shown on the facing page). Copies of this form can be used as worksheets during system-configuration planning, and as permanent records of the actual configuration.

APPENDIX B: MiniStat-Four Configuration Record

MS-4 CONFIGURATION RECORD FORM

Date: _____ Prepared by: _____

Location: _____ Remote Location: _____

MS-4 Serial No: _____

LOCAL

REMOTE

System	Password		
Setup	X-ON Character		
	X-OFF Character		

LOCAL CONFIGURATION

Data Format					Flow Control		
Sub-Channel	Data Rate	Data Bits	Parity	Stop Bits	MS-4-to-DTE Software	End-to-End Software DTE	RTS—DCD Transfer
1							
2							
3							
4							

Appendix C: Quick Setup Guide

C.1 Scope

This appendix provides concise instructions for preparing MS-4 configuration. It is intended for users already familiar with the MS-4, and for experienced users who have a basic understanding of data-communication principles, and applications and characteristics of statistical multiplexors.

Use this guide together with Figure 4-1 in **Chapter 4**.

Once you start the configuration program, the MS-4 will guide you in doing any configuration action you want.

C.2 What You Need

You must configure the MS-4 from a terminal, or a PC running terminal emulation, connected to one of the MS-4 sub-channels. The terminal's 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 MS-4, use the following default parameters:

Data Rate	9600 bps
Data Format	8 data bits
	No parity bit
	1 stop bit

To initialize the MS-4 to these parameters, read **Section 3.3**, then turn the MS-4 off, set its internal INIT/NOR jumper to INIT, and turn the MS-4 on again. Return the INIT/NOR jumper to NOR before starting the configuration.

Whenever the MS-4 is already installed in a link, establish communication with the remote MS-4 before starting. In this way, you will be able to configure both units from the terminal connected to the local MS-4.

C.3 Configuration Instructions

NOTE

The commands and passwords are case-sensitive. Pay attention to use of capital letters whenever required.

1. If necessary, power up the MS-4 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 more second, and type S.
3. The MS-4 enters the command mode. Enter the password.

NOTE

The default password is RD. If you do not know the password, initialize the MS-4 by means of the INIT/NOR jumper.

4. The MS-4 displays the MAIN Menu. Use Figure 4-1 to plan your configuration actions. Record the configuration on a copy of 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 MS-4. If you make an error that you cannot correct, initialize the MS-4 again with the INIT/NOR jumper and start over.

5. When the link to the remote MS-4 operates, use REMOTE SYSTEM CONFIGURATION to transfer local configuration to remote MS-4, and/or to configure the remote MS-4 as required.
6. If you initialized the MS-4, modify the password as required. Record the password.
7. Exit the command mode by typing "6" at the MAIN Menu.



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