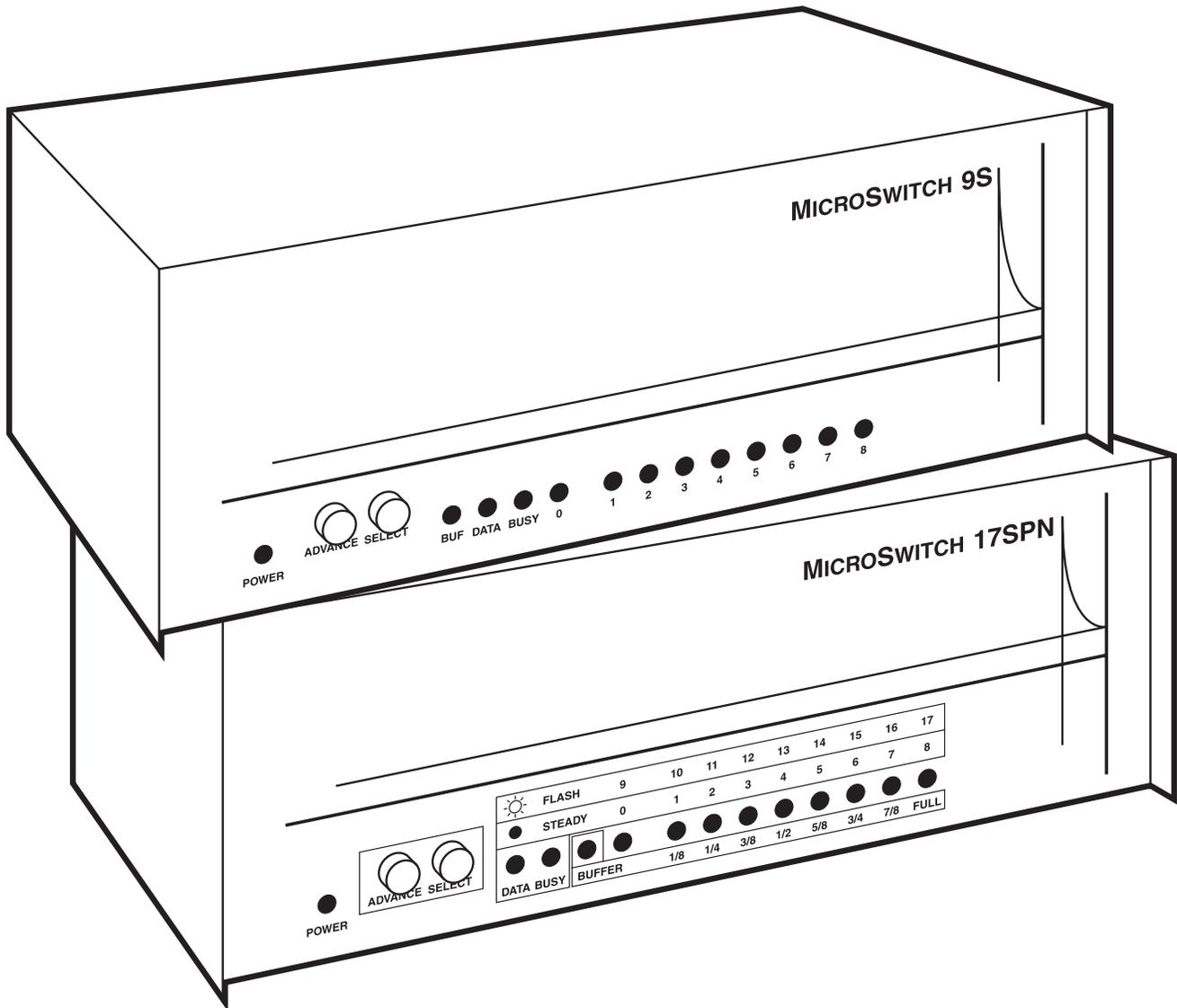




SL001A	SL005AE	SL010A	SL015A
SL001AE	SL007A	SL010AE	SL015AE
SL003A	SL007AE	SL012-C	SL017A
SL003AE	SL009A	SL013-C	SL017AE
SL005A	SL009AE	SL014-C	RM014A

MicroSwitches



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 FREE technical support 24 hours a day, 7 days a week: Call 724-746-5500 or fax 724-746-0746
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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.

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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 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.

Contents

Chapter	Page
1. Specifications	5
1.1 MicroSwitches	5
1.2 Optional MicroSwitch Rackmount Bracket (RM014A)	6
2. Introduction	7
2.1 Features	7
2.2 The MicroSwitches Illustrated	8
2.3 Understanding the Basics	14
3. Installation	15
3.1 The Complete Package	15
3.2 Placement	15
3.3 Cabling	15
4. Configuration	18
4.1 Configuration Methods	18
4.2 The Configuration Menu and Its Commands	21
5. Operation	30
5.1 Direct Commands	30
5.2 Other Features	47
5.3 The Front-Panel LEDs and Controls	50
5.4 Daisychaining MicroSwitches	53
6. Applications	54
6.1 Setting Up the Serial Port on Your PC	54
6.2 Printer Sharing	56
6.3 Modem Sharing	57
6.4 Spurious Characters from Power-Up	58
6.5 Port Contention	59
6.6 Data Contention	60
7. MicroLink Software	61
7.1 Introduction to MicroLink	61
7.2 Getting MicroLink Ready to Run	63
7.3 The SETUP Program	64
7.4 The MicroLink (MSLINK) Program	69
7.5 MicroLink Utility Programs	74
7.6 The MSCONFIG Program	76

Contents (continued)

Chapter	Page
8. Troubleshooting	81
8.1 Determining What the Problem Is	81
8.2 Possible Resolutions	84
8.3 Power-Up Tests	89
8.4 Diagnostic Modes	90
8.5 Calling Black Box	93
8.6 Shipping and Packaging	93
Appendix A: Quick-Setup Summary	94
A.1 Running MSCONFIG on a PC	94
A.2 Directly Accessing the MicroSwitch's Configuration Menu	95
Appendix B: Cable Pinouts	97
Appendix C: Connector Pinouts	99
C.1 MicroSwitch XSP, 17SPN Parallel Ports	99
C.2 MicroSwitch XSP, 17SPN Serial Ports	100
C.3 MicroSwitch XP Parallel Ports	100
C.4 Microswitch XS Serial Ports	101
Appendix D: RS-232 Signals	102
Appendix E: Command Summary	103
Appendix F: Factory Defaults	109
Appendix G: Memory-Expansion Boards	110
G.1 Description	110
G.2 Installation	110

1. Specifications

1.1 MicroSwitches

Compliance:	CE; FCC Part 15 Subpart B Class A, IC Class/classe A
Interfaces:	SL003, SL010 (“XS”) models: EIA/TIA RS-232 serial, DTE; SL005, SL009 (“XP”) models: Centronics parallel; SL001, SL007, SL015 (“XSP”) and SL017 (“17SPN”) models: Serial: EIA/TIA RS-232, DTE, proprietarily pinned on RJ-45; Parallel: IBM PC type (Centronics compatible)
Protocol:	Serial: Asynchronous
Data Format:	Serial: 5 to 8 data bits; even, odd, mark, space, or no parity; 1 or 2 stop bits (user-selectable)
Data Rate:	Serial: User-selectable: SL017 models: 19,200, 9600, 4800, 2400, 1200, 600, 300, 150, or 75 bps; All other serial models: 19,200, 9600, 7200, 4800, 3600, 2400, 1800, 1200, 600, 300, 150, 134.5, 100, 75, or 50 bps;
Flow Control:	Serial: Hardware (DTR/DSR) or software (X-ON/X-OFF) to buffer (user-selectable); ports configured as modems support DCD passthrough
Operation:	Serial: Full duplex
Memory:	64 KB buffer RAM (upgradeable to 256 KB, 512 KB, 1 MB, 2 MB, or 4 MB), plus nonvolatile RAM for configuration storage
Maximum Distance:	Serial: 50 ft. (15.2 m) to any attached device; Parallel: 20 ft. (6.1 m) to any attached device
User Controls:	(2) Front-mounted pushbuttons: ADVANCE (cycles indicators) and SELECT (stops indicator cycle for steady view); (1) Rear-mounted pushbutton: POWER; ASCII commands sent from attached terminals or PCs
Indicators:	(13) Front-mounted LEDs: (1) Power, (1) Data, (1) Busy, (1) Buffer, and (9) port activity (extra LEDs on models with fewer ports are nonfunctional)

MICROSWITCHES

Connectors:	All rear-mounted; All models: (1) 5-pin DIN female power inlet; XS models: DB25 female: SL003A, SL003AE: (5); SL010A, SL010AE: (9); XP models: 36-pin Centronics female: SL005A, SL005AE: (5); SL009A, SL009AE: (9); XSP models: DB25 female paired with RJ-45 female (user determines which connector is used at each port): SL001A, SL001AE: (3); SL007A, SL007AE: (6); SL015A, SL015AE: (9); 17SPN models (SL017A, SL017AE): (16) RJ-45 female, (1) DB25 female
Leads/Signals Supported:	Serial: TD, RD, DSR and DTR are switched; Parallel: (12) signals switched or used as inputs, (5) signals steady or unused
Temperature Tolerance:	32 to 158°F (0 to 70°C)
Humidity Tolerance:	Up to 95% noncondensing
Enclosure:	Steel
Power:	From utility-power (mains) outlet, through external power supply; Input: 110 VAC (“-A” models) or 220 VAC (“-AE models), 50 to 60 Hz, 20 watts; Output: SL017A, SL017AE: 16.5 VAC CT, 1.45 A; All other models: 17 VAC CT, 700 mA
Size:	3.5"H x 10.5"W x 5"D (8.9 x 26.7 x 12.7 cm)
Weight:	SL001, SL003, SL005 models: 6 lb. (2.7 kg); SL007, SL009, SL010, SL015 models: 7 lb. (3.2 kg); SL017A, SL017AE: 8 lb. (3.6 kg)

1.2 Optional MicroSwitch Rackmount Bracket (RM014A)

Compatibility:	Standard 19" equipment racks
Construction Material:	Anodized aluminum
Size:	5.25"H x 19"W (13.3 x 48.2 cm)
Weight:	3 lb. (1.4 kg)

2. Introduction

MicroSwitches are versatile tools for connecting your computers and peripherals using the common serial (RS-232) and parallel (Centronics® compatible) interfaces of your equipment. The Switches accept over twenty commands for controlling the flow of data. They can be used automatically or be controlled by interactive menus. Applications for the Switches include office automation, CAD/CAM, machine control, data collection, local area networking, telecommunications, retail point-of-sale, and many more. The software written for the MicroSwitches greatly enhances their performance and usefulness. Along with your unit you should have received a copy of the MicroLink utility diskette for use with PCs that can run DOS programs. MicroLink is a PC-memory-resident program which allows users to send commands to, or access menus from, the Switches; it can be popped up from any other program with a hotkey sequence. The MicroLink diskette also contains utilities for configuration, batch-file operation, problem diagnosis, and cable testing. Optional MicroSwitch LAN Software for PCs offers directory operations, file transfer, electronic mail, and other capabilities.

Initial installation involves running cables from the computers and peripherals you want to connect to your MicroSwitch. The Switch is then configured to match the attached devices and their communication parameters. Commands are sent by several different methods, depending on the application, to automate the flow of data. MicroSwitch models differ with regard to numbers of ports, port type (serial/parallel, DB25/RJ-45), and amount of buffer memory. See **Section 2.2** for explanatory illustrations of the front and rear panels of your MicroSwitch, as well as a diagram of a typical network setup.

2.1 Features

- Connect a wide range of devices to each other using serial or parallel ports.
- MicroLink software and other PC/MicroSwitch easy-operation utilities can be installed directly from the included disk.
- Optional MicroSwitch LAN Software allows file transfer and electronic mail among PCs.
- Operates automatically, by command line, or interactively, through menus.
- With appropriate cabling and adapters, works with most computers (PC, Macintosh®, mini, or mainframe computers) and peripherals (serial or parallel printers, plotters, modems, etc.).
- Users can contend for the first available port among a group of ports instead of having to memorize which port is connected to which device.
- All ports are programmable for input only, output only, or both input and output.
- The buffer memory can be expanded to up to four megabytes to support up to 64 queued jobs.
- Job-control menu can cancel, suspend, and reactivate queued jobs.
- Computers and terminals can access a port-connection menu for fast, no-nonsense destination selection.
- Printers can automatically connect, initialize, and form feed.
- Modem support includes auto hangup and commands for protocol and timeout.
- Your menu-driven setup configuration is saved in the MicroSwitches' nonvolatile memory, saving you the hassle of having to enter it again every time the switch is powered down.
- Front-panel LEDs display buffer capacity, data flow, and busy states for easy monitoring and troubleshooting.
- Diagnostic tests for internal memory and port loopback.

2.2 The MicroSwitches Illustrated

This section shows the front and rear panels of all of our MicroSwitch models, the cables and adapters you'll use with them, and a typical MicroSwitch system setup.

2.2.1 FRONT PANELS

Figure 2-1 shows the front-panel design shared by the MicroSwitches XS, XP, and XSP. (Even models with fewer than nine ports have all of the nine numbered LEDs.) Figure 2-2 shows the front-panel design of the MicroSwitch 17SPN.

The front panel gives visual feedback about the MicroSwitch's operation. The ADVANCE and SELECT buttons let you choose what information the LEDs display. The buttons and LEDs are also used to enter and display various diagnostic modes or show error conditions. The MicroSwitch is electronically controlled; the buttons and LEDs are used only in initial setup or for diagnostics. For more information about what the LED displays mean and how to control them with the buttons, refer to **Section 5.3**.

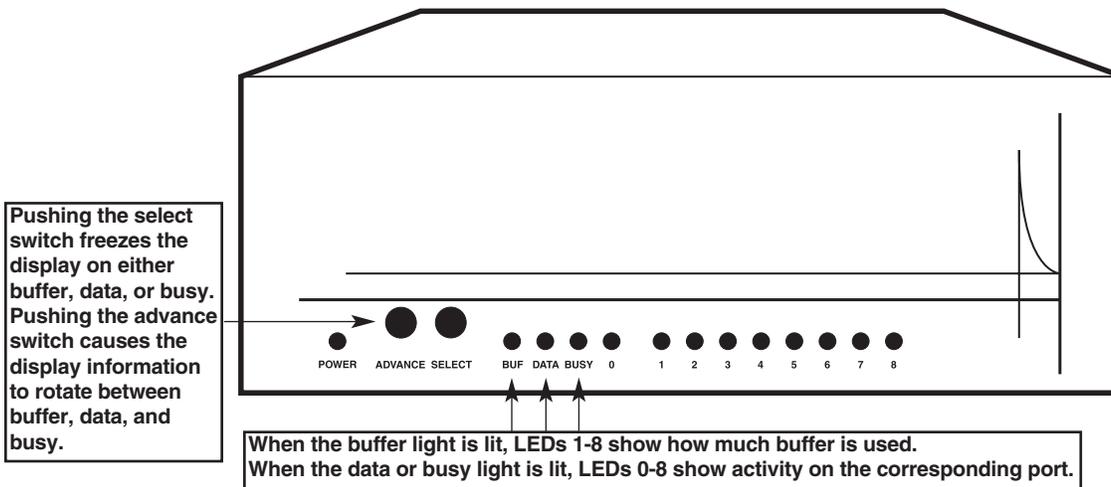


Figure 2-1. Front panel of the MicroSwitches XS, XP, and XSP.

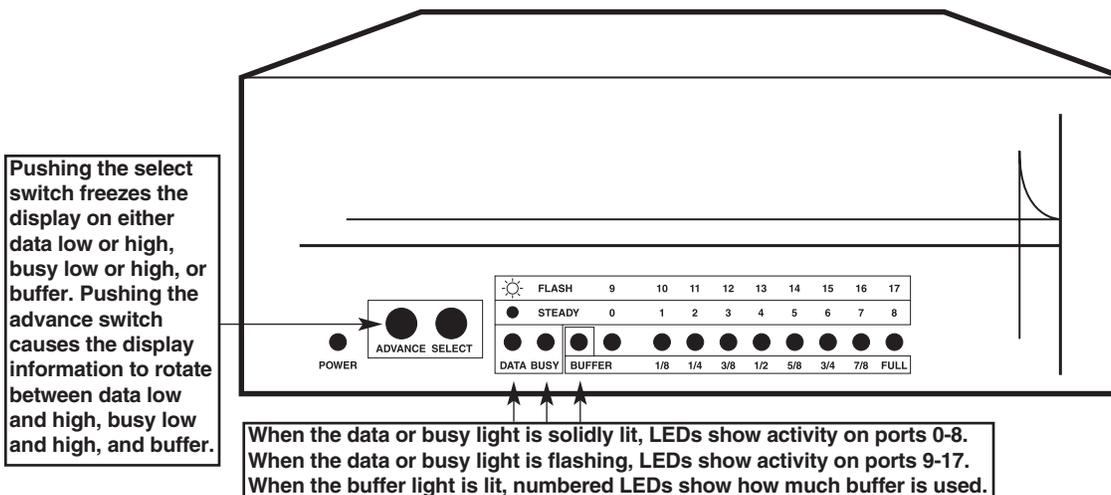


Figure 2-2. Front panel of the MicroSwitch 17SPN.

2.2.2 REAR PANELS OF THE MICROSWITCHES XS

Figure 2-3 shows the rear panel and connector arrangement for the MicroSwitch 9S. It has nine serial ports. The MicroSwitch 58 is similar but doesn't have Ports 5 through 8. Serial cables you can use to connect serial equipment to these MicroSwitches are shown in Figure 2-4. For other kinds of pinouts see **Appendix B**.

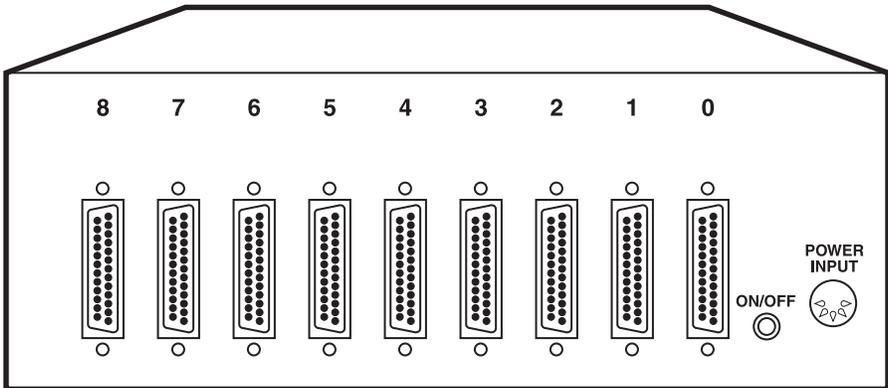


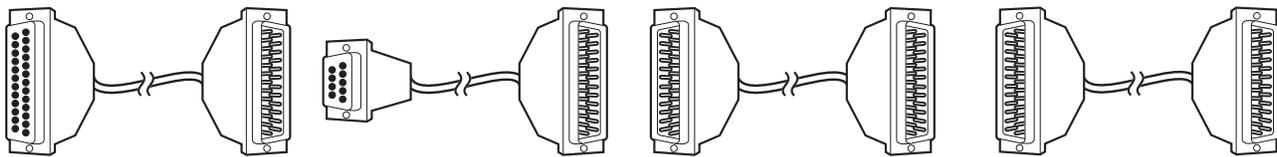
Figure 2-3. Rear panel of the MicroSwitch 9S.

Serial 25-pin PC to XS

9-pin PC to XS

Serial printer to XS

Modem to XS



EYN254C-MF Pinning:

EVNBPC Pinning:

EYN254C-MM Pinning:

ECN25C-MM Pinning:

23
 32
 77
 5, 6, 820

22
 33
 57
 1, 6, 820

23
 32
 77
 206

22
 33
 66
 77
 2020

Figure 2-4. The serial cables that can be used with MicroSwitches XS and their pinouts.

MICROSWITCHES

2.2.3 REAR PANELS OF THE MICROSWITCHES XP

Figure 2-5 shows the rear panel and connector arrangement for the MicroSwitch 9P. It has nine parallel ports. The MicroSwitch 5P is similar but doesn't have Ports 5 through 8. Parallel cables you can use to connect parallel equipment to these MicroSwitches are shown in Figure 2-6. For parallel pinouts, see **Appendix B**.

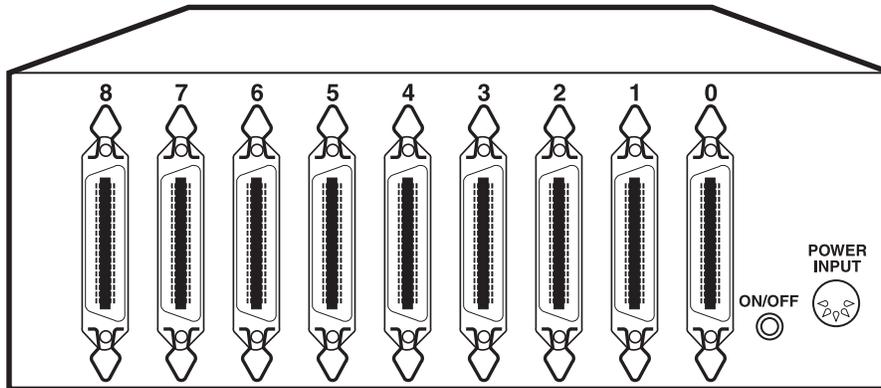


Figure 2-5. Rear panel of the MicroSwitch 9P.

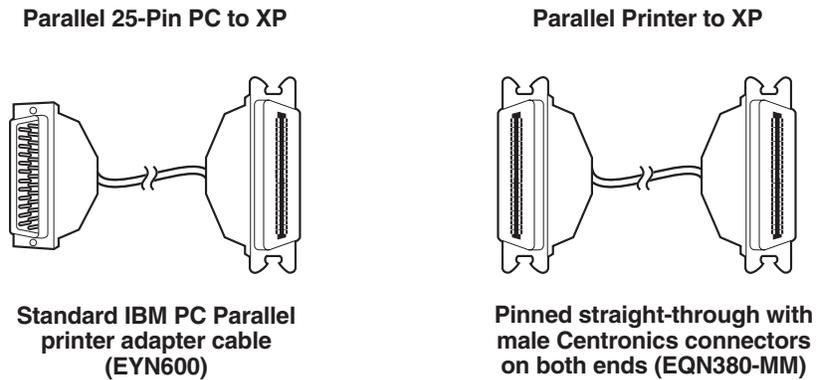


Figure 2-6. The parallel cables that can be used with MicroSwitches XP.

2.2.4 REAR PANELS OF THE MICROSWITCHES XSP

Figure 2-7 shows the rear panel and connector arrangement for the MicroSwitch 9SP, as well as an example of the modular cable and adapters you'll use to connect serial devices. The MicroSwitch 9SP has nine programmable serial/parallel ports. The MicroSwitches 3SP and 6SP are similar but don't have Ports 3 through 8 and 6 through 8 respectively. Specific cables you can use to connect parallel equipment to these MicroSwitches, and cables plus adapters to connect serial equipment, are shown in Figure 2-8. For serial and parallel pinouts, see Appendix B.

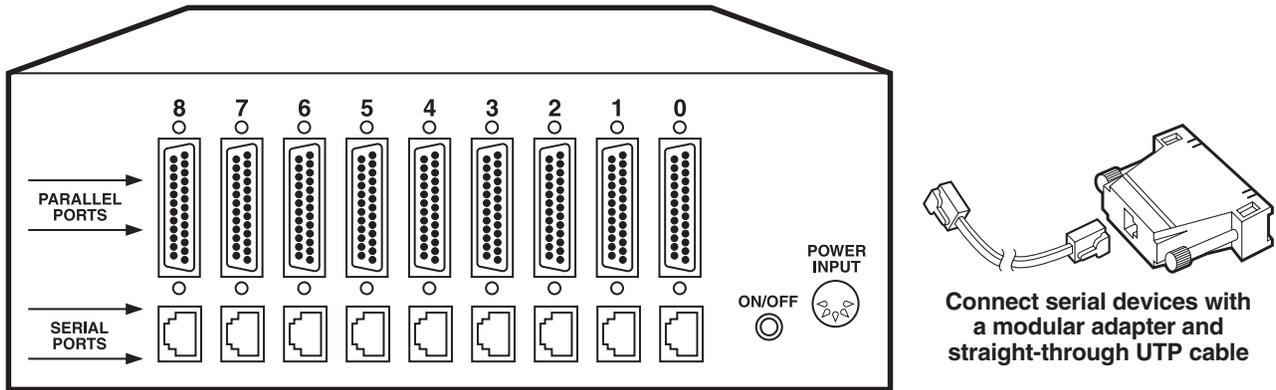


Figure 2-7. Rear panel of the MicroSwitch 9SP plus sample serial cable and adapter.

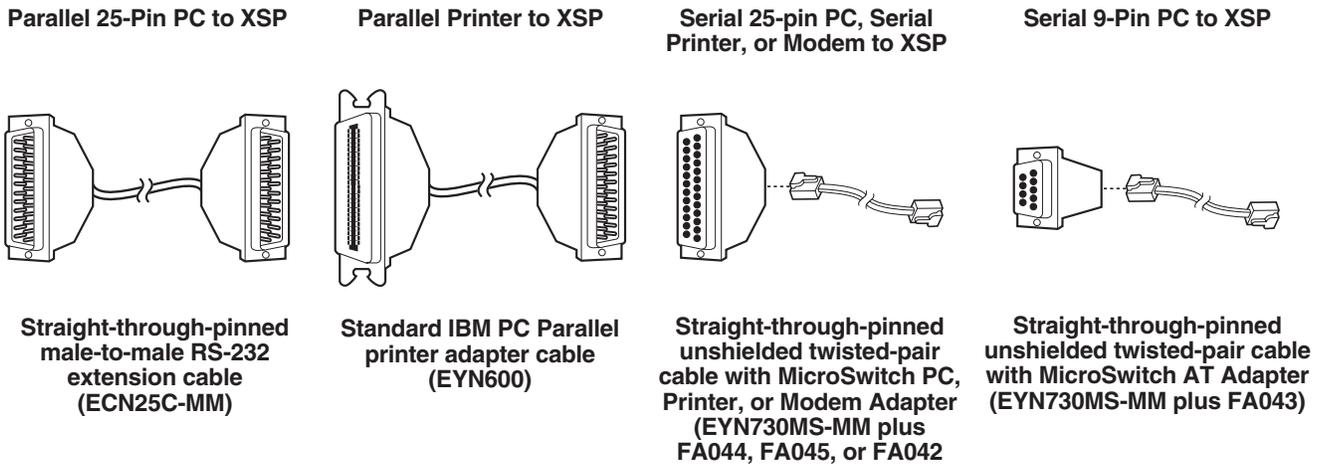


Figure 2-8. The serial cables and adapters that can be used with the Microswitch XSP.

MICROSWITCHES

2.2.5 REAR PANEL OF THE MICROSWITCH 17SPN

Figure 2-9 shows the rear panel and connector arrangement for the MicroSwitch 17SPN, as well as an example of the modular cable and adapters you'll use to connect serial devices. The MicroSwitch 17SPN has one parallel port and sixteen serial ports. Cable you can use to connect parallel printers to this MicroSwitch, and cable plus adapters to connect serial equipment, are shown in Figure 2-10. For serial and parallel pinouts, see **Appendix B**.

Note that parallel PC cable is not shown here because the MicroSwitch 17SPN's parallel port is configured for output (printers) only.

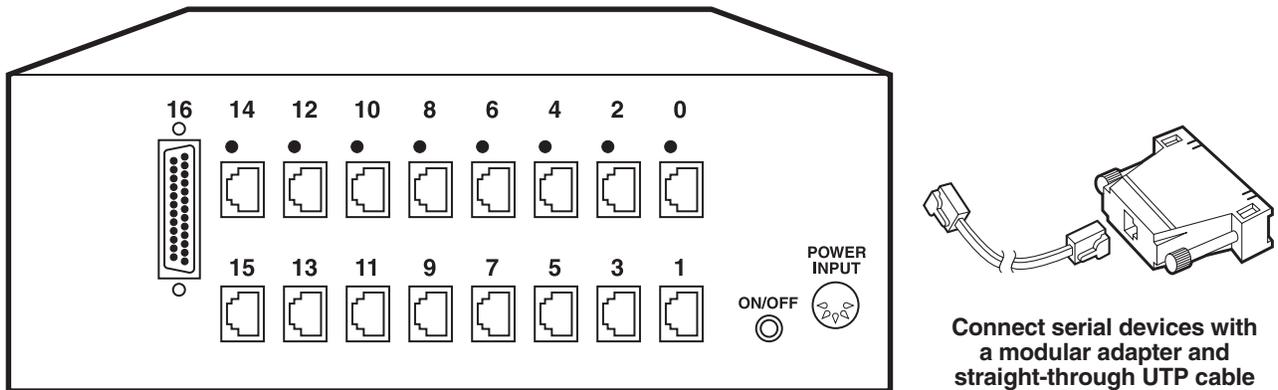
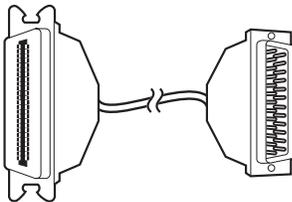


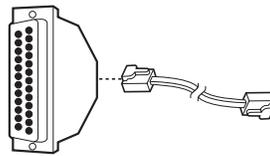
Figure 2-9. Rear panel of the MicroSwitch 17SPN plus sample serial cable and adapter.

Parallel Printer to 17SPN



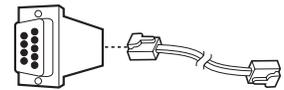
Standard IBM PC Parallel printer adapter cable (EYN600)

Serial 25-pin PC, Serial Printer, or Modem to 17SPN



Straight-through-pinned unshielded twisted-pair cable with MicroSwitch PC, Printer, or Modem Adapter (EYN730MS-MM plus FA044, FA045, or FA042)

Serial 9-Pin PC to XSP



Straight-through-pinned unshielded twisted-pair cable with MicroSwitch AT Adapter (EYN730MS-MM plus FA043)

Figure 2-10. The serial cables and adapters that can be used with the Microswitch 17SPN.

2.2.6 A MICROSWITCH SETUP

Figure 2- 11 shows a possible layout for a MicroSwitch 17SPN system.

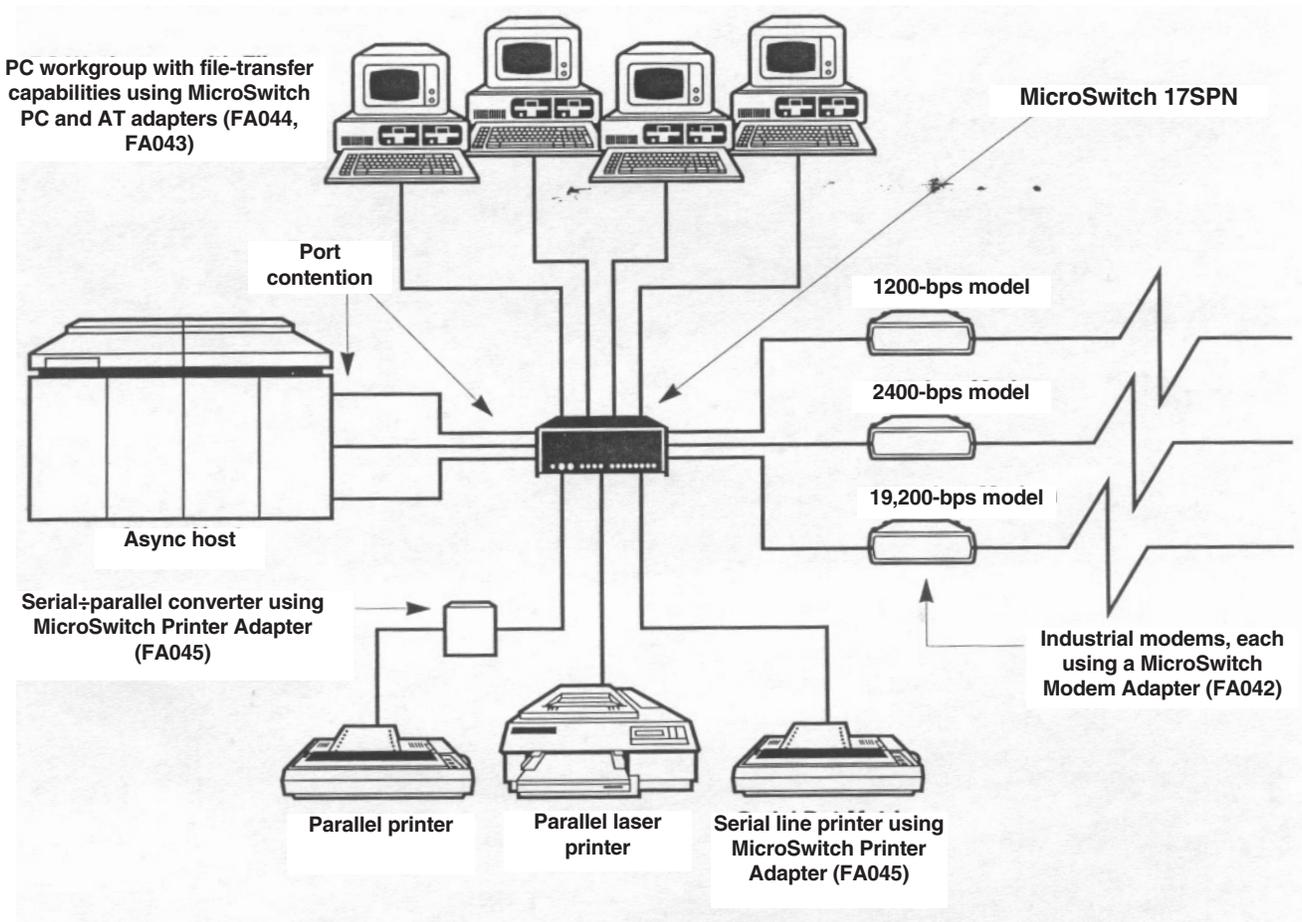


Figure 2-9. Rear panel of the MicroSwitch 17SPN plus sample serial cable and adapter.

2.3 Understanding The Basics

In order to make the best use of your MicroSwitch, we recommended that you read this entire manual. This particular section describes some basic concepts to help you understand what your MicroSwitch can do and how you can access its features.

2.3.1 DATA AND COMMANDS

Your MicroSwitch reacts to data and commands that are sent from your computer. A command is a special sequence of characters that your MicroSwitch interprets as a request to perform a function. The MicroSwitch reads these command characters, deletes them, and executes the function.

Any characters other than command sequences are treated as data (information to be relayed to another device). Data is either immediately sent or temporarily stored in the MicroSwitch's memory, depending on whether the destination device is busy or not.

2.3.2 AUTOMATIC OPERATION AND THE TIMEOUT PERIOD

The simplest method of sending data through the MicroSwitch, which you might want to use if most of your system users will be sending most of their data to one device or group of devices, is referred to as automatic operation. Data is sent to your MicroSwitch, which automatically routes it to a predefined destination that was established during the MicroSwitch system's initial configuration. No commands are sent, so the transmission is transparent (it seems to happen as it would if the sender and receiver were directly connected, without the Switch being there). Automatic operation relies on a programmable timeout period. If two or more users try to access a common destination at the same time, the MicroSwitch prevents their data from being intermixed; the first device to send data gets direct access to the destination, and data from the other devices is stored until the first device is finished.

As long as the first device continues to send, the Switch maintains the first device's exclusive connection to the destination; when the Switch senses that transmission has stopped, it activates its timeout timer. If transmission resumes before the timeout expires, the timer is reset and the Switch waits for the next pause. If, however, no data is sent for a duration equal to the timeout period, the first device is disconnected and the next user is automatically linked to the destination.

2.3.3 USING COMMANDS

A slightly more complicated but also more powerful way of sending data through the MicroSwitch is user-controlled operation. By sending commands directly to the MicroSwitch, users can choose among different destinations and control their data communication.

A command consists of a programmable prefix, a command character, and command arguments (values the command acts on). The prefix is a very special series of characters that is responsible for differentiating a command from data. The factory default prefix is "!@#\$. This corresponds to pressing [1], [2], [3], and [4] while holding down the [SHIFT] key on a PC keyboard. The most frequently used command is the "set destination" command. After receiving this command, your MicroSwitch will send data to whatever destination is specified. (If, for example, a user wanted to transmit to Port 6, he or she would send the Switch the characters "!@#\$6".) If the destination is busy and data is sent, the data will be stored and automatically sent when the destination device is ready.

Some of the other commands are used for diagnostic purposes. Others call up menus of destinations or of MicroSwitch functions. All the commands are listed in Table 5-1 in **Section 5.1**. You can send commands to your MicroSwitch in a number of ways. (It will execute commands the same way no matter how it receives them.) A few of the ways commands can be sent are listed in Table 5-2 in **Section 5.1**. The method you use will depend on your application.

3. Installation

If you are familiar with port-contention or line-sharing equipment, you might want to go directly to the Quick Setup Summary (**Appendix A**) for very brief directions on how to install and configure your MicroSwitch.

3.1 The Complete Package

Your MicroSwitch should have come with its own power supply, this manual, and a MicroLink utilities diskette with its own documentation. Save the original shipping box for possible future use.

3.2 Placement

The location of the unit is normally chosen to minimize the length of cable (including power-supply cords) running to it. For example, if the MicroSwitch is going to be used mainly for printer-sharing, you might want to place it right next to the printer. But if all the devices that will be sharing the printer are closer to each other than they are to the printer, it might make more sense to place the Switch close to those devices and run a single cable to the printer.

You will need a computer or terminal to configure the MicroSwitch. We recommend that you place it near the Switch, at least temporarily, to simplify installation. If the computer or terminal is permanently placed nearby, it will also make MicroSwitch system maintenance easier.

We also recommend that you plug the MicroSwitch's power supply into a surge protector along with all your other computers and peripherals. You might want to plug it into a power strip which has a separate power switch, so that the Switch powers up at the same time as the other computers and peripherals on the power circuit.

3.3 Cabling

Connect the MicroSwitch's power supply cord to the DC-power input jack on your MicroSwitch. Then run the cables (supplied separately) that will connect your other devices to the MicroSwitch, and attach them only at the device end. Don't connect any cables to your MicroSwitch except its power supply cord—and don't plug the MicroSwitch's power supply into an outlet—until all cables have been run and you're ready to start configuring the MicroSwitch's ports (as described in **Chapter 4**).

Please make sure you are using the correct cabling. The majority of installation problems are associated with incorrect cabling. Recommended cable pinouts for some devices are shown in **Appendix A**. If you'd like to attach a serial or parallel device that isn't listed there, call the company that manufactured it to get the pinout for the necessary cable.

3.3.1 SERIAL DEVICES

Since there are no clear industry standards on RS-232 cabling, caution must be observed when connecting your serial equipment to your MicroSwitch. A few cabling pinouts are listed in **Appendix A**. Your MicroSwitch's connector pinout is shown in **Appendix B**. Refer to **Appendix C** for a general discussion on connecting RS-232 signals.

Normal-use serial cables (RS-232 extension cable, unshielded twisted-pair) can be run to a maximum distance of 50 feet (15.2 m). With low-capacitance cable (RS-232 extended-distance data cable), runs up to 500 feet

(152.4 m) at 9600 bps will usually work, depending on the environment. Serial speeds faster than 9600 bps will reduce the maximum serial-cable distance. Call Black Box Tech Support for assistance in determining what the maximum is in your system.

Cables should be kept as far as possible from fluorescent lights, motors, or transformers, which may create electrical noise.

3.3 .1.A PCs With Serial Ports

The cabling to the serial ports of your PCs is well-defined. Please refer to **Appendix A** for the proper pinouts. There are two common types of connector styles used for PC serial ports. The first is a 25-pin D-type male (DB25M) connector. The second is a 9-pin D-type male (DB9M) connector. Parallel ports, on the other hand, normally have 25-pin D-type female (DB25F) connectors. A common cabling-related problem in system configuration is to determine which PC serial port is COM1 and which is COM2. This can be complicated by the presence of an internal modem. If you are not sure which is which, the diagnostic program on the MicroLink utility diskette can determine this.

3.3 .1.B Other Computers With Serial Ports

Please refer to **Appendixes A, B, and C** for help in determining the pinout. If you are using the X-ON/X-OFF protocol, only 3 wires on your MicroSwitch are necessary: Pins 2, 3, and 7. If you are using hardware handshaking, wire DB25 Pin 20 or RJ-45 Pin 3 on your MicroSwitch to the “buffer full” input signal on the computer.

3.3.1.C Printers With Serial Ports

Please refer to **Appendixes A, B, and C** for help in determining the pinout. If you are using the X-ON/X-OFF protocol, only 3 wires on your MicroSwitch are necessary: Pins 2, 3, and 7. If you are using hardware handshaking, wire the “buffer full” signal on the printer to DB25 Pin 6 or RJ-45 Pin 2 on your MicroSwitch.

3.3.1.D Modems

Please refer to **Appendix A** for modem cabling. The pinouts on modems are fairly standard. Normally a one-to-one (straight-through) RS-232 extension cable (product code: ECN25C) is used to connect modems to MicroSwitch XS units. To connect a modem to a MicroSwitch XSP or a MicroSwitch 17SPN, use a straight-through RJ-45 cable plus an adapter (EYN730MS-MM and FA042 respectively will work for most applications). The MicroSwitches use DSR input (Pin 6 on RS-232 cable and Pin 2 on RJ-45) as a “printer busy” signal for printers and a “data carrier detect” signal for modems. If you will be using a communication program which requires the “carrier detect” signal to go high when the modem connects, your PC’s or terminal’s serial port should have its “carrier detect” pin wired to the MicroSwitch port’s DTR pin (DB25 Pin 20 or RJ-45 Pin 3). Also, the modem should be configured to have DSR (Pin 6 on the modem’s connector) follow the modem carrier. On a Hayes® compatible 1200-bps modem, this is done with DIP switches. On a 2400-bps Hayes compatible modem, this is done by sending the modem the “AT&SI” command. Then the “AT&W” command should be used to save the setting.

3.3.1.E. Other Serial Devices

Please refer to **Appendixes A, B, and C** for help in determining the pinout for connecting various serial devices.

3.3.2 PARALLEL DEVICES

The single parallel port on a MicroSwitch 17SPN is configured as a printer port (output only) and cannot be changed. However, you can configure any parallel port on a MicroSwitch XP or XSP to be either a computer port (input) or a printer port (output). Before you connect any parallel cables to one of these Switches, follow the steps listed in **Chapter 4** to make sure you have each port configured to match its device. Parallel printer cables can be run to a maximum distance of 20 feet (6.1 m).

3.3.2.A. Parallel Computers (MicroSwitches XP)

Parallel-computer-to-MicroSwitch-XP cables are the same ones that would normally connect your computer to your printer. You probably already have one of these cables. These Master Switches have industry-standard female Centronics connectors, the same type used on most parallel printers. So, instead of connecting your computer cable to your printer, connect it to a parallel port on your MicroSwitch configured as a computer port.

3.3.2.B Parallel Computers (MicroSwitches XSP)

Parallel ports on the MicroSwitch XSP units have female DB25 connectors, the same type used in parallel ports on IBM® PCs. To connect a parallel computer to one of these MicroSwitches, you need a 25-pin straight-through cable with male DB25 connectors on both ends. Note that while the MicroSwitch 17SPN's parallel port has the same type of connector, it is permanently configured as a printer port and can't accept input from a computer.

3.3.2.C Parallel Printers (MicroSwitches XP)

MicroSwitch-XP-to-printer cable should have 36-pin male Centronics connectors at each end. Run this cable from your printer(s) to the parallel port(s) on the MicroSwitch configured as a printer port.

3.3.2.D Parallel Printers (MicroSwitches XSP and 17SPN)

As mentioned in **Section 3.3.2.B**, these units have female DB25 connectors on parallel ports. These connectors have the same wiring as the parallel ports on IBM PCs. To connect a printer that has a Centronics female port for its input, you need a standard IBM PC parallel printer adapter cable. To connect a printer that has a female DB25 connector for parallel input, you need a 25-pin straight-through cable with male connectors on both ends.

4. Configuration

4.1 Configuration Methods

There are three ways you can configure your MicroSwitch:

1. With a PC, by a series of questions and answers under the control of a program called MSCONFIG on the MicroLink utilities diskette.
2. Through its native configuration menu, which requires a terminal or a terminal-emulator. (The MSLINK program on the MicroLink utilities diskette has a terminal-emulator feature.)
3. Through MicroSwitch LAN Software. For further information, see the MicroSwitch LAN Software manual.

Which method you use will depend on your equipment:

1. For PCs with serial ports (or both serial and parallel ports), use MSCONFIG (question-and-answer session) or the MSLINK terminal emulator (configuration menu). Both of these are on the MicroLink utility diskette. See **Section 4.1.1**.
2. For terminals or serial computers running a terminal-emulation program, use the configuration menu. See **Section 4.1.2** or **Section 4.1.3**.
3. For PCs with parallel ports, use MSCONFIG on the MicroLink utility diskette. See **Section 4.1.1**.
4. For other computers with parallel ports, see **Section 4.1.4**.

NOTES

Sections 4.1.1 and 4.1.2 assume that the PC's hard disk is drive "C:" and that there are two floppy drives called "A:" and "B:". When you configure your MicroSwitch, use the drive letters you've assigned on your PC.

XSP units are factory set to all serial. They must be configured using a serial device even if the unit is to be configured as all parallel.

4.1.1 CONFIGURATION USING THE MSCONFIG PROGRAM

The MicroLink utility diskette contains a program called MSCONFIG.EXE that you can use to configure your MicroSwitch. The program is designed to ask questions in a logical order about your equipment and transparently pass the proper responses to your MicroSwitch configuration menu. The questions concern the type of devices, their communication settings, names, and other parameters. The program is smart enough to verify correct cabling and determine if there are any other problems. The program prompts you for all the information and saves the configuration information on diskette for future reference.

The following steps describe how to copy the MicroLink utilities to your computer and how to run the MSCONFIG program. They assume you have a diskette drive A and a hard disk C, and also provide a somewhat simpler track of instructions for those who have a second diskette drive B.

1. If you have only one diskette drive, go to Step 2. If you have more than one, first make a copy of the diskette for backup purposes. With the MicroLink utility diskette in drive A and a formatted diskette in drive B, issue the DOS command:

```
COPY A: *.* B:
```

Store the original diskette and use the freshly made backup copy.

2. If you will be installing MicroLink on your hard disk, or if you only want to put it there until you can make a backup copy, load its files onto your hard disk, into its own directory. Otherwise, go to Step 3.

Make a sub-directory somewhere on the hard disk for MicroLink. For example:

```
MD C:\MICROLNK
```

Copy the MicroLink files into this directory:

```
COPY B: *.* C:\MICROLNK
```

3. Change the DOS default drive to the MicroLink drive/directory:

For hard disk: For diskette:

```
CD C:\MICROLNK              B:
```

4. If you've already made your backup copy, go to Step 5. Otherwise, take the original MicroLink diskette out of drive A and put a blank formatted diskette in its place. Make your backup copy by issuing the command:

```
COPY *.* A:
```

If you want to keep MicroLink on your hard disk, go to Step 5. Otherwise, issue the commands below to get rid of the copy of MicroLink on your hard disk and change the default drive to your backup diskette. First make absolutely sure you are in the hard disk's MicroLink directory:

```
DIR
```

If the response includes

```
Directory of C:\MICROLNK
```

and MSCONFIG.EXE and MSLINK.EXE are among the directory's filenames, proceed:

```
DEL *.*
```

DOS asks: Are you sure (y /N) ? Answer "y," then, when the DOS prompt comes up:

```
CD ..
```

```
RD MICROLNK    removes the empty directory
```

```
A:
```

5. Run the program by entering the command:

```
MSCONFIG
```

6. MSCONFIG will prompt you to enter all necessary configuration information. For further information on MSCONFIG, refer to **Section 7.4** of this manual.

4.1.2 CONFIGURATION USING THE MICROLINK TERMINAL EMULATOR

The MicroLink program called MSLINK on the utilities diskette has as one of its features a terminal emulator. You can run the MSLINK terminal emulator to access your MicroSwitch configuration menu from a serial computer. The example below uses the “/B” option to run MSLINK as a normal program. (You can also load it as memory-resident, so that it’s accessible from within other programs.)

The following steps describe how to run the MicroLink terminal emulator and access the configuration menu.

1. Make sure that you have made a copy of the MicroLink diskette and changed your DOS default drive to the MicroLink directory, as described in Section 4.1.1.

2. Run MicroLink from DOS but do not load it as memory-resident:

If the MicroSwitch is connected to serial port COM1:	If the MicroSwitch is connected to serial port COM2:
MSLINK /1/B	MSLINK /2/B

3. The MicroLink window should appear at this point. Call the terminal emulator and send the configuration-menu command by pressing the [F1] key.
4. The configuration menu should appear. Refer to **Section 4.2** for how to use the configuration menu. When you’re finished, exit the menu with the “EX” command. To return to DOS, hit the [ESCAPE] key twice.

4.1.3 CONFIGURATION USING A TERMINAL OR A DIFFERENT TERMINAL EMULATOR

The configuration menu is accessed by issuing the configuration command. In order to interact with the menu you must connect a terminal device to Port 0 (zero) of your MicroSwitch. This device may be a dumb terminal or a computer running a terminal-emulator program.

The following steps describe how to access the configuration menu from a terminal or terminal emulator.

1. Set the communication parameters of your terminal or computer to 9600 bps, no parity, 8 data bits, and 1 stop bit.

NOTE

These are the factory-default settings for serial communication. If your MicroSwitch has previously been configured with different serial communication settings on Port 0, you must use those settings.

2. Enter the five characters “!@# \$C”.
3. The configuration menu should appear. Refer to **Section 4.2** for how to use the configuration menu. When you’re finished, exit the menu with the “EX” command. To return to DOS, hit the [ESCAPE] key twice.

4.1.4 CONFIGURATION THROUGH A PARALLEL PORT

Configuring a MicroSwitch on a parallel computer without using the MSCONFIG program involves putting configuration-menu commands in a file and then sending that file to the MicroSwitch's Port 0 (zero). Refer to **Section 4.2** for full details about the configuration menu. An example of a command string you could send as a file, to change Port 6 to a printer port and turn on its form-feed feature, is shown below. Line feeds are ignored, but a carriage return must follow each separate command. Comments listed on the right are for explanation only and should not be included in the file.

!@#\$C	Configuration command
TY	Change a port's type
6	Change Port 6
P	Change it to a printer port
N	Do not go on to next port
FF	Change a port's form feed
6	Change Port 6
Y	Yes, enable form feed
N	Do not go on to next port
EX	Exit configuration menu
!@#\$P	Print the new configuration to the default destination device for verification

In summary, if you want to configure your MicroSwitch from a parallel port:

1. Create a file containing the necessary menu commands and arguments. Include the "print configuration" command as the last line, so you can see and verify the new configuration.
2. Send the file to Port 0 of your MicroSwitch.

4.2 The Configuration Menu and Its Commands

Two sample configuration-menu screens (one for a MicroSwitch 9SP with 256K of memory, one for a MicroSwitch 17SPN with 2 MB of memory) are shown in Figure 4-1 on the next page. The configuration menu displays the configuration settings for all ports and allows you to change them. The item to be changed is selected with a two-letter abbreviation of the configuration item plus a carriage return. You are further prompted to answer questions appropriate for each parameter. The style of configuration is designed to allow you to easily configure by parameter for each port.

Here's an example: Replying NA for the "name" command after the "Enter choice" line causes the MicroSwitch to prompt you for names for the ports:

```
Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,FG,MA,SA,EX)  NA
Port 0 Enter port name (up to 8 characters)  PC Next port (Y/N)  Y
Port 1 Enter port name (up to 8 characters)  VAX Next port (Y/N)  Y
Port 2 Enter port name (up to 8 characters)  AT Next port (Y/N)  Y
Port 3 Enter port name (up to 8 characters)  CAD Next port (Y/N)  N
```

MICROSWITCHES

```

MicroSwitch configuration rev. 5.3
Memory = 256K   Timeout = 20 sec.   Minutes = 5 min.   Prefix = !@#$

PORT TYPE      NAME      DEST      PRI  TE  FF  INIT      PROTOCOL
0 Computer ANITA    NULL      Low  On                19200,N,8,1,DTR  ,Half
1 Computer DIANE  NULL      Low  On                19200,N,8,1,DTR  ,Half
2 Computer HAL    NULL      High On                19200,N,8,1,DTR  ,Half
3 Computer ERIC   NULL      Low  On                19200,N,8,1,DTR  ,Half
4 Computer NANCY  NULL      Low  On                19200,N,8,1,DTR  ,Half
5 Computer ROBERT NULL      Low  On                19200,N,8,1,DTR  ,Half
6 Modem  MODEM    NULL      Low  On                2400,N,8,1,XON P T,Full
7 Printer DRAFT                    On  .@                Parallel
8 Printer LASER                    Off .E                Parallel
A Group  GROUPA    Members are: 8
B Group  GROUPB    Members are: 8
Menu access      Members are: 6 7 8

TI - TIMEOUT VALUE  MI - MINUTES      PX - PREFIX      TY - TYPE
NA - NAME           DE - DESTINATION  PY - PRIORITY    TE - TIMEOUT ENABLE
PR - PROTOCOL       FF - FORM FEED    IN - INIT STRING  GR - GROUP LIST
MA - MENU ACCESS    SA - SAVE CHANGES EX - EXIT

Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,GR,MA,SA,EX)

```

```

MicroSwitch configuration rev. 5.3
Memory = 2MB   Timeout = 20 sec.   Minutes = 2 min.   Prefix = !@#$

PORT TYPE      NAME      DEST      PRI  TE  FF  INIT      PROTOCOL
0 Computer MATTO  NULL      Low  Off                9600,N,8,1,XON   ,Half
1 Computer JEANT1 NULL      Low  On                9600,N,8,1,XON   ,Half
2 Computer JOE2    NULL      High On                9600,N,8,1,XON   ,Half
3 Computer CLIFF3  NULL      Low  On                9600,N,8,1,XON   ,Half
4 Computer IRENE4  NULL      Low  On                9600,N,8,1,XON   ,Half
5 Computer JEANK5  NULL      Low  On                9600,N,8,1,XON   ,Half
6 Computer LOU6    NULL      Low  On                9600,N,8,1,XON   ,Half
7 Computer ROGER7  NULL      Low  On                9600,N,8,1,XON   ,Half
8 Modem  MPS10    NULL      Low  On                9600,N,8,1,XON   T,Full
9 Computer PORT9   NULL      Low  On                9600,N,8,1,XON   ,Half
10 Computer PORT10 NULL      Low  On                19200,N,8,1,XON  ,Full
11 Computer PORT11 NULL      High On                9600,N,8,1,XON   ,Half
12 Printer SPOOLER                    Off                19200,N,8,1,XON   ,Full
13 Modem  DATAPBX0 MONITOR  Low  On                9600,N,8,1,XON   P T,Full
14 Modem  DATAPBX1 NULL      Low  On                9600,N,8,1,XON   P T,Full
15 Printer MONITOR                    Off                9600,N,8,1,DTR   ,Half
16 Printer PRINTER                    Off                Parallel

A Group  GROUPA    Members are: 8
B Group  GROUPB    Members are: 8
Menu access      Members are: 6 7 8

Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,GR,MA,SA,EX,HE=help)
CD =Hi|RI =Lo|DSR=Hi|cTS=Hi| Format= 9600 8 1 None | ESC=return to menu

```

NOTE: This last line appears only when the configuration menu is invoked from the MSLINK program.

Figure 4-1. Sample configuration menu screens for a MicroSwitch 9SP (top) and MicroSwitch 17SPN (bottom).

Possible responses to prompts are listed in parentheses (see the note below). Responses may be entered in either upper or lower case. A final carriage return is required to enter the response. You may use the backspace key to correct your entry.

Entering only a return after a prompt that requests a name, number, or string of characters will leave that parameter unchanged (excepting the initialization-string prompt, at which a return will clear the string). Replying with only a return to a Y/N (yes/no) prompt will be interpreted as a “no” or will leave the parameter unchanged. You will be prompted for all responses. Messages will indicate invalid responses.

NOTE

The “enter port number” prompts appearing in examples of interactive screens in this manual all say, “Enter port number (0-8)”. Users of any MicroSwitch XS, XP, or XSP—even those with fewer than nine ports—will receive this text. (Users on units without the higher-numbered ports may enter only those port numbers that their MicroSwitch supports.) MicroSwitch 17SPN users will receive the text “Enter port number (0-16)” instead.

4.2.1 TIMEOUT (“TI”)

This timeout, also called the “seconds timer,” is used to automatically disconnect a device from its destination when the connection isn’t being used and someone else needs access to the destination. When no data is transmitted between a source port and a destination port for the length of this timeout period, the ports are disconnected.

The seconds timer is turned on when you choose destinations with one of the “set destination” commands (see **Section 5.1**) and when connections are made automatically to default destinations. Destinations selected through the port-connection menu have a “minutes timer” (refer to **Section 4.2.2**).

This type of timeout is most commonly used to regulate printer-sharing. If the default destination device might be idle for a relatively long time between transmissions in a communication session (a modem, for example), you might have to disable this timeout or force the Switch to use the “minutes timer” instead. See **Sections 4.2.8** and **5.1.13**.

The factory default is 20 seconds, but may be changed to any value from 1 to 254 seconds. To change the timeout, enter “TI” at the choice prompt and then enter the new timeout:

```
Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,GR,MA,SA,EX)  TI
Enter timeout in seconds (1-254)  20
```

4.2.2 MINUTES TIMER (“MI”)

The minutes timer is similar to the other timeout (see **Section 4.2.1**), but it is measured in minutes and is only invoked when a destination is selected from the port-connection menu or when the “minutes timeout enable” (“!@#\$T2”) command is issued. Refer to **Sections 5.1.10** and **5.1.13** for more information.

The factory default is 2 minutes, but may be changed to any value from 0 to 254 minutes.

NOTE

The minutes timer can be set to “0 minutes,” but we don’t recommend this. Such a setting will cause the MicroSwitch to time out as soon as it senses even a brief halt in communication.

MICROSWITCHES

To change the minutes timeout, enter “MI” at the choice prompt and then enter the new minutes-timer setting.

```
Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,GR,MA,SA,EX)  MI
Enter timeout in minutes (0-254)  5
```

4.2.3 PREFIX (“PX”)

The prefix is a series of up to 8 characters that identifies a character string being sent to your MicroSwitch as a command rather than as data. All commands are preceded by this string of characters. The factory default is the four characters “!@#\\$”.

Normally, you would change the prefix only when MicroSwitches are chained together, so that each MicroSwitch has its own unique prefix. If you are going to use a different prefix, it should be an unlikely sequence of characters that would not normally occur in a data stream, because anything that fits a MicroSwitch’s definition of a valid command is stripped out of the data stream and not sent to the destination device.

A new prefix is not stored in non-volatile memory until a “save configuration” command is entered: To change the prefix, enter “PX” at the choice prompt and enter the new prefix. A carriage return or null character (binary zero) may not be part of the prefix.

```
Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,GR,MA,SA,EX)  PX
Enter prefix (up to 8 characters)  %"&
```

4.2.4 TYPE (“TV”)

Use the “type” command to tell your MicroSwitch what type of device is connected to each port. The possible choices for a parallel port are “computer” or “printer.” The possible choices for a serial port are “computer,” “printer,” or “modem.” Port 0 may not be configured as a printer port.

On MicroSwitches with parallel ports, the factory default is set for the highest-numbered parallel port to be a printer port. All other parallel ports are factory-configured as computer ports. (The default destination of all computer ports is the highest-numbered port.) To connect a plotter or a data-collection device to a serial port on a MicroSwitch with serial ports, use “printer” as the device type and set the duplex in the protocol to full.

To change the type, enter “TY” at the choice prompt. Enter the port number from 0 to 8 (or 0 to 15 on a MicroSwitch 17SPN—port 16 can’t be anything but a printer port). Then enter the new device type “C”, “P”, or “M”. You can configure the type for the next port by answering “Y” at the “next port” prompt. Answer “N” to return to the configuration menu.

```
Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,GR,MA,SA,EX)  TY
Enter port number (0-8)  1
Port 1 Enter device type (C=computer, P=printer,M=modem)  M
Next port (Y/N)  N
```

4.2.5 NAME (“NA”)

The name, which can be up to 8 characters long, provides a familiar identification for a port. It is used in the job control menu and the status command. Do not use any spaces or special characters in the name.

To change the name, enter NA at the choice prompt. Enter the port number from 0 to 8 and then the new name.

```
Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,GR,MA,SA,EX)  NA
Enter port number (0-8)  0
Port 0 Enter port name (up to 8 characters)  PC Next port (Y/N)  N
```

4.2.6 DESTINATION (“DE”)

The default destination is the device that will be sent any data transmitted from the selected source port when your MicroSwitch is initially powered up. You may not choose the destination to be the source device itself or a parallel computer. Ports configured as printers can't be given a destination.

You can enter “A” or “B” for group A or B. Data will be sent to the first available port of a group when the destination is a group. You can also set the default destination to the “null port” by entering “N” on a MicroSwitch 17SPN or “9” on any other model. Data from a source port will be discarded when its destination is the null port.

To change the destination, enter “DE” at the choice prompt. Then enter the source-port number followed by the new destination-port number. In the example below, Port 3 on a MicroSwitch 5S is a computer port and Port 4 is a printer port.

```
Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,GR,MA,SA,EX)  DE
Enter port number (0-9,A,B)  3
Port 3 Enter default destination (0-9)  4 Next port (Y/N)  Y
Port 4 can't be configured with this parameter Next port (Y/N)  N
```

4.2.7 PRIORITY (“PY”)

The priority setting determines whether a port must abide by the order of queued jobs or whether it can override the normal order. If several ports are sending data to a common device and several jobs are queued up, data from a high-priority port will be placed before that of any low-priority device in the queue. Any job currently sending data to its destination is not disturbed or interrupted.

All computer or modem ports may be configured to have either low or high priority. Ports configured as printers can't be given a priority. To change the priority, enter “PY” at the choice prompt. Enter the port number followed by the priority “H” or “L”.

```
Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,GR,MA,SA,EX)  PY
Enter port number (0-8)  2
Port 2 Enter default priority (H=High,L=Low)  H Next port (Y/N)  N
```

4.2.8 TIMEOUT ENABLE (“TE”)

This command turns both the “seconds timer” and “minutes timer” timeouts on or off for a given source port. Disabling both of the timeouts allows the source port to make an uninterruptible connection. This capability is useful when linking to modems, because an automatic disconnection from a modem could be highly inconvenient or worse. It is also useful for extended sessions where there may be no data activity for periods of time longer than the duration of the timeout, such as communicating to a mainframe or a plotter. This command can’t be used for ports configured as printers.

NOTE

Disabling the timeouts is not recommended as a general practice, because an uninterruptible connection can accidentally or deliberately monopolize a destination port, causing other users to be locked out.

To turn the timeout on or off for a port, enter “TE” at the choice prompt. Enter the port number, then enter “Y” to enable the timeout or “N” to disable the timeout. Refer to **Section 5.1.13** for further information.

```
Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,GR,MA,SA,EX)  TE
Enter port number (0-8)  2
Port 2 Enable timeout (Y/N)  N Next port (Y/N)  N
```

4.2.9 PROTOCOL (“PR”)

The protocol for a serial port consists of the data rate (“baud rate”), parity, word length, number of stop bits, and flow control. You may configure the protocol separately for each port. New port configurations are not saved in non-volatile memory until the “save” command is issued.

When the MicroSwitch prompts you for flow control and you respond “X” for X-ON/X-OFF, the unit gives you three additional prompts. Of these, the “pulse DTR low” prompt gives you the option of dropping DTR for modem hangup or computer disconnection. Refer to **Section 5.2.1** for further information on the X-ON/X-OFF protocol. Refer to **Section 5.2.2** for more information on DTR pulse. The last prompt is for the port’s operation (duplex) mode. “Half-duplex” means data flows both ways, but only in one direction at a time. “Full duplex” means data can flow in both directions at the same time. Generally modems, plotters, and minicomputer ports are set to full duplex. PCs and printers are set to half-duplex. See **Section 5.2.5** for more information.

To change the protocol, enter “PR” at the choice prompt and answer the subsequent prompts.

```
Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,GR,MA,SA,EX)  PR
Enter port number (0-8)  0
Port 0 Serial or parallel (S/P)  S
```

[This question only appears on XSP units. Entering “P” ends the dialogue and the port’s protocol will appear in the configuration menu as “Parallel”. Entering just a carriage return leaves the serial/parallel status of the port unchanged. If Port 0 is changed to parallel, the change doesn’t take effect until you use the “EX” command to exit the configuration menu. At that time, the MicroSwitch will print the message “Port 0 changed to parallel” on Port 0’s screen.]

```
Enter baud rate
(19200,9600,7200,4800,3600,2400,1800,1200,600,300,150,134.5,110,75,50)  1200
```

[The baud rate selections for the MicroSwitch 17SPN are 19200, 9600, 4800, 2400, 1200, 600, 300, 150, and 75 bps.]

```

Enter parity type (N=none,E=even, O=odd,M=mark,S=space)  E
Enter word length (5,6,7,8)  7
Enter stop bits (1,2)  1
Enter flow control (D=DTR,X=XON/X-OFF)  X
Robust on ? (Y=yes,N=no)

```

[This prompt appears when you respond with “X” to the flow-control prompt. When robust is enabled, it is indicated in the configuration menu with an “R” following the XON field.]

```

XON/X-OFF codes into a port control its transmit data ? (Y=yes,N=no)

```

[This prompt appears when you respond with “X” to the flow-control prompt. When transmit-data control is enabled, it is indicated in the configuration menu with a “T” following the XON field.]

```

Pulse DTR low for 2 seconds upon disconnecting ? (Y=yes,N=no)

```

[This prompt appears whichever way you respond to the flow-control prompt. When pulse DTR is enabled it is indicated in the configuration menu with a “P” following the DTR or XON field.]

```

Enter duplex (F=full,H=half) port (Y/N)  N  Next port (Y/N)  N

```

4.2.10 FORM FEED (“FF”)

The form-feed option is used only for ports configured as printers. If form feed is enabled, the MicroSwitch will make sure the attached printer ejects to the next page following the end of a job.

When form feed is enabled on a given port, the MicroSwitch examines the last character of each print job sent to that printer. If it is not a form feed character, one is added. If the last character is a form feed, no action is taken so as not to waste paper. When form feed is disabled, the MicroSwitch won’t add form feeds, but it won’t take out form feeds that are already there.

The form feed option can’t be used for computer or modem ports. To change the form feed, enter “FF” at the choice prompt, give the port number, and answer “Y” to enable the form feed or “N” to disable it.

```

Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,GR,MA,SA,EX)  FF
Enter port number (0-8)  4
Port 4  Enable form feed? (Y=yes,N=no)  Y  Next port (Y/N)  N

```

4.2.11 INITIALIZATION STRING (“IN”)

When you set an initialization string for a printer port, it is sent at the beginning of each job that goes to that port. This is a convenient way to reset the printer before each print job. When you set an initialization string for a computer or modem port, it is sent at the beginning of each job from that port. On all MicroSwitches but the 17SPN, a computer or modem port’s string can’t be sent to a printer port, so the computer/modem string is primarily used to identify messages or files transmitted to other computers and modems. On a 17SPN, a computer or modem port’s string will override the string on a printer port. This means that the computer/modem string will be sent to the printer instead of the printer port’s string. So a 17SPN’s computer/modem strings are often used for more complex printer-control operations.

A string may be up to 8 characters long on all Switches but the 17SPN. 17SPN strings may be up to 64 characters long, but only the first 8 characters will appear on the configuration menu.

MICROSWITCHES

To change the initialization string, enter “IN” at the choice prompt, then enter the port number, then the string. Entering only a return at the “enter initial string” prompt will clear (disable) the string. Non-printable characters such as [ESCAPE] may be entered and will be displayed on the configuration menu as periods. However, only MicroSwitch 17SPNs allow carriage returns, line feeds, or null characters (binary zeros) to be part of the string (a null must precede each carriage return or line feed). On 17SPNs, initialization strings can be set with a direct command (see **Section 5.1.16**).

```
Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,GR,MA,SA,EX)  IN
Enter port number (0-8)  4
Port 4 Enter initial string (up to 8 or 64 characters)  .E
Next port (Y/N)  N
```

4.2.12 GROUPS (“GR”)

There are two groups: group A and group B. Up to 8 ports can belong to each group. When users request a connection to a group, they are connected to the first available port in that group. The example below demonstrates configuring group A to have Ports 5, 6, and 8 as its members. After this has been done, if one were to send data to group A and Port 5 was being used by another port, data would be routed to Port 6.

To select the members of a group, enter “GR” at the choice prompt, give the group number “A” or “B”, and then assign up to 8 ports as members of the group. Hit [RETURN] only when you’re finished selecting members of the group. If later you want to add or change members, you must re-enter all port numbers.

```
Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,GR,MA,SA,EX)  GR
Enter group number (A,B)  A
Enter group member (0-8), return only to terminate  5
Enter group member (0-8), return only to terminate  6
Enter group member (0-8), return only to terminate  8
Enter group member (0-8), return only to terminate  [RETURN]
```

4.2.13 MENU ACCESS (“MA”)

Menu access is used to determine which destinations will appear on the port-connection menu. Enter these port numbers the same way group-member ports are entered (see **Section 4.2.12**).

To select the destinations, enter “MA” at the choice prompt, then assign up to 8 ports that will appear in the port-connection menu. Hit [RETURN] only when you’re finished selecting ports. If later you want to add or change ports in the menu, you must re-enter all port numbers.

```
Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,GR,MA,SA,EX)  MA
Enter menu access member (0-9,A,B), return only to terminate  6
Enter menu access member (0-9,A,B), return only to terminate  7
Enter menu access member (0-9,A,B), return only to terminate  A
Enter menu access member (0-9,A,B), return only to terminate  [RETURN]
```

4.2.14 SAVE (“SA”)

The “save” command is used to store the prefix and port protocols in nonvolatile memory. All other parameters are stored instantly in nonvolatile memory. Subsequently powering up the unit will use the newly saved parameters as configuration settings.

The intention of the “save” command is to allow you to configure your equipment with temporary parameters. If you should happen to accidentally change a protocol or the prefix to values which are not compatible with your application software, you could lock yourself out of the MicroSwitch and be unable to use it. But, unless you’ve saved the new configuration, you can go back to the previous parameters stored in nonvolatile memory by cycling the power to your MicroSwitch. (There is also a provision to restore the default parameters to the unit even if you have saved bad parameters, discussed in **Section 8.4.3.**)

To save the parameters, enter “SA” at the choice prompt. A prompt to enter yes or no, to prevent accidental entry, will follow. You must answer “Y” at this prompt for the parameters to be saved.

```
Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,GR,MA,SA,EX) SA
Are you sure? (Y=yes,N=no) Y
```

4.2.15 EXIT (“EX”)

Use this command to exit the configuration menu and return Port 0 to the active state. Enter “EX” at the choice prompt. An exit message will be displayed.

```
Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,GR,MA,SA,EX) EX
Configuration terminated
```

4.2.16 HELP (“HE”)

This option appears on the “enter choice” prompt line of only the MicroSwitch 17SPN. (Please refer to Figure 4-1 at the start of **Section 4.2.**) The 17SPN’s configuration menu doesn’t display the list of abbreviations with the commands they stand for that appears in all other units’ menus, because this would cause some of the lines at the top of the menu to scroll off of the screen. To bring up this list, enter HE at the choice prompt.

5. Operation

If you have properly configured your MicroSwitch, it will be ready for operation. Users shouldn't need much more information to work with a MicroSwitch in automatic operation (each user sends data to one default destination). But if the Switch is set up for user-controlled operation, system users will need to know how to work with the MicroSwitch's direct-command set. Table 5-1 on pages 32 and 33 lists all the direct commands and Table 5-2 on page 33 lists possible methods of sending them to the Switch. You might want to copy these tables and distribute them to your users.

Refer to **Section 5.1** for specific details of each command. Your application will determine which commands are necessary and how the commands are to be sent. See **Chapter 6** for details on different applications.

Refer to **Section 5.2** for more information on your MicroSwitch's many software and internal-hardware features. **Section 5.3** explains the indicators and controls on the Switch's front panel.

5.1 Direct Commands

The commands give your MicroSwitch a lot of flexibility and give your users power to control the flow of data. Though many of the direct commands have counterparts among the two-letter configuration-menu entries, they often differ slightly in their capabilities. Each command is described here in terms of what it does and how it can be used.

A command consists of the MicroSwitch's command prefix, an individual command character, and optional command operands. For example, the command you would use to set your destination to Port 7, using the factory default prefix, is the five characters “!@#\$7”. Some command arguments can include non-ASCII binary characters, especially null characters and binary equivalents of decimal numbers. Since these binary characters are not printable (and you will not see them on your screen if you type them in at a terminal), they will be shown underlined in the examples in this section, as the corresponding decimal number: 15, .0, etc. These characters can be produced on some keyboards by holding down the [ALT] key while typing in the value on the numeric keypad (not the top row). On other keyboards they can be created by holding down the [CTRL] key and pressing [@] for .0, uppercase [A] for 1, uppercase [B] for 2, and so on, up to uppercase [P] for 16. Consult your device manual if you're not sure how to do this with your machine.

NOTES

All examples in this section use the factory-default prefix.

In the examples in this section, argument fields are sometimes separated by spaces to make the examples easier to understand. Do not include these spaces when you send actual commands.

5.1.1 SET DESTINATION TO PORT COMMAND**Syntax:** PREFIX + ASCII port number 0-8**Example:** !@#\$7

Use the “set destination” command to select anew destination port from among

- all ports on any model but the 17SPN, or
- Ports 0-8 on a MicroSwitch 17SPN.

You can't select your own port, a port connected to a parallel computer, or a higher-numbered port than you actually have on your unit (for example, “Port 7” if you have a MicroSwitch 6SP). If you enter the command incorrectly, the invalid characters will automatically be sent as data to the current destination port. Note that when you enter this command, you are not creating a connection. The connection is not actually made until you send data to the port.

If you send data but the destination doesn't process it right away, the destination might be busy: Another port might be connected to the destination, or the destination device might be flow-controlling the MicroSwitch OFF. In cases like this, any data you send will be stored in your MicroSwitch's buffer. When the destination port is ready for it, the stored data will be sent to the port. With the MicroSwitch 17SPN, to select a port numbered higher than 8 as your destination, use the “set extended destination” or “set ASCII destination” commands. See **Sections 5.1.15** and **5.1.17** respectively.

5.1.2 SET DESTINATION TO NULL COMMAND**Syntax:** PREFIX + ASCII character 9**Example:** !@#\$9

Each MicroSwitch has a “null port” software setting (it does not correspond to any real hardware port) that functions as a kind of “trash can” for spurious characters that devices can transmit when they're turned on or off. No data directed to this “port” will be transmitted or queued. No jobs will be created and no record will appear in the status display. In the configuration-menu display, this destination appears as NULL. You might want to set your port's destination to the null port before you power down your device, so that the MicroSwitch will discard any noise characters that it would otherwise interpret as data. Just remember to assign a real destination when you turn your device back on.

NOTE

The MicroSwitch 17SPN's Port 9 is not the null port. The null port is a software feature selected with “!@#\$9”. To select Port 9 as your destination on a 17SPN, send the command “!@#\$x9” or “!@#\$=009” (see Sections 5.1.15 and 5.1.17 respectively).

(text continues on page 34)

MICROSWITCHES

Table 5-1. The MicroSwitch's direct commands.

COMMAND	NAME	DESCRIPTION	RESTRICTIONS
0-8	Set destination to port	Select a single port to which all data transmitted from your port will be routed	None
9	Set destination to null	Force MicroSwitch to discard power-up/power-down junk characters transmitted from your port	None
A-B	Set destination to group	Selects a group of ports; data transmitted from your port will be routed to the first of these ports that becomes available	None
C	Configuration menu	Access configuration menu	Command can be sent from port 0 only
Dxx	Set remote destination	Select a destination for another port	Command can be sent from port 0 only
Fxxxxxx	Format	Set protocol of a port	Command can be sent from serial ports only; can only be used to set protocol of your port and modem ports
Ixx	Identify	Get configuration information about Microswitch and its ports	Command can be sent from serial ports only
Jxx	Job-control menu	Access job-control menu; view queue; cancel, hold, and release jobs	Command can be sent from serial ports only
KLL	Kill (cancel)	Remove a port's last job from the queue	None
M	Port-connection menu	Access port-connection menu to select a destination interactively; end a connection made from this menu	Command can be sent from serial ports only
P	Print configuration	Print configuration menu to current destination	Command can be sent from port 0 only
S	Status	Get status of the job queue	Command can be sent only from serial ports with a terminal or terminal emulator
Tx	Timeout enable/disable	Turns timeouts or command recognition on or off for your port	None
Vxxx	Verify	Get serial signal information or set DTR high or low	Command can be sent from serial ports only
Xx	Set extended destination	Same as "set destination to port," but supports MicroSwitch 17SPN ports 9-16	Port numbers must be entered in binary rather than ASCII

Table 5-1 (continued). The MicroSwitch’s direct commands.

COMMAND	NAME	DESCRIPTION	RESTRICTIONS
Zx...x0	Set initialization string	Set your port’s initialization string	Used with 17SPN computer ports only; string must end with (and cannot contain) a null character (binary zero)
=xxx	Set ASCII destination	Same as “set extended destination, but take 3 ASCII digits	Used with 17SPN only; leading zeros are significant—three digits must be sent regardless of the port number

Table 5-2. Methods of sending commands.

METHOD	DESCRIPTION
From a terminal or terminal emulator	The command is typed in manually from the keyboard or sent from a programmable function key or keyboard macro.
From MicroLink	You can easily send commands with MicroLink. It is invoked from a hotkey sequence. Your MicroLink utilities package includes the MSLINK terminal emulator, which allows you to enter commands directly from your keyboard (see above).
From MicroSwitch LAN Software	It is also easy to send commands using MicroSwitch LAN Software. It has many of the menu commands built-in. It is also invoked with a hotkey sequence.
From an application program	Many word-processor or spreadsheet programs can use initialization strings. These strings can be programmed to contain commands.
From a custom program	A custom program can be written to send commands to the MicroSwitch from your device.
From a batch file	You can write commands into a batch file. When the file is invoked, the commands will be sent to the MicroSwitch.
Embedded in other files	It is possible to send commands to the MicroSwitch while you are printing or transferring files. Embed commands in a file that will be transmitted through the MicroSwitch. As the file is going through the MicroSwitch, the Switch will sense the commands, strip them out of the file, and perform whatever function you have requested.

(text continued from page 31)

5.1.3 SET DESTINATION TO GROUP COMMAND

Syntax: PREFIX + ASCII character A or B

Example: !@#\$A

If destination ports have been assigned with the configuration menu to group A or group B, you can set your destination to one of these groups and you will be connected to the first available member port (that is, the first member port not being used by someone else).

Suppose group A is configured to consist of Port 7, a printer, and Port 8, another printer. If someone is currently printing to the printer on Port 7, and your destination is group A, when you send data it will be routed to the printer on Port 8.

5.1.4 CONFIGURATION MENU

Syntax: PREFIX + ASCII character C

Example: !@#\$C

Restriction: Valid from Port 0 only

This command is used to access the configuration menu from Port 0 only. The configuration menu is described in **Chapter 4**. Even though you can use the configuration menu to change communication protocols and so forth, this command may be issued while the system is online. Do not change the default destinations of active (currently transmitting) ports.

5.1.5 SET REMOTE DESTINATION COMMAND

Syntax: PREFIX + ASCII character D + binary source-port number + binary new-destination-port number

Example: !@#\$D1 2 sets destination of Port 1 to Port 2

Restriction: Valid from Port 0 only

The “set remote destination” command provides a way of connecting one port to another port from a third port (the MicroSwitch system console on Port 0). This is especially useful when it would be difficult or impossible for the two devices that need to be connected to send the necessary commands.

If a current job is in progress on a port and you change that port’s destination, the current job is terminated and a new job is started.

5.1.6 FORMAT COMMAND

Syntax: PREFIX + ASCII character F + *nbbpws* where:

n is the port number to be changed:

- For all but MicroSwitch 17SPN: ASCII port number 0-8 or M for “my port”;
- For 17SPN: ASCII port number 0-9, binary port number 0-15, or ASCII M for “my port.”

bb is the first two digits of the baud rate:

19=19200	36=3600*	60=600	11=110*
96=9600	24=2400	30=300	75=75
72=7200*	18=1800*	15=150	50=50*
48=4800	12=1200	13=134.5*	

*can't be selected for 17SPN units

p is the parity: N=none, E=even, O=odd, M=mark, S=space

w is the word length: 8 = 8 data bits, 7 = 7 data bits, 6=6 data bits, 5=5 data bits

s is the number of stop bits: 1 = 1 bit, 2 = 2 bits

c is the flow-control/operation-mode type: The members of each numbered pair of settings are mutually exclusive (choose one or the other, not both). Only one of these settings may be selected each time you send this command:

(1) D=DTR	X=X-ON/X-OFF
(2) F=Full duplex	H=Half-duplex
(3) P=Pulse DTR	p=Don't pulse DTR
(4) R=Robust ON	r=Robust OFF
(5) T=X-ON transmit control ON	t=X-ON transmit control OFF

MicroSwitch 17SPN only:

(6) L=Loopback mode ON	l=Loopback mode OFF
------------------------	---------------------

You can use commas to skip fields that don't need to be changed. Use one comma to skip each field except *bb*, which requires two commas.

Example: !@#F8 12 E 7 1 X sets Port 8 to 1200 bps, even parity, seven data bits, 1 stop bit, and X-ON/ X-OFF flow control

Example: !@#FM , , , , , H port sending command changes to half duplex, all other parameters are unchanged

Example: ! @#F12 19 N 8 1 D sets Port 12 on a 17SPN to 19,200 bps, no parity, 8 data bits, 1 stop bit, and DTR/DSR flow control

Restrictions: Can be sent from serial ports only; can only be used to set your port or modem ports; some baud rates not available with 17SPN (see above)

You can use the format command to temporarily change the serial protocol of your port or a modem port from its currently configured settings. The new protocol will not be saved in nonvolatile memory. When the unit is powered off, the default state most recently programmed and saved from the configuration menu is restored to all ports. This command is useful when you are engaging in wide-area communication and the modem at the

other end communicates at a speed different from the one at which your modem and MicroSwitch are set to relay data to each other. In such a situation, you can set your modem to the new speed (see the modem manual for how to do this), then send a format command to the MicroSwitch to set your modem's MicroSwitch port to the new speed. (You might also want to change the settings of your PC or terminal and its MicroSwitch port.) This way, you can take advantage of higher speeds and avoid buffering too much data at lower speeds.

When you send a format command that changes the protocol for your port, it takes effect immediately, so you'll have to change the protocol on your PC or terminal itself to match in order to continue communicating. You can also send a format command to make an on-the-fly change to the protocol of a modem port you are using. However, unless the modem has hardware protocol switches or is autosensing on its serial port, you will have to change the serial-port protocol of the modem itself before changing that of its MicroSwitch port. (Once you change the protocol of its MicroSwitch port, you won't be able to send software commands to the modem.)

Thirdly, you can change the protocol of a modem port that isn't being used before you establish a connection to the modem. The MicroSwitch will ignore any format command directed toward a printer port, any computer port but yours, or a modem port that is being used by someone else. Another use for this command is to adapt to older or simpler communication programs which operate at a single baud rate that can't be changed.

In the *c* field, selecting a different type of flow control (D or X) does not automatically affect the flow-control-related features (P, R, and T), and vice versa. Each of the numbered pairs of settings is independent of all the others. For example, X-ON/X-OFF flow control and pulse DTR can both be on at the same time. (Some modems hang up with a DTR pulse even if they are using X-ON/ X-OFF. Conversely, there are a few rare applications that use robust X-ON with DTR/DSR flow control.)

Regardless of whether the selected port is a valid port or not, or whether the syntax is correct or not, the format command will be stripped out of the data stream.

For MicroSwitch 17SPN only: You can test the device, cable, and MicroSwitch port that you're using by turning on loopback mode. (This is completely different from the loopback part of the "long test with loopback" diagnostic mode described in **Section 8.4**.) To turn loopback on for your port, send a format command with an "M" (for "my port") and an uppercase "L" in their appropriate positions, as described at the beginning of this section. When loopback mode is on, any characters you send to your port will be echoed back to you. You can turn loopback mode off by sending another format command that includes "M" and a lowercase "l". You can also turn loopback off by emulating a break: Lower the baud rate of your device, send a null character (binary zero), and raise the baud rate again.

5.1.7 IDENTIFY COMMAND

There are seven variations of this command. Use them to identify your port number, your port's destination, the MicroSwitch's ROM-revision level, the name of a port, the number of ports installed on your MicroSwitch, a port's type and operation mode (printer, computer, full/half duplex), and configuration (serial, parallel, or empty).

Your MicroSwitch returns a response to each of these commands. All letters in operands must be upper case. Invalid commands will be treated as data. All of these commands share the restriction that they can be sent from serial ports only.

IDENTIFY MY PORT NUMBER

Input Syntax: PREFIX + 3 ASCII characters IME

Output Response: Single binary port number

Example Input: !@#\$IME

Example Output: 5 *indicates your port is number five*

IDENTIFY DESTINATION

Input Syntax: PREFIX + 2 ASCII characters ID + single binary port number or ASCII M for "my port"

Output Response: Binary port number, ASCII letter A or B (group), or binary byte value 127 (null)

Example Input: !@#\$IDM

Example Output: 8 *indicates your destination is Port 8*

IDENTIFY ROM-REVISION LEVEL

Input Syntax: PREFIX + 3 ASCII characters IRE

Output Response: Two ASCII characters representing revision level of the MicroSwitch ROM

Example Input: !@#\$IRE

Example Output: 40 *indicates revision level 4.0 is installed (your revision level should be 4.0 or higher)*

IDENTIFY NAME OF PORT

Input Syntax: PREFIX + 2 ASCII characters IN + binary port number, ASCII A or B (group), or ASCII M (my port)

Output Response: 8 ASCII characters (a name shorter than 8 characters is padded with trailing spaces)

Example Input: !@#\$IN4

Example Output: SAMUEL [+ two spaces] *indicates name of Port 4 is "SAMUEL"*

MICROSWITCHES

IDENTIFY NUMBER OF PORTS INSTALLED

Input Syntax: PREFIX + 3 ASCII characters IQP

Output Response: Single binary byte (see note below)

Example Input: !@#\$IQP

Example Output: 2 indicates there are 2 (17SPN) or 3 (XS, XSP) ports installed (see note below)

NOTE

Microswitch 17SPNs do report the total number of ports installed, but all other Microswitches report the number of the highest installed port. Assuming your Switch is not a 17SPN, and assuming devices are attached to it consecutively from Port 0, this means the total number of ports is one more than the number it will report if you send it this command. A response of .4 indicates Ports 0, 1, 2, 3, and 4 are occupied, for a total of five ports. If your Switch isn't a 17SPN and there are vacant ports between your occupied ports, the response generated by this command could be misleading.

IDENTIFY TYPE AND OPERATION MODE OF PORT

Input Syntax: PREFIX + 2 ASCII characters IT + binary port number or ASCII M (my port)

Output Response: Binary byte ranging in value from 0 to 7, with three significant bits in the bit positions shown:

bit position 2 = 1 for half-duplex, 0 for full duplex

bit position 1 = 1 for modem, 0 for not a modem

bit position 0 = 1 for printer, 0 for not a printer

Example Input: !@#\$IT7

Example Output: 4 (bit 2= 1, bit 1=0, bit 0=0) indicates Port 7 is half duplex, not a modem, and not a printer (therefore, a computer port)

IDENTIFY CONFIGURATION OF PORT

Input Syntax: PREFIX + 2 ASCII characters IC + binary port number or ASCII M (my port)

Output Response: Single ASCII character: S for serial, P for parallel, X for empty (nothing attached to the port)

Example Input: !@#\$IC2

Example Output: S indicates Port 2 is a serial port

5.1.8 JOB-CONTROL MENU

Input Syntax: PREFIX + ASCII character J

Output Response: Interactive job-control menu (see below)

Example Input: !@#\$J

Restriction: Can be sent from serial ports only

The job-control menu is used to interactively view the job queue and cancel, suspend, and release individual jobs. The job-control menu has four possible choices for entries: SQ shows the queue; SJ suspends jobs; RJ releases jobs; and CJ cancels jobs. EX is used to exit from the job-control menu.

Invoking the job-control menu does not terminate the job in progress like the status command does. A job in progress is put on hold while you use the job-control menu, and is returned to normal status when you exit.

JOB-CONTROL MENU PROMPT

```

Job control menu from SAMUEL
SQ- Show queue      SJ- Suspend job
RJ- Release job     CJ- Cancel job
EX- Exit
Enter choice (SQ,SJ,RJ,CJ,EX)

```

SHOW QUEUE

The “show queue” option displays a list of all the jobs in the system. This display is identical to the status command’s (see **Section 5.1.12**). Enter “SQ” at the prompt and a job queue like this will be shown:

JOBNUM	SOURCE	DEST	STATUS	PRIORITY	TIMEOUT	LENGTH
0	JOHN	LASER	Connect	Low	Off	0
1	JEAN	LASER	Hold	Low	On	6

A “No jobs in the queue” message will be displayed if there are no jobs in the queue.

SUSPEND JOB

The “suspend job” option lets you suspend a particular job or all jobs from your port. A suspended job is inhibited from transmitting, but while it’s suspended no other jobs are allowed to use its destination. For example, if you send a file to a printer and the printer runs out of paper, you can suspend the job while you refill the paper tray without having to worry about the next job in the printer’s queue skipping ahead of you. For an example using the “suspend all future jobs” option, you could issue this command, send three print jobs requiring different letterheads, and release the jobs one at a time as you change the stationery.

To suspend a job, enter SJ at the prompt. You are then prompted for the type of suspension: Enter “N” for a particular job or “A” to suspend all future jobs originating from your port. If you enter “N,” you must enter the number of the job to suspend.

```

Enter choice (SQ,SJ,RJ,CJ,EX)  sj
Enter suspend type (N-number A-all)  n
Enter job number (0-63)  3

```

MICROSWITCHES

RELEASE JOB

The “release job” option undoes what “suspend job” does. It restores a suspended job to an active state and allows it to continue transmitting to its destination. “Release job” lets you release a particular job or cancel the suspension of future jobs from your port. Enter “RJ” at the prompt. You are then prompted for the type of release: Enter “N” for a particular job or “A” to release all future jobs originating from your port. If you enter “N,” you must enter the number of the job to release.

```
Enter choice (SQ, SJ, RJ, CJ, EX)  rj
Enter release type (N-number A-all)  n
Enter job number (0-63)  3
```

CANCEL JOB

The “cancel job” option allows a job to be removed from the job queue. This is used when a job has been accidentally sent to the wrong port or a decision is made to abort sending data. Enter “CJ” at the prompt.

```
Enter choice (SQ, SJ, RJ, CJ, EX)  cj
Enter job number (0-63)  2
```

This message appears if the job is properly cancelled:

```
Job cancelled.
```

This message appears if the job does not exist:

```
Job does not exist.
```

One or more of these warning messages may appear but will not prevent you from cancelling the job:

```
Job did not originate from your port.
Destination of job is not a printer.
Job is currently active.
Are you sure (Y/N)?
```

These warning messages indicate the job you have selected was not cancelled:

```
Job not cancelled. Will be displayed if you enter “N” at the “Are you sure?” prompt above
Job is on hold. Cancel not allowed. Jobs on hold from ports other than your port cannot be cancelled
Job is in net transaction. Cancel not allowed. A net job (created by MicroSwitch LAN Software) cannot be cancelled
Port is busy. Cancel is not allowed. The port is in the process of issuing a command
```

EXIT

The “exit” option terminates the job-control menu and returns your port to whatever state it was in before the menu was invoked.

```
Enter choice (SQ, SJ, RJ, CJ, EX)  ex
Job control menu terminated.
```

5.1.9 KILL (CANCEL) COMMAND**Syntax:** PREFIX + three ASCII characters KLL**Example:** !@#\$KLL *cancels last job sent from my port*

The kill command is used to remove a job from the job queue. It cancels the last job sent from your port. This command can be used multiple times to cancel previous jobs.

5.1.10 PORT-CONNECTION MENU**Syntax:** PREFIX + ASCII character M**Example:** !@#\$M**Restriction:** Can be sent from serial ports only

The port-connection menu is an interactive method of connecting to a destination. It displays a list of destinations which have been assigned with the “menu access” command of the configuration menu. You choose a destination from among those listed by entering its port name. An immediate response is given and you are connected to the port if it is available.

Once you have been connected through the menu, the only active commands are the “job-control menu” command, the “identify” command, and the “port-connection menu” command (which will now end the connection and return a disconnect message). The “minutes timer” is activated when you make a connection through the port-connection menu. It will automatically disconnect you (and send you a disconnect message) if no data is sent in either direction for the duration of the timeout and neither port is busy. The number of minutes in the minutes timer can be changed only by using the configuration menu. The timer can be disabled if necessary, or you can disable command recognition and force it to use the “seconds timer” instead (see **Section 5.1.13**). Upon exiting the port-connection menu you are automatically connected to the null port.

There are several possible results of using this command and the menu itself, depending on the availability of any destination you select and whether you are sending the command to invoke the menu or to disconnect. Here are some examples:

PORT CONNECTION MENU PROMPT

Port connection menu from JASMINE

Destinations are:

VAX MODEM LASER

Enter name of destination

SUCCESSFUL CONNECTION

Enter name of destination VAX

Connected to VAX

PORT NOT AVAILABLE, REQUEST QUEUED

Enter name of destination VAX

Waiting for VAX You are queued in position 1 with job number 1

Hit return key to abort waiting *Hitting any other key repeats this message*

MICROSWITCHES

PORT BECOMES AVAILABLE AFTER WAITING IN QUEUE

```
Enter name of destination VAX
Waiting for VAX          You are queued in position 1 with job number 1
Hit return key to abort waiting
Connected to VAX
```

PORT NOT AVAILABLE, QUEUING ABORTED

```
Enter name of destination VAX
Waiting for VAX          You are queued in position 6 with job number 6
Hit return key to abort waiting Return key is pressed
Waiting aborted
```

PORT AVAILABLE, BUT IS BUSY

```
Enter name of destination DRAFT
Connected to DRAFT
WARNING, destination is busy The destination port is flow-controlled off, or (if it's a modem) no modem carrier is present
```

INTENTIONAL DISCONNECTION

```
Disconnected from DRAFT !@#$M was sent after being connected to the destination
```

DISCONNECTION DUE TO TIMEOUT

```
Disconnected from DRAFT due to timeout No data was entered for the duration of the minutes timer
```

NO DESTINATION CHOSEN, ONLY A CARRIAGE RETURN ENTERED

```
Enter name of destination Return key is pressed
No destination chosen, menu exited
```

5.1.11 PRINT CONFIGURATION COMMAND

Syntax: PREFIX + ASCII character P

Example: !@#\$P

Restriction: Can be sent from Port 0 only

This command is used to send a copy of the Switch's configuration, as displayed in the configuration menu, to the current destination (normally, to be printed by a printer). It is valid from Port 0 only. The configuration data may be routed to any valid port by selecting a new destination before you send this command.

5.1.12 STATUS COMMAND

Syntax: PREFIX + ASCII character S

Example: !@#\$S

Restriction: Can be sent from serial ports with a terminal or terminal emulator only

This command displays all active and queued jobs. It can be sent from a serial port with a terminal or terminal emulator only. Issuing the status command will terminate any job in progress.

Here's a sample display:

```
Queue Status from AT           Destination is LASER

JOBNUM      SOURCE      DEST        STATUS      PRIORITY    TIMEOUT    LENGTH
0           VAX         LASER       Connect     High        On         49518
1           VAX         LASER       Queued      High        On         100444
4           AT          LASER       Queued      Low         On         2344
7           AT          LASER       Queued      Low         On         36543
2           VAX         LQ          Transmit    High        On         1234
3           MAC         MODEM       Active      Low         Off        0
5           PC          PLOTTER     Transmit    Low         On         95216
6           PC          MAINFRAM    Active      Low         Off        12
```

The jobs are displayed in ascending order of destination port. First the name of the port requesting the status and its current destination are displayed. A description label (a line of column headers) is then shown to describe the contents of each column that follows. If only the label is displayed then no jobs are present. A number is assigned to every job. This number is displayed in the “Job number” field. The source is the name of the port that sent the job. The destination is the port to which the job is being sent.

The “priority” field shows the priority of the job. There are only two possible states, either high or low. The “timeout” field shows whether the job has its timeout enabled or disabled. The “length” field shows how many bytes of the MicroSwitch’s buffer memory the job is using.

Here are the possible “status” field values and what they mean:

- **Connect:** The MicroSwitch is both receiving and transmitting the job (data is flowing from source to destination).
- **Receive:** The MicroSwitch is receiving the job but is storing it in the buffer because its destination is being used by someone else.
- **Queued:** The MicroSwitch has received the job in its entirety and is keeping it in the buffer because its destination is still being used by someone else.
- **Busy:** The MicroSwitch has received and stored the job and is waiting for the job’s destination device to signal that it is ready for the MicroSwitch to start transmitting.
- **Transmit:** The job was received and stored but is now being sent, or is about to be sent, to its destination.
- **Active:** The job represents a connection between a source and a destination, but no data is currently being sent between them (timer is counting down unless it’s been disabled).

- **Waiting:** Either (1) the job has sent all of its data to its destination but the destination became busy before the job could be disconnected, or (2) the job was started from the port-connection menu but is either waiting to be assigned a destination or is connected but has not yet sent any data
- **Suspend:** The job was suspended through the job-control menu.
- **Hold:** The job is currently on temporary hold due to interruption by either (1) MicroSwitch LAN Software, (2) someone accessing the job-control menu on the job's source port, or (3) someone sending an initialization string.

5.1.13 TIMEOUT COMMAND

Syntax: PREFIX + ASCII character T + ASCII character *n*, which can be either 0, 1, 2, or 3:

if $n = 0$ then timeouts are disabled

if $n = 1$ then timeouts are enabled

if $n = 2$ then the minutes timer is enabled but commands are ignored

if $n = 3$ then the seconds timer is enabled but commands are ignored

Example: `!@#$TO` *disable the timeouts on my port*

The “timeout” command is used to enable or disable the timeouts, as well as to temporarily disable command recognition. The timeout part of the command can be used when a connection is to be maintained for periods longer than the timeout duration and there is no data activity. You might want to disable the timeouts ($n = 0$) when communicating with a modem or a gateway to a mainframe. Re-enable the timeouts ($n = 1$) when communicating with a printer.

You might want to disable command recognition when a prefix might occur in a stream of binary data. The “enable minutes timer and disable command recognition” option ($n = 2$) could be used for downloading binary files through a modem. The “enable seconds timer and disable command recognition” option ($n = 3$) could be used for downloading fonts to a printer. Command recognition is automatically re-enabled as soon as the timeout expires.

Note that command options $n = 2$ and $n = 3$ allow you to invoke the timer that would not normally be in effect. If it's okay for command recognition to be off, you can force the MicroSwitch to use the minutes timer with a default destination or after a “set destination” command. Likewise you can force the seconds timer from the port-connection menu. This change is only effective for the duration of the connection during which the command is sent.

CAUTION!

Timeouts are not automatically re-enabled when you end your current connection. If you have disabled the timeouts with the !@#\$TO command, then until you turn them back on any connections you make will never time out. Re-enable the timeouts when you finish the job that required they be off, so you don't lock out your fellow users.

NOTE

We recommend that you use this command to disable the timeouts only when absolutely necessary.

5.1.14 VERIFY COMMAND

The three variations of this command are used for diagnostic purposes to verify that serial cables are correctly hooked up. The “verify echo” variant is used to verify that data is properly being transmitted and received from a serial port. An input value is sent. The returned value is a “ones complement” value of the byte sent: the input value and the output value will always add to 255. “Verify input” can determine if a port’s input’s are high or low. “Verify output” is used to set a port’s DTR high or low. This feature can be used to control devices connected to a port’s DTR. All three command variations share the restriction that they can be sent from serial ports only.

VERIFY ECHO

Input Syntax: PREFIX + 3 ASCII characters VEE + one byte of any value

Output Response: Complement of input byte value

Example Input: !@#\$VEE55

Example Output: 200 *echoes complement of input value*

VERIFY INPUT

Input Syntax: PREFIX + 2 ASCII characters VI + single binary port number or ASCII M (my port) + ASCII character 0 (zero)

Output Response: Single ASCII character 0 for low (negative voltage at pin) or 1 for high (positive voltage at pin) on DSR

Example Input: !@#\$VI20

Example Output: 1 *indicates DSR on Port 2 is high (positive voltage at pin)*

VERIFY OUTPUT

Syntax: PREFIX + 2 ASCII characters VO + single binary port number or ASCII M (my port) + ASCII character 0 for “set to low” (negative voltage at pin) or 1 for “set to high” (positive voltage at pin)

Example: !@#\$VO40 *forces Port 4 DTR to go low (negative voltage at pin)*

5.1.15 SET EXTENDED DESTINATION COMMAND

Syntax: PREFIX + ASCII character X + binary port number

Example: !@#\$X5 *sets my destination to Port 5; same as sending command !@#\$5*

Example: !@#\$X13 *sets my destination to Port 13; can't be done with the “set destination to port” command*

This command has the same function as the “set destination to port” command but has a binary number for an argument. Though it can be used to connect to any port on any MicroSwitch, the primary purpose of this command is to support connection to Ports 9 through 16 on a MicroSwitch 17SPN.

5.1.16 SET INITIALIZATION STRING COMMAND

Syntax: PREFIX + ASCII character Z + initialization string from 0 to 64 characters long + Q. (null)

Example: !@#\$ZPrintout from Roger's PC12 Q sets a banner page with form feed on the sending port

Example: !@#\$ZQ disables a string that was previously set with this command

Restrictions: Can be used to set initialization strings on MicroSwitch 17SPN computer ports only. Strings must end with (and can't contain) a null character (binary zero). This command allows on-the-fly changes to the initialization string set on a computer's port. An initialization string set in this manner overrides any default string set on a printer. Each string set by this command applies only to the computer from which the command was sent. A string that has been set with this command can be changed or disabled by using the configuration menu, but only the first eight characters of the string are displayed on the menu due to space limitations.

5.1.17 SET ASCII DESTINATION COMMAND

Syntax: PREFIX + ASCII character = (equals sign) + *ddd* (three-digit ASCII port number 000 to 016)

Example: !@#\$=015 sets destination to Port 15

Restrictions: Can be used with MicroSwitch 17SPN only. Leading zeros are significant; three digits must be sent regardless of the port number.

This command, which does the same thing as the "set extended destination" command, allows users to connect to MicroSwitch 17SPN ports numbered higher than 8 without using binary or control characters. This is useful for procedures using batch files or involving mainframe computers (which often have difficulty handling binary characters).

5.2 Other Features

5.2.1 DTR/DSR AND X-ON/X-OFF PROTOCOLS

The DTR protocol is also known as hardware handshaking, which refers to a separate signal line (often called “Busy/Ready”) used to meter the flow of data. A device like a printer can’t always accept data at a continuous rate. It must pause to manipulate its mechanical elements that are responsible for printing on the paper. During this time it must signal the sending device that it can not accept data. It does this by asserting a signal that says “I’m busy” (DTR lowered). When the printer has finished its adjustments and can accept more data, it changes that signal line to indicate “I’m ready” (DTR raised). On the computer there is a corresponding input that accepts the busy/ready signal and either permits or inhibits the computer from transmitting according to the state of the signal. A port configured as a modem type will not change the DTR line in response to busy or full conditions. “Busy” or “full” conditions on a modem link will be handled by your communications software.

The X-ON/X-OFF protocol is similar, but it does not use a separate signal line. Instead it uses two special data bytes, X-ON (binary 17) and X-OFF (binary 19), intermixed with the data. When a computer receives an X-OFF code, it is being instructed to halt transmitting. When an X-ON is received, the computer can resume sending data. A printer would be one of the types of devices that would send these codes, as it becomes busy and then ready again during its processing.

Each port on your MicroSwitch can be independently programmed to use one or the other of these protocols, so devices that use one protocol can be connected to devices that use the other. Your MicroSwitch is able to do this because it has a buffer and doesn’t have to pass through flow-control signals. For example, an X-OFF sent from a printer will not be relayed to the source device. The MicroSwitch can continue to receive the print job from the source and will store the data in the buffer. Only when your MicroSwitch’s buffer becomes full will it flow-control OFF the source device by sending an X-OFF or lowering DTR. When the buffer becomes sufficiently empty again, the MicroSwitch will flow-control the source back ON.

5.2.2 DTR PULSE

This is a feature that is used to hang up modems from their telephone connections. A computer causes a modem to hang up by sending a special software command or by lowering the DTR signal. Most communication programs lower DTR to hang up a modem. Your MicroSwitch passes through the signal from a modem’s carrier to the computer. It does not pass through the computer’s DTR signal from the computer to the modem. Instead your MicroSwitch can be programmed to pulse the DTR line automatically following the termination of a job. The modem port must be pre-configured with the pulse DTR option to enable this feature.

When a computer terminates a job to the modem, either by timeout or command, the modem port will pulse DTR low for two seconds. This hangs up the modem. That’s one less wire the cable has to carry from the computer to your MicroSwitch if you use this option.

Computer ports can also be configured for DTR pulse. When a job it originates is finished, such a computer port will have its DTR pulsed. Many mainframes and minis respond to the pulse as a signal to end the connection on the pulsed line.

5.2.3 ROBUST X-ON/X-OFF

Robust X-ON is a variation of the X-ON/X-OFF protocol. It can be configured on a port-by-port basis. Instead of sending an X-OFF code when the buffer becomes busy and sending an X-ON when the buffer is ready, either an X-ON or an X-OFF is sent once a second. If your MicroSwitch's buffer is full the Switch sends an X-OFF every second; when the buffer can accept more data, the Switch sends an X-ON every second. This protocol, which is used to prevent lockup of a port due to a missed X-ON, is required by certain programs.

5.2.4 X-ON TRANSMIT CONTROL

This is another variation of the X-ON/X-OFF flow-control protocol. When a computer communicates to a printer, X-ON/X-OFF flow control signals really need be sent only in one direction (from the printer to the computer). In some cases you might want your MicroSwitch to ignore flow controls from the source, but act on flow-control signals from the destination. One such case is a computer sending a graphics file to a printer. In the graphics data stream there may be numerous instances of X-ON and X-OFF codes which are not intended to be flow control, but are instead data representing part of an image. In this case the X-ON and X-OFF codes should not be acted on as flow control, but should be passed through as data. To do this the computer port would be configured with X-ON transmit-control disabled and the printer would have its X-ON transmit-control enabled.

If two computers are communicating through the MicroSwitch and they might send data equivalent to X-ON or X-OFF bytes, their ports should be configured for DTR/DSR flow control. If they have to be X-ON/X-OFF, then there's not much that can be done if their communication has to flow in both directions at the same time. But if you can keep communication strictly one direction at a time, you might be able to send the problem data by disabling X-ON transmit-control on the source port while keeping it enabled on the destination port.

5.2.5 HALF-DUPLEX AND FULL DUPLEX

This feature concerns the flow of information to a serial destination port. When it's connected to a source, a full-duplex destination becomes a "slave port"; its commands are not recognized until it's disconnected again. When it's disconnected, it can once again send commands to the MicroSwitch and be the initiator of a conversation. The MicroSwitch sends all data identified with a full-duplex slaved destination port back to the source: not only any data transmitted by the destination, but also all the data the destination receives. This is useful for modems, mainframe or minicomputer ports, and plotters, where once a connection is established the data going to the destination needs to be echoed back to the source.

A half-duplex destination will never have its commands disabled, and when it receives a message from another port, the data is simply absorbed, never echoed back. The device on a half-duplex port might be able to respond to data it receives by setting its destination to the data's source port and sending a reply. Half-duplex is the typical setting for PCs and serial printers, and MicroSwitch LAN Software takes full advantage of this capability.

Even if a printer port is set to half-duplex (the default setting), the MicroSwitch will ignore any data- it sends.

5.2.6 INITIALIZATION STRINGS

The primary purpose of an initialization string is to reset a printer to a known state at the beginning of a job. This prevents the printer settings of the previous user from affecting the next user's printout. The maximum length of an initialization string is 8 characters on all MicroSwitches but the I7SPN, on which strings can be up to 63 characters long. The most common string sent to a printer is its reset command, usually [ESCAPE] [E] or [ESCAPE] [@]. Refer to your printer manual for the characters you need to send.

The MicroSwitch will add a printer port's initialization string in front of any data sent to that printer. You can set such a string using the configuration menu; set the string on the printer port, not on the source ports.

You can set initialization strings on computer and modem ports, but on all MicroSwitches but the I7SPN these have a different purpose. These strings are sent to the destination only when it's a computer or modem instead of a printer. This can be used to identify where a message came from. As an example, assume that Port 1, a computer, has an initialization string of "ONE", Port 2 is a computer with a string of "TWO", and Port 8, a printer, has an initialization string of "EIGHT". If Port 1 sent Port 8 a print job consisting of the word "hello," "EIGHThello" would be sent out Port 8. If Port 1 sent Port 2 a file consisting of the word "goodbye", "ONEgoodbye" would be sent out Port 2.

Initialization strings on a MicroSwitch I7SPN may be up to 64 characters long and can be used to perform more complex tasks such as setting a font, page layout, etc. Strings set on a I7SPN's computer or modem ports will override strings set on its printer ports. Translating the example above to the I7SPN, the print job sent from Port 1 to Port 8 would be sent out of Port 8 as "ONEhello". These strings can be changed with the I7SPN's "set initialization string" command (see **Section 5.1.16**) and they come in very handy when you're chaining units together (see **Section 5.4**).

5.2.7 FORM FEED

Form-feed characters are used to separate jobs from one another. Some applications do not send a form feed and thus two print jobs may be printed on the same piece of paper. If most of your applications fall into this category, you might have to enable the MicroSwitch's automatic form-feed feature from the configuration menu (see **Section 4.2.10**).

This feature is designed not to waste paper. The MicroSwitch will look at the end of a job and will add a form feed only if there isn't one there already. This is very useful for sending page prints, which often do not have form feeds, and for laser printers when they have to get a form feed to eject the page.

If this feature seems to cause excess paper to be used, it's probably because an application is causing a form feed without sending a form-feed character. It might be sending either a series of line feeds or a form feed embedded in a string with other control characters. In cases like this, you might have to disable the MicroSwitch's form feed feature.

5.2.8 BUFFER CHARACTERISTICS

Your MicroSwitch uses an intelligent algorithm to allocate buffer memory. The buffer is dynamically allocated, which means that any port can utilize as much buffer as it needs. The buffer is divided into 256 memory-allocation units. Each input port will always have 1 or 2 memory units allocated to it. As data in the buffer is sent to its destination, memory units that become empty are reclaimed to be used again. When the buffer approaches maximum capacity, reclaimed memory is first distributed to ports that are actively receiving and transmitting, so that a lockout due to the buffer being full will not occur. MicroSwitch ports that are receiving data from a source but have not yet been connected to a destination are allocated memory only when enough is available to allow the other active ports to continue. Lockout could only occur if the buffer were completely full and all destinations were busy so that no memory could be reclaimed.

5.2.9 JOB ALLOCATION

Up to 64 jobs may be dynamically allocated. This is not the same as buffer-memory allocation. Each job is stored in memory as a separate entity, subject to be connected to its destination depending on its priority, its queue position, its cancel status, and any flow control received by the MicroSwitch.

5.3 The Front-Panel LEDs and Controls

The front-panel LEDs of your MicroSwitch display information on buffer capacity, data flow, busy states, errors, and diagnostics. You can control what the LEDs display with the two pushbutton switches labeled ADVANCE and SELECT. The front-panel display is helpful for initial installation and diagnosing problems that may occur.

5.3.1 POWER-UP SEQUENCE

When the unit's power switch is turned ON, your MicroSwitch goes through a power-up self-test of the main functions of its electronics. The leftmost LED, labeled POWER, should glow green, and the other LEDs (which are red) should all briefly light up as well. Then the unit will perform four tests, lighting up LEDs 1 through 4 as it does so. Errors are indicated by the BUF, DATA, and BUSY LEDs all lighting at once along with the numbered LED which corresponds to the error number. Figure 5-1 on page 52 shows the LED display sequence at power-up. Figure 5-4, also on page 52, shows the error displays.

5.3.2 OPERATIONAL DISPLAY

Following the successful completion of its power-up test, your MicroSwitch is ready for operation and begins to "scan" —display a standard cycle of information-with its LEDs. It alternates between each of three display states in this order (except on 17SPNs): buffer capacity, data transfer, and busy (flow control). When the BUF LED is lit, buffer capacity is being displayed. Likewise data transfer is being shown when the DATA LED is lit, and flow-control information is being shown when the BUSY LED is lit. One state is displayed for five seconds, then the next, then the next, and then it starts over.

On a 17SPN, data transfer is first, followed by busy and then buffer capacity, matching the order of the front-panel LEDs. Also, the data and busy states are each split into two: the DATA or BUSY LED is solidly lit while information about Ports 0 through 8 ("data/busy low") is displayed for five seconds, then the LED flashes while information about Ports 9 through 16 ("data/busy high") is displayed for another five seconds. Put together, a complete 17SPN scan of its five states (data low, data high, busy low, busy high, and buffer) lasts twenty-five seconds.

5.3.3 CONTROLLING THE DISPLAY WITH THE ADVANCE AND SELECT SWITCHES

The display can be quickly cycled through its three or five possible display states by pressing the ADVANCE switch. The display can be stopped on any of the states by pressing the SELECT switch. If you want the scan to resume, press the ADVANCE switch again.

5.3.4 BUFFER DISPLAY

This is the first of the LED display states to be entered (or last, if you're using a 17SPN) following the four power-up tests. The BUF LED is lit, indicating that information about buffer capacity is being displayed, and the numbered LEDs show the percentage of buffer memory that's currently being used (see Figure 5-3 on page 52). On all models except the MicroSwitch 17SPN, the normal empty (initial) condition is for LED 1 to be flashing, indicating that a small amount of memory has been allocated for receiving data. The 17SPN, when empty, just lights the BUF LED and leaves the other LEDs dark.

5.3.5 DATA DISPLAY

The data display is the second of the states (first on the 17SPN). It shows which MicroSwitch ports are currently transmitting or receiving data. The DATA LED is lit, indicating that data-transfer information is being displayed. If any of the numbered LEDs is lit, data is being transferred either into or out of the corresponding port. If a source port is actively connected to its destination (the MicroSwitch is relaying data as fast as it receives it), both the source and destination LEDs will glow steadily or flash as the data is transferred.

On the MicroSwitch 17SPN, data information for Ports 0 through 8 is displayed when the DATA LED is steadily ON. When the DATA LED is flashing, data information for Ports 9 through 16 is displayed.

5.3.6 BUSY DISPLAY

The last of the states (second on the 17SPN) is the busy display. It shows the current flow-control status of each MicroSwitch port. The BUSY LED is lit, indicating that flow-control information is being displayed on the numbered LEDs.

For ports attached to parallel printers, the corresponding LED shows the state of the printer's busy line. If the LED is continuously lit, the printer is either off line or disconnected. If the printer is receiving data, the LED flashes. If the LED is dark, the printer is either ready to receive or has been turned off.

For ports attached to parallel computers, the corresponding LED will be continuously lit or flashing when the computer is transmitting or receiving data, and dark when no data is being transferred.

For ports attached to serial equipment, the corresponding LED shows either DTR/DSR or X-ON/X-OFF flow-control status, depending on which protocol you've selected for each port. When the LED is dark, the MicroSwitch and attached devices are flow-controlled ON (normal data-transfer conditions). When the LED is lit, either the attached device is asserting DSR low or X-OFF or the MicroSwitch is asserting DTR low or X-OFF because its buffer is full.

As with the data display, busy information for Ports 0 through 8 of a MicroSwitch 17SPN is displayed when the BUSY LED is steadily ON. When the BUSY LED is flashing, busy information for Ports 9 through 16 is displayed.

MICROSWITCHES

	BUF	DATA	BUSY	0	1	2	3	4	5	6	7	8	
1st	●	●	●	●	●	●	●	●	●	●	●	●	All LEDs on
2nd	○	○	○	○	●	○	○	○	○	○	○	○	Test 1 EPROM
3rd	○	○	○	○	○	●	○	○	○	○	○	●	Test 2 64K buffer
	○	○	○	○	○	●	○	○	○	○	●	●	Test 2 256K buffer
	○	○	○	○	○	●	○	○	○	●	●	●	Test 2 512K buffer
	○	○	○	○	○	●	○	○	●	●	●	●	Test 2 1MB buffer
	○	○	○	○	○	●	○	●	●	●	●	●	Test 2 2MB buffer
	○	○	○	○	○	●	●	●	●	●	●	●	Test 2 4MB buffer
	○	○	○	○	○	○	○	●	○	○	○	○	Test 3 Static RAM
5th	○	○	○	○	○	○	○	●	○	○	○	○	Test 4 Nonvolatile RAM
6th	●	○	○	○	☼*	○	○	○	○	○	○	○	Unit Operational <i>or</i>
6th	○	●	○	○	○	○	○	○	○	○	○	○	17SPN Unit Operational

Figure 5-1. The LED power-up display.

	BUF	DATA	BUSY	0	1	2	3	4	5	6	7	8	
	●	●	●	○	●	○	○	○	○	○	○	○	Error 1 EPROM
	●	●	●	○	○	●	○	○	○	○	○	○	Error 2 RAM buffer
	●	●	●	○	○	○	●	○	○	○	○	○	Error 3 Static RAM
	●	●	●	○	○	○	○	●	○	○	○	○	Error 4 Nonvolatile RAM

Figure 5-2. The LED error display.

	BUF	DATA	BUSY	0	1	2	3	4	5	6	7	8	
	●	○	○	○	☼*	○	○	○	○	○	○	○	Buffer is less than 1/8 full
	●	○	○	○	●	☼*	○	○	○	○	○	○	Buffer is 1/8 to 1/4 full
	●	○	○	○	●	●	☼*	○	○	○	○	○	Buffer is 1/4 to 3/8 full
	●	○	○	○	●	●	●	☼*	○	○	○	○	Buffer is 3/8 to 1/2 full
	●	○	○	○	●	●	●	●	☼*	○	○	○	Buffer is 1/2 to 5/8 full
	●	○	○	○	●	●	●	●	●	☼*	○	○	Buffer is 5/8 to 3/4 full
	●	○	○	○	●	●	●	●	●	●	☼*	○	Buffer is 3/4 to 7/8 full
	●	○	○	○	●	●	●	●	●	●	●	☼*	Buffer is 7/8 to 100% full
	●	○	○	○	●	●	●	●	●	●	●	●	Buffer is 100% full

* On a MicroSwitch 17 these LEDs would be off (○)

Figure 5-3. The LED buffer-capacity display.

LEGEND:

- indicates LED is not lit
- indicates LED is lit
- ☼* indicates LED is flashing

5.4 Daisy chaining MicroSwitches

MicroSwitches can be daisy chained to allow connection of more ports than exist on one unit. There are several methods of doing this, but the most straightforward way is to run a cable from a serial or parallel port (configured as a computer port) on one Switch to a matching port on another. Pinouts for cables between MicroSwitches are shown in **Appendix B**.

The first thing you need to do after connecting two MicroSwitches is to change the prefix on one of the units. Once this is done, you'll be able to send commands as data to one MicroSwitch through the other. This will allow you to select a destination attached to the opposite Switch by combining commands. A "set destination to a port on the other unit" command would consist of the prefix of the first Switch + the port on the first Switch to which the second Switch is attached + the prefix of the second Switch + the desired port on the second Switch.

For example, assume two Switches are connected by a cable running between each Switch's Port 8. Assume Switch 1's prefix is "!@#\$" (the factory default) and Switch 2's prefix has been changed to "\$#@!". You are on Port 4 on Switch 1 and want to connect to Port 6 on Switch 2. Send the double command `!@#$8 $#@!6` to make the connection. The first command in the string (`!@#$8`) connects you to Port 8 on the first Switch, which is attached to the second Switch. The second command (`$#@!6`) connects you to Port 6 on the second Switch.

There is a side effect to be aware of. When you use only one Switch, you can send ten different files, one after the other, after setting your destination only once. Suppose, however, you issue the command above, send one file, and pause for a minute while you get the second file ready. While you're at it, another port on Switch 1 issues the command `!@#$8 $#@!5` to connect to Port 5 on Switch 2. This has the effect of switching your destination: If you send the second file now, it will go to Switch 2's Port 5 instead of Port 6. Therefore you must send a "set destination" command before every time you send data to a port on the second Switch, unless the first Switch is a 17SPN (see below).

Another point to note is that only one person on either Switch could access a port on the other Switch at a time unless more than one cable was run between the Switches. Jobs from sources on one Switch intended for the same destination on the other Switch would queue up in the buffer of the source ports' Switch. Therefore the queue-status displays of a chained MicroSwitch might not accurately reflect the number of jobs waiting for a particular destination.

Daisy chaining with 17SPNs is done the same way. Just remember that to reach the higher-numbered ports, you'll have to use the "set extended destination" or "set ASCII destination" command instead. For example, if the prefixes are set as in the examples above, the units are connected through their Ports 12, and you want to reach Port 14 on Switch 2, you can send `!@#=$=012 $#@!=014` to do it.

If Switch 1 (the switch attached to the source port) is a 17SPN, there is a way to avoid having to manually send a "set destination" command before each job intended for a certain destination on Switch 2. You can use the "set initialization string" command to put the "set destination" command into your port's initialization string. The initialization string will automatically be sent to Switch 2 as soon as you connect to the port on Switch 1 that Switch 2 is attached to.

For example, assume Switch 1's prefix is "!@#\$" and Switch 2's is "%^&*". Assuming the units are connected through their Ports 1, sending the command `!@#$1` will connect you to Switch 2. Now, if you have several jobs that all need to go to a printer on Switch 2's Port 5, the command `!@#$Z %^&*5 0` will set your port's initialization string to "%^&*5". Begin sending data. Your initialization string will be tacked onto the front of each job you send, automatically routing the jobs to Port 5 no matter who else is reaching across the chain.

6. Applications

If you've read the previous chapters, you know that the MicroSwitch responds to many commands and that there are several ways of sending those commands. The key to using your MicroSwitch effectively is to blend its commands with convenient methods for sending them. To help you understand this process better, several common MicroSwitch applications are described below, with examples. The examples mainly feature PCs with DOS, but most of the techniques are usable by other computers and operating systems as well.

NOTE

The examples in this chapter use the DOS names LPT1 for the PC's parallel port and COM1 for the serial port. LPT2 and COM2 will work just as well.

6.1 Setting Up the Serial Port on Your PC

If you'll need to send data from your PC to the MicroSwitch through the PC's serial port, you must make sure that your PC is configured correctly. This involves redirection, the DOS command `MODE`, and possibly adjusting your application software.

6.1.1 REDIRECTION FROM A PARALLEL PORT TO A SERIAL PORT

Redirection is sending data directed to a parallel port to a serial port instead. DOS contains a built-in command (the `MODE` command) to do this. MicroLink has this redirection capability too—you can access it from MicroLink's pop-up window. The "print screen" operation from DOS is initially set to go to the PC's parallel port. If you're printing through the serial port instead, the data must be redirected.

There are two ways of sending data from your application program to your serial port:

1. You can initialize your application program (following the proper installation guidelines in its manual) to use the serial port. If you use this method, the application won't be able to access a local printer attached to the parallel port of the PC. The application also won't be able to use a baud rate different from its installed settings.
2. You can initialize your application to use the parallel port and then redirect it to the serial port. This method is more flexible and allows you to use both a printer on your MicroSwitch and an optional local printer attached to the PC's parallel port. It also allows you to run at baud rates different from the possible settings of the program—especially 19,200 bps, which is unreachable for many programs. This method is not applicable to programs which require a serial port, such as a communication program.

6.1.2 USING THE DOS "MODE" COMMAND TO REDIRECT YOUR DATA

You must initialize the serial port on the PC before you use it. To do this from DOS you must enter the appropriate `MODE` command. For example the command to set the first serial port to 9600 bps is "`MODE COM1:9600,N,8,1,P`". Use the `MODE` command for data redirection as described in the previous section: the command line to redirect data from parallel port one to serial port one is "`MODE LPT1 : =COM1`". To get your PC to perform this redirection automatically, all the time, write this command line into your PC's `AUTOEXEC.BAT` file, which is used to initialize your computer when it is booted.

6.1.3 SETTING UP YOUR PC'S APPLICATION SOFTWARE

Your application software must be set up to match the protocol of the MicroSwitch port connected to your PC. If you will be using redirection, you must install your program to use the PC's parallel port. If your program is installed to use the PC's serial port, the communication settings of the serial port must match exactly the settings of the attached MicroSwitch port, including baud rate, number of data bits, number of stop bits, and parity.

Application programs fall into three major categories when it comes to how they interact with the PC's serial port:

1. Some programs have no communication parameter settings. They use the settings from the DOS command MODE. This is the most flexible and transparent type of program to use.
2. Some programs have, as part of their configuration, a communication parameter which must be set properly. Examples of this type of program are Lotus® 1-2-3® (can be set up for serial or parallel) and almost all communication programs (can be set for serial only). The parameters are set either within the program or with a separate installation program.
3. Some programs have fixed settings that can't be changed. Examples of this least flexible type of program are AutoCAD® and VENTURA PUBLISHER®. VENTURA PUBLISHER can at least be set up to use the parallel port and then redirected to the serial port. Many others of this type, such as AutoCAD (when it's used with plotters), can't. Also, this type of program is usually set to use X-ON/X-OFF protocol. With this type of program, you must set your MicroSwitch port's protocol to match the program's settings by using the MicroSwitch's "format" command.

6.1.4 RUNNING YOUR PC AT 19,200 BPS

Versions of DOS earlier than revision 3.3 do not have the ability to set the baud rate to 19,200 or greater. We have provided a utility on the MicroLink diskette, called B19200, to set the baud rate of either COM1 or COM2 to 19,200 (see **Section 6.1.5** for an example and refer to **Section 7.5.1** for more information). It also changes the parity to none, data bits to 8, and stop bits to 1.

6.1.5 USING A BATCH SHELL TO SET THE BAUD RATE

You can create a "batch shell" to temporarily change the communication settings of a port and then restore the previous settings. The example below shows a batch program that uses the "format" command to change "my port" on the MicroSwitch from its usual setting of "19200,N,8,1" to AutoCAD's fixed setting of "9600,E,7,1". The first send command also sets the destination of "my port" to Port 7 (a plotter). When the program is finished it restores the port to 19,200 bps and sets the destination to Port 8 (a laser printer). Note the use of the program B19200 to set the baud rate from 9600 to 19,200. The example also uses the SEND utility provided on the MicroLink diskette (see **Section 7.5.3**).

```
SEND 1 !@#$7!@#$FM96E71X Select Port 7 as my destination and set my port on the MicroSwitch to 9600 bps, even parity, 7 data bits, 1 stop bit, and X-ON/ X-OFF flow control
```

```
MODE COM1 : 96 , E , 7 , 1 , P Set my PC's serial port to match
```

```
ACAD Run AutoCAD
```

```
SEND 1 !@#$8!@#$FMI9N81D Select Port 8 as may destination and set my port on the MicroSwitch to 19,200 bps, no parity, 8 data bits, 1 stop bit, and DTR/DSR flow control.
```

```
MODE COM1 : 96 , N , 8 , 1 , P Set my PC's serial port to match, except for the baud rate
```

```
B19200 1 Boost the baud rate of my PC's serial port to 19,200
```

6.2 Printer Sharing

Most printer sharing with your MicroSwitch is done automatically. The only operation normally required is to set the destination, so that the correct printer will get the data. The following examples show methods of selecting the printer.

6.2.1 SELECTING A PRINTER FROM PCs BY USING DOS BATCH FILES

There are several DOS commands that might seem like they're able to send MicroSwitch commands to your MicroSwitch, such as PRINT, ECHO, or COPY. In practice, PRINT and ECHO both have side effects which make them unusable. PRINT adds form feeds to whatever you try to print, and ECHO adds a carriage return and line feed to everything you send. COPY can send only files or characters typed into the keyboard. On the MicroLink utility diskette we have provided a program called SEND, which sends a string without carriage returns, line feeds, or form feeds. SEND is simpler than COPY for use with DOS batch files.

First, decide which devices you want as destinations and find out what their port numbers are. For example, let's assume you want to connect to Port 7, a laser printer, and Port 8, a line printer. Let's name the laser printer LASER and the line printer DRAFT. Create the following batch file and call it SELECT.BAT:

```
IF %1==LASER SEND 1 !@$7
IF %1==DRAFT SEND 1 !@$8
```

At the DOS prompt, type "SELECT LASER" to set your destination to Port 7. Type "SELECT DRAFT" to set your destination to Port 8. Alternatively, you could create two files: one called LASER.BAT and the other called DRAFT.BAT. LASER.BAT would consist of SEND 1 !@\$7 and DRAFT.BAT would consist of SEND 1 !@\$8. At the DOS prompt, you would type LASER to select the laser or DRAFT to select the line printer.

In order to print, all you need to do is select your printer as described above, and then print as you normally would from your application or with the DOS command PRINT.

6.2.2 PRINTER SHARING FROM PCs BY USING MICROLINK

Selecting your printers with MicroLink is even easier. You must run MicroLink's SETUP program to configure it to your equipment (see **Section 7.3**). MicroLink is a very versatile utility that can pop up from any program and send any command to your MicroSwitch. You can also access your MicroSwitch's configuration menu by sending "!@\$C" from MicroLink's terminal emulator. See **Section 7.4.6** for how to use the terminal emulator.

6.2.3 ACCESSING A LOCAL PRINTER

You may have a local printer attached to the parallel port on your PC that you wish to access in addition to the printers on your MicroSwitch. You can use the DOS command "MODE LPT: =COM1" to redirect printer output to the COM1 port. You can cancel this redirection with the command "MODE LPT1: =,P". Any programs set to use the COM1 port won't be able to use the LPT1 port.

MicroLink has the ability to do pop-up redirection with its macro functions. It is much simpler and more flexible than the DOS command MODE. See **Section 7.3.4.B** for how to enter macro characters through the SETUP program. See **Section 7.4.5** for how to use MicroLink's popup menu.

6.2.4 SELECTING A PRINTER FROM WORD-PROCESSING SOFTWARE

Many software packages, such as WordPerfect®, have a flexible method for customizing the printer drivers used with the package. They often support initialization strings that allow you to add a destination command at the beginning of your print jobs. Please refer to your word-processing software's manual for more information.

6.2.5 PRINT-INTENSIVE ENVIRONMENTS

If you are producing large volumes of print, the MicroSwitch's grouping feature may be useful to spread out the output to multiple printers of the same model. Once group A or B has been configured on your MicroSwitch with the printer ports as its members, you can set your destination to the group and print jobs will automatically go to the first available printer.

6.3 Modem Sharing

Your MicroSwitch has all the features required for modem-sharing. In addition to the "set destination" commands, the "format" and "timeout" commands are usually the only ones necessary.

6.3.1 MATCHING THE BAUD RATE

Using a communication program will require you to match the program's baud rate and the baud rate on your MicroSwitch port. Say your PC's serial port and your MicroSwitch port are both set to 9600 bps and you want to dial out on a modem fixed at, or already set for, 2400 bps, attached to another port on your MicroSwitch (also set for 2400 bps). There are two ways to set up the rates:

1. Leave your PC's serial port and your MicroSwitch port at 9600 and set the communication program to 9600. The MicroSwitch will automatically "translate" speeds.
2. Issue a "format" command to set your MicroSwitch port to 2400, issue a DOS MODE command to set your PC's serial port to 2400, and leave the communication program at 2400. This will give you constant speed across the system. When you're finished with the communication program, you'll have to restore your MicroSwitch port and your PC's serial port to 9600.

6.3.2 USING THE TIMEOUT

The normal timeout (the "seconds timer") is often too short to be used in a modem-communication session. Print data normally comes in fairly continuous bursts, but a modem session may have significant periods of time where there is no data activity.

A modem session could be a connect session with a mainframe, featuring mostly user-computer interaction and screen-oriented data. For this, you could issue the timeout command "!@#\$T0", which would turn the timeout off and still leave you able to issue commands. Or you could make the connection using the port-connect menu, which would use the "minutes timer" instead.

A modem session could also be devoted to uploading or downloading of binary files. In this case, you might want to time out using the minutes timer *and* turn command recognition off with the timeout command "!@#\$T2". If the prefix's character sequence should happen to occur somewhere among the binary files, turning off command recognition will prevent the MicroSwitch from interpreting the sequence as a command (which could ruin your day).

6.3.3 DATA-CARRIER DETECTION BY YOUR MICROSWITCH

Communication programs detect successful connection to a remote modem in two ways. Very old programs like CROSSTALK® require a data-carrier signal to be present at the PC. Somewhat newer programs like ProComm®, designed for use with Hayes compatible modems, detect connection when the modem sends a string and do not need the carrier-detect signal.

A port on your MicroSwitch configured as a modem port can pass the data-carrier signal back to the computer. The cabling must be pinned and seated correctly, and the modem must be set correctly, before this can happen. The carrier signal from the modem (normally present on either Pin 6 or Pin 8 of its DB25 serial port) must go to DSR, DB25 Pin 6 or RJ-45 Pin 2, of your modem's MicroSwitch port. Your MicroSwitch passes it through to DB25 Pin 20 or RJ-45 Pin 3 on the computer's port. The PC's serial port must receive it on its DCD pin (Pin 8 for DB25 connector, Pin 1 for DB9 connector).

For a Hayes compatible 1200-bps modem to pass the carrier signal, the modem's DIP switch 6 must be set to "up." Note that, on this type of 1200-bps modem, the serial port's Pin 6 and Pin 8 are normally wired together. 2400-bps Hayes compatible modems have no DIP switches. Set Pin 6 to follow carrier by issuing the "AT&S1" command to the modem. Then you must save the setting in the modem with the "AT&W" command.

6.3.4 MODEM POOLING

Modem pooling lets any user connect to the first available modem in a group of modems. Once group A or B has been configured on your MicroSwitch with the modem ports as its members, you could connect to the first available modem by using the "set destination to group" command or through the port-connection menu.

6.3.5 AUTOMATIC CONNECTION TO A MODEM

You might want to automate access to a modem. Say several computers contend for a modem in your system and you want a program to run or not run depending on whether or not the modem is available. You could check on it manually by sending the MicroSwitch the "status" command, but by creating a batch file that uses the MSTAT utility on the MicroLink utility diskette, you can program modem jobs to run automatically when they sense that a modem is free. See **Section 7.5.7** for more information about MSTAT.

6.4 Plotter Sharing

Sharing a plotter is similar to sharing a printer. The destination must be chosen and the data rates and protocol (including flow control, usually X-ON/X-OFF) must match exactly. The cabling must also be correct.

6.4.1 SPOOLING PLOTTER JOBS

Often plotters are queried by plotting programs for a parameter such as paper size. This requires the plotter's MicroSwitch port to be configured as a full-duplex printer port, so that any responses sent by the plotter will be sent back to the computer. You cannot successfully spool (queue jobs) directly from a plotting program which requires feedback from the plotter every time a sheet of paper is loaded. The reason you can't queue jobs is that the program expects an immediate response from the plotter, which it won't be able to deliver if it's still plotting or processing data from previous jobs. A way around this problem is to plot to disk and spool the plot files.

6.4.2 BUFFERING PLOTTER JOBS

The idea of having a buffer in the MicroSwitch is to free up your computer. Instead of waiting for a plotter to catch up with you, you can send a large job all at once, and the MicroSwitch will store the data in its buffer so that the computer can continue working. The buffer should handle the plotting to completion. This is not always possible, however. Some applications are so slow that some plotters are able to plot the data as fast as the application can send it. There's no way to buffer this type of data-flow condition. Your MicroSwitch's buffering action is totally dependent on the application environment: the clock frequency of the computer, the efficiency of the plotting software, the speed of the plotter, the data rate of the communication port, the type of figures being plotted, and their placement on the page.

6.5 Spurious Characters from Power-Up

You can use the “set destination to null” command to prevent devices from sending spurious data to your MicroSwitch when they're turned on and off. When you turn a device on or off, it can produce a “transient” that your MicroSwitch interprets as data. The MicroSwitch will route such spurious data to the device's current destination, where it might appear as a few “garbage” characters at the top of a page or screen. However, if you set the destination to “null,” the transient characters will be ignored. A good method of implementing this feature on a PC is to add it to a batch file along with your hard-disk-parking utility, if you have one. Invoke the batch file just before you shut the computer off to select the null destination and park the hard disk.

Create a file called, for example, F.BAT:

```
SEND 1 !@#$9 Send the “set destination to null” command
FPARK Park the hard disk
```

To invoke F.BAT before shutting the computer off, enter “F” at the DOS prompt. Your MicroSwitch will be set to ignore transients and your hard disk (if present) will be parked. If you do this and you have a default or most-often-used destination, you might want to insert into your PC's AUTOEXEC. BAT file the line

```
SEND 1 !@#$n
```

where *n* is that destination's port number. When you turn the PC on, the destination will be set automatically.

6.6 Port Contention

Port contention means that a number of devices are trying to access (are contending for) a smaller number of ports. This is a common situation with multi-user VAX™ or UNIX® based systems: Since not all terminals in such a system are normally in use at the same time, several terminals can be connected to a port-contention device like the MicroSwitch, which in turn can be connected to one or more of the host ports. This allows more efficient use of system resources, but the tradeoff is that if more than one user wants access to the same port, somebody has to wait.

On the MicroSwitch, the port-connection menu is designed for this kind of application. Through the port-connection menu, any terminal can connect to an available host port. If all the host ports are busy, the request is queued up. A message is issued and the connection is made as soon as a host port becomes available. Refer to **Section 5.1.10** for more information. Ports can be placed on the port-connection menu with the configuration menu's “menu access” option (see **Section 4.2.13**).

6.7 Data Collection

Another common application for the MicroSwitch is to collect data from a group of instruments. The instruments are devices which you want to control from a master computer. You may want to listen to and possibly transmit data to them.

If you want to receive a “data log” (cumulative data) from an instrument only when you ask for it, you should configure the instrument’s port as a full-duplex printer port. As it transmits data, the data is stored in the MicroSwitch’s buffer. When you connect to a port, any data it has sent since your last inquiry is sent to your port in one lump sum. Keep in mind that if your MicroSwitch doesn’t have a UPS (uninterruptible power supply), a power failure will cause all data in the MicroSwitch’s buffer to be lost.

If you want to receive data from an instrument at the moment the instrument transmits it, you should configure its port as a full-duplex computer port. Configure its default destination to your main port (Port 0). You should configure Port 0 as a half-duplex computer port. With more than one such instrument in a setup, you might have a problem recognizing which data is coming from which instrument. In this case you could set initialization strings as instrument-port identifiers. Then you could recognize which port sent what data and possibly send replies. The “set remote destination” command allows you to connect instruments or peripherals to each other, on the fly, from a master port (Port 0). See **Section 5.1.5**.

7. MicroLink Software

7.1 Introduction to MicroLink

MicroLink is a communication program which is used to send control codes through the parallel and serial ports of your PCs to manage your MicroSwitches, printers, modems, and other peripherals. A control code is a sequence of characters that causes a device to do something: a printer to reset, a modem to dial a phone number, etc. The utility is accessed with a hotkey sequence, so you have instant control of your peripherals. Macro functions may be embedded in these control codes, which allow rerouting of printer output and changing of serial-port settings. When the hotkey sequence is pressed, a window with a list of functions appears. Each function is identified by a name and a function key and has a corresponding control code. Hitting one of the function keys causes the control code to be transmitted and any macro functions to be executed. The function names and corresponding function keys and control codes are defined when you run the MicroLink SETUP program. MicroLink, when used with a PC configured to communicate through one of its serial ports (COM1 or COM2), includes a pop-up terminal emulator. This allows you to establish two-way communications through your serial port at any time. This also allows you to receive status reports or access menus from your MicroSwitch and similar devices.

7.1.1 MICROLINK FEATURES

- Memory-resident, available instantly at any time
- Occupies less than 12K of memory
- Configurable function names and control codes
- Programmable hotkey sequence
- Can send control strings out COM1, COM2, LPT1, or LPT2 port
- Terminal emulator available from pop-up window
- Macro functions allow rerouting of parallel output, changing of serial port settings, etc.
- Screen-oriented setup and operation
- Co-exists fully with SideKick® and other resident utilities
- Multiple copies with different configurations and hotkey sequences can be loaded at the same time
- When memory-resident, can be updated from configuration program
- Can be run from DOS command line without staying resident in memory
- Differently colored pop-up windows for each communication port on color displays
- Not copy-protected

MICROSWITCHES

7.1.2 SYSTEM REQUIREMENTS

MicroLink requires an IBM PC/XT™ or PC/AT® or 100% compatible (including i386, i486, any-generation Pentium compatible, and PS/2® computers), 12K of free memory, and a 3.5" floppy disk drive. MicroLink runs under MS-DOS® or PC-DOS, versions 2.10 or higher, or any version of Microsoft® Windows® that supports DOS.

7.1.3 KEYBOARD CHARACTERS

Throughout this chapter, certain keyboard characters are represented in the following ways:

[RETURN] = Return (or Enter)

[ESC] = Escape

[CTRL] = Control

[ALT] = Alternate

[F1], [F2], [FM] = Numbered function keys

[PgUp], [PgDn] = Page Up and Page Down

[BKSP] = Backspace

[INS] = Insert

[DEL] = Delete

7.1.4 CONTENTS OF THE MICROLINK DISKETTE

The MicroLink diskette contains these files:

- MSLINK.EXE *MicroLink program*
- MSLINK.DAT *Sample configuration data file for MicroLink*
- SETUP.EXE *MicroLink configuration program*
- SEND.EXE *Serial string-transmission utility**
- SENDP.EXE *Parallel version of SEND.EXE**
- SENDFIL.EXE *File-transmission utility**
- SENDFILP.EXE *Parallel version of SENDFIL.EXE**
- SHERLOCK.EXE *MicroSwitch diagnostic program**
- MSTAT.EXE *Utility for checking the status of devices attached to a MicroSwitch**
- MSCONFIG.EXE *MicroSwitch interactive configuration utility**

*These are MicroLink utility programs specifically designed for use with your MicroSwitch. They are not required in order to use MicroLink. Refer to **Section 7.5**. MSCONFIG.EXE is described in **Section 7.6**.

7.2 Getting MicroLink Ready to Run

Step 1: Copy the MicroLink diskette and change the default drive to MicroLink's drive/directory. If you have already done these things as part of your MicroSwitch configuration, go to Step 2. Otherwise, see **Section 4.1.1**, steps 1 through 4.

Step 2: Configure MicroLink's function keys with the SETUP program. Start SETUP by typing SETUP at the DOS prompt and pressing [RETURN] (see **Section 7.3**). The SETUP display will appear, on which you can assign character/macro strings to MicroLink's function keys. Use the up-, down-, right-, and left-arrow keys to select fields. Use [TAB], [INS], [DEL], [HOME], [END], and [BKSP] with the printable-character keys to change fields. Any characters, including control characters, may go into SETUP's String Contents column. Assuming you're using a MicroSwitch, some of the default values for the fields should be usable.

When you are finished setting strings, press [F5], then press [PgUp] or [PgDn] until the desired communications device appears in the scroll bar. Then press [END]. Use [F2] to save your changes, which you will be asked to confirm. Then, use [F9] to exit SETUP, which you will also be asked to confirm.

Step 3: Set up your COM port If you are using a COM port for your communications, enter the appropriate DOS MODE command to set its communications parameters (see **Sections 6.1.2** and **6.1.5**). (If you will be using MicroLink through this port regularly, you might want to include this MODE command in your AUTOEXEC.BAT file if your PC already has one, or create an AUTOEXEC.BAT file to contain the command). An example of a MODE command: `MODE COM1:9600,N,8,1,P` sets COM1 to 9600 bps, no parity, 8 data bits, and 1 stop bit.

Step 4: Install MicroLink At the DOS prompt type MSLINK and press [RETURN]. An installation message will print:

```
MicroLink 2.0 (C)1988
I000 Successful installation
```

Other messages may print depending on how MicroLink is configured. MicroLink is now ready to use. (You may wish to include the MSLINK command in your AUTOEXEC.BAT file to load MicroLink automatically.)

Step 5: Invoke MicroLink. MicroLink may now be activated at any time by holding down [CTRL] and then pressing the [TAB] key. To transmit a string from the menu, press its designated function key, which will be a key in the range from either [F1] to [F8] or [SHIFT] + [F1] to [SHIFT] + [F8].

To enter the terminal emulator, press [F1]. To leave the terminal emulator or MicroLink press [ESC].

7.3 The SETUP Program

7.3.1 STARTING SETUP

You can invoke SETUP with the command:

```
SETUP [drive:\path\filename.ext]
```

“drive:\path\filename.ext” is an optional pathname you can add to the command line as an argument. You would have previously created this file with SETUP. SETUP will load this file into its display, where you can edit it. If you don’t specify a file, SETUP looks for MSLINK.DAT in the current directory.

If you don’t specify a file or if you specify a nonexistent file, and SETUP doesn’t find MSLINK.DAT in the current directory (this will be the case when you run SETUP for the first time), SETUP will still start, but it will show the status line:

```
Data file is missing or invalid!  F1 to create new or F2 to abort
```

You may press [F1] to continue, which will cause SETUP to begin with the factory-default setup, which you can use to create a new data file. Pressing [F2] will return you to DOS with no action taken.

In the example in Figure 7 -1, function [F3] has been given the title of “Connect to Port 3.” If this setup is saved, pressing [F3] from MicroLink’s pop-up window would transmit the five-character string “!@#\$3” out the current communications port (COM1, as shown at the bottom of the menu).

Main Menu		MicroLink 2.03 Setup
Key	Title on Pop-Up	String Contents
Norm :F1	Connect to Port 1	!@#\$1
Norm :F2	Connect to Port 2	!@#\$2
Norm :F3	Connect to Port 3	!@#\$3
Norm :F4	Connect to Port 4	!@#\$4
Norm :F5	Connect to Port 5	!@#\$5
Norm :F6	Connect to Port 6	!@#\$6
Norm :F7	Connect to Port 7	!@#\$7
Norm :F8	Connect to Port 8	!@#\$8
Shift:F1	Connect to Port 0	!@#\$0
Shift:F2	Configuration mode	296N811296N812!@#\$C3
Shift:F3	Network status	!@#\$S3
Shift:F4	Job-control menu	!@#\$J3
Shift:F5	Port-connection menu	!@#\$M3
Shift:F6	Connect to nothing	!@#\$9
Shift:F7	Timeout disable	!@#\$T0
Shift:F8	Timeout enable	!@#\$T1
F1 Help F2 Save to disk F3 Reload from disk F4 Update popup F5 New comm port F6 New hot key F7 Clear Field F8 Xmit string Edit field with Tab, Backspace, Ins, Del, Home, End F9 Exit Current com device: COM1		

Figure 7-1. A sample SETUP display.

7.3.2 USING SETUP

The SETUP screen has three columns. The first column identifies each function key (unshifted and then shifted). The second column shows the function name (if any) that you assign to each key. This title will be listed alongside its function key in MicroLink's pop-up menu. Maximum length of a title is 18 characters. The third column shows the character/code string that will be transmitted when the associated key is pressed. Unprintable or non-ASCII characters are displayed in IBM video format: [CTRL] + [D] is shown as a diamond, [CTRL] + [C] as a heart, etc. Macro characters are displayed in flashing reverse video. Maximum length of a string is 43 characters.

You may move the scroll bar to any of the 16 lines and either of the "Title on Pop-Up" or "String Contents" columns by using the arrow keys. Use the arrow keys, not the [RETURN] key, to advance to the next field. Ending titles or control strings with carriage returns or line feeds is not necessary. Entering a carriage return when you define a string will cause a carriage-return code to be inserted into the string, which is usually not desirable.

7.3.3 EDITING

You can change data in the field highlighted by the scroll bar with SETUP's editing functions. Typing characters will overwrite the existing characters at the cursor. If you are at the end of the string, the characters will be added to the end of the line, up to the line limit. You may use the editing functions when the menu-status line (next to the last line on the display) reads:

Edit field with Tab, Backspace, Ins, Del, Home, End

- The [TAB] key will move the cursor one position to the right, without changing any characters. If the cursor is already at the end of the field, the PC's "bell" will sound.
- The [BKSP] key will move the cursor one position to the left, without changing any characters. If the cursor is already at the beginning of the field, the bell will sound.
- The [INS] key will insert a space at the cursor. The character under the cursor and all characters to the right of the cursor are moved one position to the right. If the field was full when [INS] was pressed, the rightmost character in the field is lost.
- The [DEL] key will delete the character the cursor is on. Characters to the right of the cursor are moved one position to the left to fill the gap.
- The [HOME] key will move the cursor to the beginning of the field.
- The [END] key will move the cursor to the end of the field. When used in the String column, it will move the cursor to the actual end of the string, not the end of the scroll bar.
- The [F7] key will erase the field the scroll bar points to. The cursor will then be placed at the start of the field.

7.3.4 SPECIAL CHARACTERS

7.3.4.A Control Characters

To enter a backspace into a field, press and hold [ALT], press [8] on the numeric keypad, then release [ALT]. To enter a tab into a field, press and hold [ALT], press [9] on the numeric keypad, then release [ALT]. To enter a printer parameter, hold down the [ALT] key, type the value of the parameter on the numeric keypad (range 1 to 255), then release the [ALT] key. To enter a parameter with value 0 (a null), enter [CTRL] + [@] ([CTRL] + [SHIFT] + [2]).

An example of the use of printer parameters is setting an HP® LaserJet® printer's top margin. The control code for this is described in the HP manual as “[ESC] [&] [#] [E]”, where # is the number of lines to set the top margin to. If you wanted a 4-line margin, you would type [ESC] [&], then press and hold [ALT], type [4] on the numeric keypad, release [ALT], then type [E].

7.3.4.B Macro Characters

To enter a macro character (begin a macro), enter [SHIFT] + [FN], where [FN] is a function key [F1], [F2], [F3], or [F10]. Macro characters are valid only in the String column. Some macros require parameters to follow the macro character. The defined macros and their parameters are:

[F10] EXIT (appears as reverse-video 0)

When Macro F10 is encountered while transmitting a string, MicroLink will return you to DOS, just as if you had pressed [ESC]. MicroLink does not return you to DOS until the entire string is sent.

[F1] REDIRECT LPT OUTPUT (appears as reverse-video 1)

When Macro F1 is encountered, MicroLink interprets the next 2 characters as parameters to redirect LPT output. The parameters are:

1st character: ASCII digit 1 or 2 to show which LPT port to act on.

2nd character: ASCII digit 1 or 2 to show which COM port LPT output will be sent to, or ASCII X to cancel redirection of the LPT port indicated by the first character.

Examples:

11 redirects LPT1 to COM1

12 redirects LPT2 to COM1

1X cancels redirection of LPT1

[F2] SET SERIAL PORT (appears as reverse-video 2)

When Macro F2 is encountered, MicroLink interprets the next 6 characters as parameters to set a COM port's parameters (very like the DOS MODE command). The parameters are:

1st 2 characters: Two ASCII digits to represent the desired baud rate. Use the first two digits of the rate desired: 9600 baud would be “96”, 19,200 baud would be “19”, 300 baud would be “30”, etc.

3rd character: One ASCII letter showing the desired parity. Use “N” for no parity, “E” for even parity, or “O” for odd parity.

4th character: One ASCII digit showing the desired number of data bits.

5th character: One ASCII digit showing the desired number of stop bits.

6th character: One ASCII digit indicating which COM port to set (1 or 2).

The changing of the port occurs immediately when the macro sequence is encountered.

Examples:

```
296N811 sets COM1 to 9600 baud, no parity, 8 data bits, and 1 stop bit
```

```
219E712 sets COM2 to 19,200 baud, no parity, 7 data bits, and 2 stop bits
```

[F3] FORCE TERMINAL EMULATOR (appears as reverse-video 3)

When Macro F3 is encountered, MicroLink will switch to the terminal emulator when the entire string is finished sending. If the terminal emulator is already active, Macro F3 has no effect. Macro F3 also has no effect if MicroLink is configured to use a parallel port.

7.3.4.C Invalid Macros and/or Macro Parameters

If invalid macro characters and/or parameters are encountered, MicroLink will transmit the invalid character(s) and all characters that follow out the current communications port. Invalid characters can be identified easily, since they are the first ones transmitted.

7.3.5 SETUP FUNCTIONS

When you are entering data into a field, you can press the function keys listed in the previous section to trigger macros. But when you're not actually typing things in, pressing function keys [F1] through [F9] will activate SETUP's wide range of features:

[F1] Help

The [F1] key causes a window to open on the screen. This window contains information about MicroLink and SETUP. Pressing any key takes you to further windows, and eventually back to the main SETUP menu. Pressing [ESC] at any window returns you to SETUP.

[F2] Save to disk

[F2] saves your configuration to disk. You are then returned to the menu. Before writing to the disk, SETUP will display:

```
Previous setup data on disk will be overwritten
```

```
SAVE TO DISK: Are you sure? (Y/N)
```

You may press "N" to abort the SAVE and return to SETUP, or "Y" to save SETUP's settings to disk and then return to SETUP. While the disk is being written, the menu status line reads:

```
Disk being written.. please wait
```

[F3] Reload from disk

[F3] reloads the data file back into the menu. You use this option to start configuration over without having to exit to DOS. This option will overwrite any changes made to the menu's fields since the last [F2] (Save), or since startup if [F2] has not been used. Before the reload, SETUP will display:

```
Current setup data on screen will be overwritten
```

```
RELOAD FROM DISK: Are you sure? (Y/N)
```

You may press "N" to abort and return to SETUP, or "Y" to reload the screen from disk and return to SETUP. While the reload is in progress, the status line will read:

```
Disk being read.. please wait
```

[F4] Update popup

[F4] updates a currently loaded copy of MicroLink with the parameters currently displayed on the menu. You use this option to update the pop-up if you make changes after loading it into memory. Before the update is attempted, SETUP will display:

```
Currently loaded popup will be updated from screen data
```

```
UPDATE POPUP: Are you sure? (Y/N)
```

You may press “N” to abort and return to SETUP, or “Y” to update the popup in memory and return to SETUP. If you have not yet loaded MicroLink and you use this option, the status line reads:

```
No currently loaded pop-up to update. Press any key to continue
```

When the update is complete, the status line reads:

```
Currently loaded pop-up updated - press any key to continue
```

[F5] New communication port

You can choose a different communication port with the [F5] function. The scroll bar moves to the “Current communication device:” line. Press [PgUp] or [PgDn] repeatedly until the desired port appears. Then press the [END] key to exit this option. Note that SETUP does not check to see whether the selected port actually exists on your PC.

[F6] New hotkey sequence

You can change MicroLink’s hotkey sequence with [F6]. The hot-key sequence consists of any combination of the right and left [SHIFT] keys, [ALT], and [CTRL], plus one other (usually nonprinting) key such as [ESC], [TAB], [F3], [SysReq], etc. Some possible combinations: [ALT] + [CTRL] + [SPACE], [CTRL] + [TAB] (the factory default), [Right-SHIFT] + [Left-SHIFT] + [F10], etc.

When you press [F6], the current hot-key sequence is displayed along with the prompt:

```
Y=Accept N=Change
```

Accept the current sequence by pressing “Y” and you will be returned to the menu. If you wish to change the hotkey sequence, press “N” at this point. SETUP will then display:

```
Enter new hot key now--R/L Shift, Alt, Ctrl must be pressed first
```

Type the new hot-key sequence sequence you wish to use. SETUP will not begin to accept a new sequence until you press one of the [SHIFT], [ALT], or [CTRL] keys. When you press one or more of these keys along with one other key, SETUP will display the new combination and return to the “accept or change” prompt. Accept the displayed sequence by pressing “Y”, and you will be returned to the menu. If you pressed a wrong key or you’ve changed your mind, press “N” and try again. There is no way to cancel this operation once it’s under way, so if you want to go back to the old hotkey sequence you’ll have to enter it again.

[F7] Clear field

The [F7] key erases the field that the scroll bar is on. In the case of the Title field, it is filled with spaces. In the String Contents field, it is cleared to zero length.

[F8] Transmit string

[F8] is the test-transmit key. This key causes the selected communications port to transmit the string that is on the same line as the scroll bar. Note that the scroll bar may be either in the Title or the String Contents column, but SETUP will always transmit the contents of the String column. This allows testing of your character strings without having to load the pop-up utility. When [F8] is pressed, one of the following messages will be displayed on the menu status line after the transmission:

```
This string is undefined (empty). Press any key to continue
Communications hardware error. Press any key to continue
String has been transmitted. Press any key to continue
Macros will not be acted on in the normal way but will be transmitted as if they were regular characters.
```

[F9] Quit

[F9] stops SETUP and returns you to DOS. You must use [F2] before using this option if you wish to save your changes to disk. SETUP will display:

```
Make sure to save any changes before exiting
EXIT TO DOS: Are you sure? (YIN)
```

You may press “N” to abort the QUIT and return to SETUP, or “Y” to quit SETUP.

7.4 The MicroLink (MSLINK) Program**7.4.1 LOADING AND RUNNING MICROLINK**

You can run MicroLink or load it as a memory-resident program with the command:

```
MSLINK [drive:\path\filename.ext] [/B or /1 or /2 or /N]
```

“drive:\path\filename . ext” is an optional pathname you can add to the command line as an argument. You would have previously created this file with SETUP. MSLINK will load its pop-up menu from this file. If you don’t specify a file, SETUP looks for MSLINK.DAT in the current directory. “/B” is an optional argument that causes MicroLink to (1) run without loading as memory-resident and (2) use the communication port specified in the data file. “/1” and “/2” also run MicroLink without loading it, but “/1” forces the use of COM1 and “/2” forces the use of COM2, regardless of which one is specified in the data file. “/N” is an optional argument that causes the terminal emulator to be excluded when you load the program as memory-resident. This saves approximately 7K of memory.

Examples:

```
MSLINK TEST1.DAT causes MicroLink to use the file TEST1.DAT (instead of MSLINK.DAT) as its data file
```

```
MSLINK RQA.DAT /N causes MicroLink to use the file RQA.DAT as its data file, and excludes the popup terminal emulator from memory
```

```
MSLINK /B causes MicroLink to run in the background immediately (rather than loading as memory-resident) using the default data file MSLINK.DAT
```

7.4.2 LOADING MULTIPLE COPIES OF MICROLINK

If you have communication tasks that require different sets or expanded ranges of control codes and commands, you might want to have more than one copy of MicroLink in memory at the same time. To load a second (or third, etc.) copy of MicroLink, you must create an additional data file by copying the original MSLINK.DAT with a different filename. The new file must then be modified with SETUP, because additional copies of MicroLink must have different hotkey sequences. For example, to load an additional copy of MicroLink that will use a data file called SECOND.DAT:

```
COPY MSLINK.DAT SECOND.DAT (DOS respond-s, 1 File(s) copied)
SETUP SECOND.DAT
```

Make desired changes to SECOND.DAT at this point. Be sure to assign a different hotkey sequence with SETUP's [F6] option. Then use [F2] SAVE TO DISK, and then [F9] EXIT. Load MSLINK and the new data file:

```
MSLINK SECOND.DAT
```

7.4.3 LOAD-TIME MESSAGES

- If (A) MSLINK can't find the file you specify, (B) you don't specify a file and there is no MSLINK.DAT file in the current directory, or (C) you are trying to use a MicroLink revision 1 data file with this product, this message will be displayed:

```
I002 Invalid or missing setup file
Continue with default settings (Y/N)?
```

If you press "Y", MicroLink will load with its default setting (COM1) and you will be returned to DOS. If you press "N", MicroLink will return you to DOS without loading. To avoid this, enter the MSLINK command with the proper filename, copy the setup file to the current directory, or use SETUP to create anew setup file.

- If you have already installed MicroLink (loaded it into memory) with the same data file, you will receive the message:

```
I003 MicroLink is already installed
```

You will then be returned to DOS. To avoid this, use SETUP to change the hotkey sequence of one of the MicroLink setup files.

- If you defined a parallel communications device with SETUP or included "/N" on the command line (see **Section 7.4.1**), this message

```
1005 /N option and/or parallel device used, excluding terminal emulator
```

This indicates that MicroLink has not loaded the terminal emulator software. To load the terminal emulator, try again and choose a serial port or leave IN off of the command line.

- If the communications port that MicroLink is configured for does not exist on your PC, you will be sent this message and returned to DOS:

```
1001 Cannot locate specified communications adapter
```

Check your PC's configuration to determine which ports are installed. If the appropriate communications adapter is present and this message still appears, check the adapter switch settings.

- If you are attempting to run MicroLink under a version of DOS lower than 2.10, you will be sent this message and returned to DOS:

```
1004 MicroLink requires DOS 2.10 or higher
You'll have to upgrade your DOS.
```

- If installation (loading into memory) is successful, this message will appear:

```
1000 Successful installation
```

After the message prints, you are returned to DOS. The MicroLink program is now resident in memory.

7.4.4 LOADING MICROLINK AUTOMATICALLY WHEN YOU TURN ON YOUR PC

Once you have established that MicroLink is working correctly, you may place its installation commands into your system's AUTOEXEC.BAT file so that MicroLink will load automatically at boot time. If you don't have an AUTOEXEC.BAT file, you might want to create one. AUTOEXEC.BAT is usually kept in the root directory of your hard disk, or on your DOS diskette if you don't have a hard disk. Say your MicroLink files are in a \MICROLNK subdirectory of the directory \UTIL and COM1 is used as MicroLink's output port. You could add these lines to your AUTOEXEC.BAT file:

```
MODE COM1:9600,N,8,1,P
CD \UTIL\MICROLNK
MSLINK
```

If your AUTOEXEC.BAT file also loads SideKick or any other potentially conflicting memory-resident program, place the MicroLink commands so that MicroLink is loaded before the other program.

7.4.5 USING MICROLINK

To invoke MicroLink, press the [CTRL] + [TAB] keys ([CTRL] first), or your user-defined hot-key sequence if you've changed it with SETUP's [F6] option. Note that if a program is running, there may be a waiting period before MicroLink's menu appears. This is due to MicroLink's interlock mechanism, which prohibits MicroLink from interrupting a critical operation such as a disk access. This feature prevents conflicts between MicroLink and your application program. The activation attempt is stored, so you only need to press the hotkey combination once. The program will remember your request and "pop up" as soon as it safely can.

When the pop-up menu appears, each function key on the menu is paired with the title you defined when you ran SETUP. On a color display, the color of the menu indicates the communication port to be used (Blue=COM1, Green=COM2, Red=LPT1, Magenta=LPT2). To send a string, press the associated function key (and [SHIFT] for the bottom 8 titles). When a string is transmitted, its associated title and the status message are both highlighted. Three different status messages are possible:

```
Transmitted String was successfully transmitted
String Empty String is blank, no transmission was made
Transmit Error
```

"Transmit Error" indicates that the current communication port is not connected, appears busy, or does not exist. This message may take as long as 60 seconds to appear if the associated error is a timeout. Also, if you used the "P" option in your MODE command that set up the output port, the system will wait forever for the port to become ready. If the PC seems to be hung up, hit [CTRL] + [BREAK]; the "Transmit Error" message should come up.

To terminate the pop-up menu at any time and return to your original task, press the [ESC] key. The menu disappears, the screen is restored, and control is returned to your original program.

MICROSWITCHES

The two examples in Figure 7-2 show MicroLink's menu (1) immediately after being called up with the hotkey sequence (left), and (2) after the [F3] key is pressed (right). Note that the title of the string sent is highlighted, and a transmit status message (in this case, "Transmitted") appears at the bottom of the menu. The up-arrows next to the lower eight entries indicate that [SHIFT] must be pressed along with the indicated function key to transmit these strings.

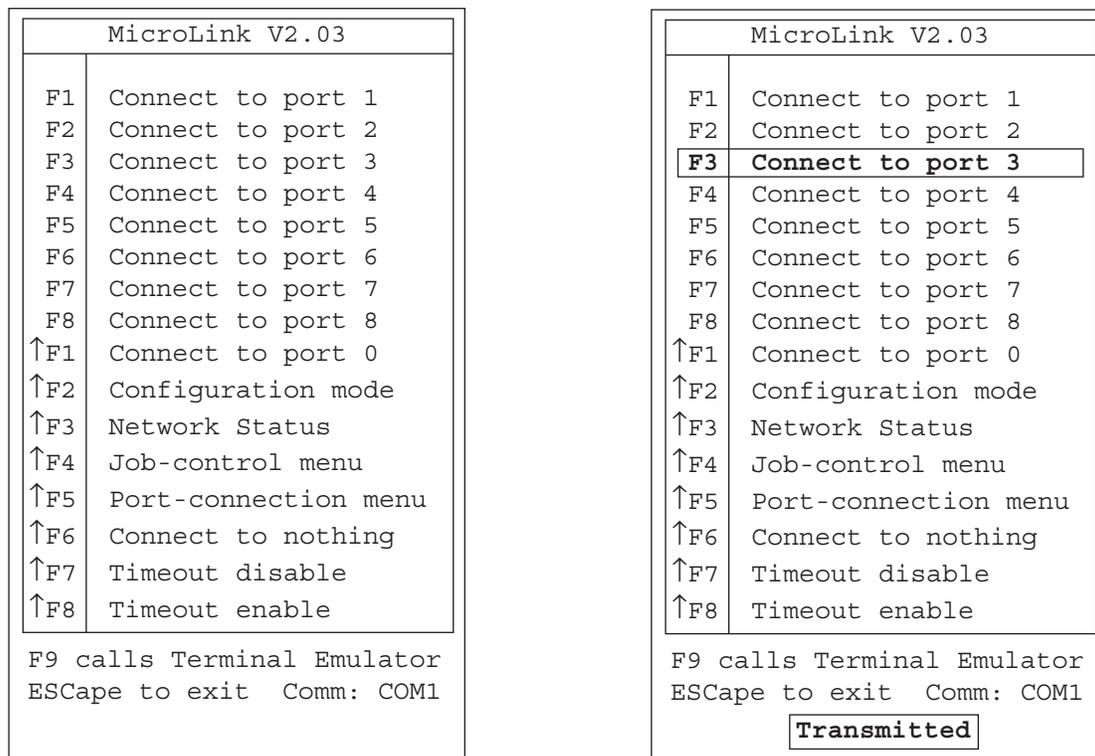


Figure 7-2. MicroLink's pop-up menu before (left) and after (right) a function key is pressed.

7.4.6 USING THE BUILT-IN TERMINAL EMULATOR

7.4.6.A Activating the Terminal Emulator

To activate the terminal emulator, call up MicroLink's menu (if it's not already on screen) with [CTRL] + [TAB] or your own hot-key sequence. Press the [F9] key. The screen will clear. Any characters you type at this point will be sent out the selected communications port. Any characters received will be displayed on your screen. If you press keys that do not have defined ASCII values (arrow keys, [PgUp], [HOME], etc.), the bell will sound. If you press a function key from [F1] to [F8] or [SHIFT] + [F1] to [SHIFT] + [F8], the string associated with the key will be transmitted, but not displayed on the screen.

The protocol, baud rate, etc., that the terminal emulator uses depends on the last MODE command issued from DOS. To guarantee a specific port setup, you should enter a MODE command from the DOS prompt to configure the communications port, or create a MicroLink macro function to set it. To exit the terminal emulator and return to MicroLink's menu, press the [ESC] key.

To enter characters that do not have corresponding keyboard keys, press and hold the [ALT] key, enter the character's ASCII code on the numeric keypad, then release [ALT]. The character will then be sent. To send an escape, press [ALT], type 27 on the numeric keypad, then release [ALT]. Keying [ESC] directly will exit the terminal emulator instead.

The terminal emulator ignores flow control signals such as CTS, DSR, or DCD. Thus, you may still communicate with a device that is driving DCD, DSR, or CTS low. The terminal emulator always drives RTS and DTR high.

If you select one of the parallel ports as the communications port at MicroLink's installation time and you change the communications port to a serial port later (using SETUP's [F4] Update Popup option), the terminal emulator will not be available. You must reboot and reload MicroLink if you are changing from a parallel to a serial port and wish to use the terminal emulator. Conversely, if you choose a serial port at load time, then change to a parallel port with SETUP's [F5] option and attempt to use the terminal emulator, MicroLink will display:

```
Can't run with parallel device. Press key to exit.
```

You may press any key to return to MicroLink's main menu. If you wish to use the terminal emulator at this point, you must return to DOS, run SETUP, change your communications device to COM1 or COM2, and then use SETUP's [F4] option to update MicroLink.

7.4.6.B The Terminal Emulator's Status Line

MicroLink's terminal emulator displays several status indicators on the bottom line of the screen. They reflect the current state of the selected COM port. These indicators are updated continuously and may change on-screen if the state of the pins changes. The first four indicators show the state of the CD (Carrier Detect), RI (Ring Indicator), DSR (Data Set Ready), and CTS (Clear to Send) input pins. "Hi" means that the pin is at +12 volts, and "Lo" means that the pin is at -12 volts. The fifth indicator shows the current baud rate, parity, data bits, and stop bits of the port. This provides a convenient method of checking the setting of the serial port.

7.4.7 PRECAUTIONS TO TAKE WHEN USING MICROLINK

If you use SideKick on your PC, you *must* load MicroLink *before* SideKick. Loading MicroLink after SideKick will in all probability freeze your system. If your PC's AUTOEXEC.BAT file contains a MODE command with the "P" option, MicroLink might wait indefinitely for its output port to become ready. You can abort this wait by pressing [CTRL] + [BREAK], but, depending on your application, there is a chance that the [CTRL] + [BREAK] might abort your application program as well. To avoid this catch-22, correct the "busy" situation.

If you are using background email, you should not use MicroLink on the port that the email program is using. If you are running communications software (CROSSTALK, ProComm, etc.), you should avoid popping up MicroLink while the communications program is running. This may cause a conflict over control of the communication hardware and lead to garbled data.

MicroLink does not run reliably under multitasking software (some versions of Microsoft Windows, MULTILINK™, PC Network, etc.) This is due to MicroLink's inability to obtain control of the hardware. If MicroLink is loaded into memory, you should reboot your system to remove it before attempting to run any multitasking program.

If you invoke MicroLink with a hotkey sequence during the graphic display of a program like Microsoft Word®, AutoCAD, PC Paintbrush®, etc., MicroLink will activate, but the screen will not change. MicroLink will warn you with two beeps. You may still transmit strings by pressing function keys, but you will not be able to read the status messages returned. You may still use [ESC] to exit.

Because MicroLink outputs directly to the video hardware, and reads the keyboard directly, it cannot be invoked remotely through a DOS “CTTY” command or through a communications program’s “host mode” (though it will not interfere with such an application).

7.5 MicroLink Utility Programs

The MicroLink diskette contains several other programs that are designed to make the use of your MicroSwitch easier. These programs are not in any way connected with the operation of MicroLink. A detailed explanation of these programs follows.

7.5.1 B19200.COM

Utility to set your PC’s serial port to 19,200 bps. The command-line syntax of B 19200 is:

```
B19200 p
```

where *p* is the number of a serial port (1 or 2) to set to 19200,N,8,1. B19200 is required if you wish to operate your MicroSwitch at 19,200 bps, because the DOS MODE command does not allow a speed higher than 9600 bps. B19200 automatically sets parity to none, data bits to 8, and stop bits to 1. It has no effect on any printer redirection that may be set.

7.5.2 SHERLOCK.EXE

Troubleshooting utility for MicroSwitches connected to serial ports. This program is self-documenting. It is run by changing your current directory to the MicroLink directory and typing SHERLOCK at the DOS command line. SHERLOCK expects your PC to be cabled to your MicroSwitch. It can detect faults in the cable, MicroSwitch, PC serial adapter, and other areas. The file ROSETEST:DAT is used by SHERLOCK in testing HP or compatible plotters.

7.5.3 SEND.EXE

Utility to send a string out a given serial port. Used in setting a destination on a MicroSwitch. Unlike the DOS ECHO command, SEND does not add a carriage return and line feed to the string being sent. Syntax of the SEND command is:

```
SEND p string
```

where *p* is the COM-port number to send from (1 or 2) and *string* is a string of characters to send. While SEND may be run from the DOS command line, it is most useful in batch files. An example of batch usage of SEND:

```
SEND 1 !@#$7  
LOTUS  
SEND 1 !@#$8
```

This batch file would set the destination of your MicroSwitch port, which is connected to serial port COM1 on the PC in this example, to the printer on the Switch’s Port 7. The program named LOTUS is then run, and when it is completed, your destination is set to Port 8.

7.5.4 SENDP.EXE

Identical to SEND, except that *p* in the SENDP command line is the number of the parallel port (1 or 2) to send the string out of. The syntax and usage are otherwise the same.

7.5.5 SENDFIL.EXE

Utility to send a file out a given serial port. The syntax for SENDFIL is

```
SENFIL p filename
```

where *p* is the COM port number to send from (1 or 2) and *filename* is any valid DOS file specification. Since SENDFIL ignores any busy signals to your PC, it is *not* recommended for printing files. SENDFIL is designed for sending longer command strings to a MicroSwitch, printer, or modem. Example: Assuming that LASERLAN.TXT contains the string to set a laser printer to landscape mode, and this printer (or a MicroSwitch currently connected to this printer) is connected to serial port COM2, the command “SENFIL 2 LASERLAN.TXT” will send this string to the printer, placing it in landscape mode.

7.5.6 SENDFILP.EXE

Same as SENDFIL.EXE, only it sends out a parallel port (1 or 2). The syntax and usage are otherwise the same.

7.5.7 MSTAT.EXE

Utility to interrogate a MicroSwitch 9 to see if a given device is currently in use. MSTAT automates the process of obtaining a status report from your MicroSwitch and checking on whether devices are being used. MSTAT works by sending your MicroSwitch a command and waiting for it to respond. It then scans the response for the a specified string. If MSTAT finds the string, it outputs

```
Device is connected (ErrorLevel=0)
```

If it does not find the specified string in the response, it declares:

```
Device is not connected (ErrorLevel=1)
```

If MSTAT receives no answer to the command it sends, it returns the message:

```
No answer to command, can't tell if device is connected (ErrorLevel=10)
```

If the response to MSTAT's command exceeds MSTAT's internal buffer, MSTAT prints:

```
Input buffer overflow, can't tell if device is connected (ErrorLevel=10)
```

MSTAT returns ErrorLevel codes (see “Batch File Commands” in your DOS manual) that batch files may check and take action upon. The syntax of MSTAT is:

```
MSTAT p answer command
```

where *p* is the COM port number to use, *answer* is the string to search for in the response, and *command* is the string to send out the COM port to evoke the response.

Example batch file using MSTAT:

```
MSTAT 1 LASERJET !@#$$S
IF ERRORLEVEL 1 GOTO PRTRDY
ECHO PRINTER IS IN USE AT THIS TIME
GOTO EXIT
:PRTRDY
ECHO PRINTER IS AVAILABLE AT THIS TIME
:EXIT
```

When it's invoked, this file sends the string "!@#\$\$" (the status command) out the COM1 port and waits for a response. When your MicroSwitch responds with the status display, MSTAT searches the text of the display for the string "LASERJET". If MSTAT finds the string (which will only happen if someone else is using that printer), it sets the ErrorLevel to zero and sends you the message "Device is connected (ErrorLevel=0)". The batch file then branches on ErrorLevel, chips in with the message "PRINTER IS IN USE AT THIS TIME", and sends you back to DOS. If MSTAT doesn't find the string "LASERJET" in the status text (which means no one is using the LaserJet right now), it sets the ErrorLevel to one and displays the message "Device is not connected (ErrorLevel=1)". The batch file then branches on ErrorLevel and sends the additional message "PRINTER IS AVAILABLE AT THIS TIME" before returning you to DOS.

7.6 The MSCONFIG Program

The MSCONFIG program is provided for easy configuration of your MicroSwitch. It is not needed for operation of MicroLink. MSCONFIG uses a question and answer session to perform a first-time setup of your MicroSwitch. It also keeps your MicroSwitch's configuration in a disk file for later modification. For further details on your MicroSwitch's configuration options, see **Chapter 4**.

MSCONFIG can be used to configure all options on your MicroSwitch except the menu access, prefix, timeout enable, timeout value, minutes timer, and priority parameters. To set these parameters see **Chapter 4**. Most configurations do not require changing these items. Connect your PC's COM1 or COM2 port to Port 0 on your MicroSwitch with the correct serial cable (see **Appendix B** for the proper cable configuration).

The next few pages contain an extended example of the use of MSCONFIG. This example configures an MicroSwitch 5S (5 serial ports) for the setup shown in Figure 7-3. In the example, "[RETURN]" stands for the [Return] or [Enter] key and input provided by the user is presented in bold italic type. This example dialogue is taking place on the computer on Port 0 (Hudson's computer).

MSCONFIG may only be run from a computer connected to your MicroSwitch's Port 0. It is assumed that MSCONFIG.EXE resides on Hudson's B: drive. Where "<Enter=xxxx>" appears, "xxxx" is the default, which you can choose just by pressing [RETURN].

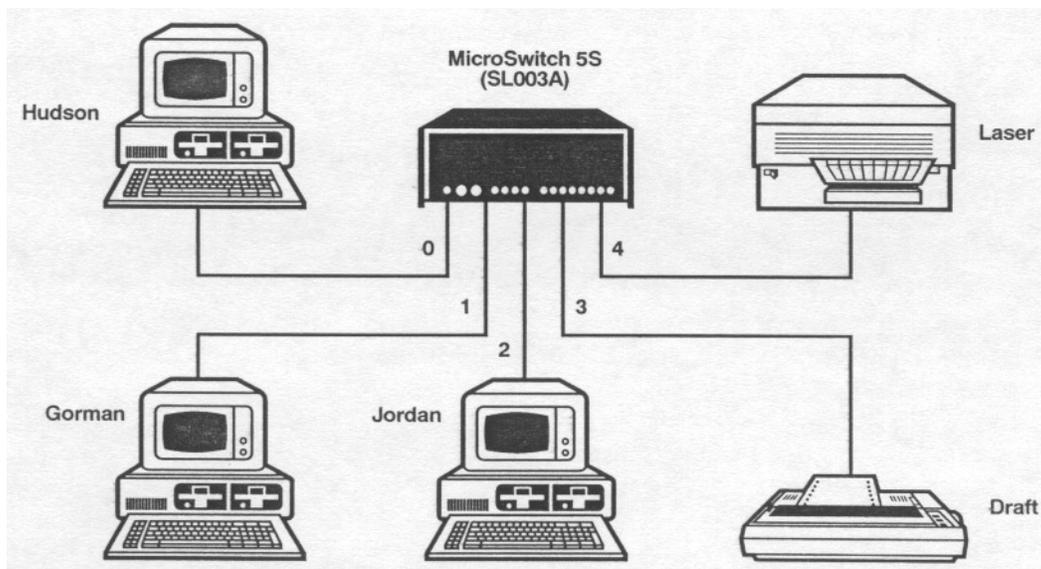


Figure 5-3. The LED buffer-capacity display.

B:\> *msconfig* [RETURN]

Pre-Configuration Setup MicroSwitch Configuration Program, version 2.03

Which of these ports is hooked up to Port 0 of your MicroSwitch

For MicroSwitch units whose Port 0 is serial (includes all MSU units):

1. COM1:
2. COM2:

For MicroSwitch units whose Port 0 is parallel:

3. LPT1:
4. LPT2:

Which one (1-4): **1** [RETURN]

Initializing...

MicroSwitch Configuration Program

Version 2.02

Currently configuring a Version xx MicroSwitch 5S

1. First-Time Configuration
2. Display/Change Current Configuration
3. Print Current Configuration
4. Send Configuration to MicroSwitch
5. Save Configuration to Disk
6. Recall Configuration from Disk (Cancels changes since last save)
7. Display/Change Printer/Device Groups
8. Exit to DOS

Enter your selection (1-8) <Enter=8> ? **1** [RETURN]

Now configuring port number 0 which is Serial
This port must be configured as a computer.

Enter a name for this device <Enter=Port0> ? **HUDSON** [RETURN]

Enter the default destination port for this device (0-4,9=Null) <Enter=16> ?
[RETURN]

Enter the baud rate for this device <Enter=9600> ? **[RETURN]**

Enter the parity for this device <Enter=None> ? **[RETURN]**

Enter number of data bits for this device <Enter=8> ? **[RETURN]**

Enter number of stop bits for this device <Enter=1> ? **[RETURN]**

Enter handshaking protocol for this device: (D)tr, (X)on/off <Enter=D> ? **[RETURN]**

MICROSWITCHES

Now configuring port number 1 which is Serial
This port may be configured to be one of the following:

1. Computer
2. Printer
3. Plotter
4. Modem

Select one (1-4) , or "A" to abort configuration <Enter=1> ? **[RETURN]**

Enter a name for this device ? **GORMAN [RETURN]**

Enter the default destination port for this device (0-4,9=Null) <Enter=4> ?
[RETURN]

Enter the baud rate for this device <Enter=9600> ? **[RETURN]**

Enter the parity for this device <Enter=None> ? **[RETURN]**

Enter number of data bits for this device <Enter=8> ? **[RETURN]**

Enter number of stop bits for this device <Enter=1> ? **[RETURN]**

Enter handshaking protocol for this device: (D)tr,(X)on/off <Enter=D> ? **[RETURN]**

Now configuring port number 2 which is Serial
This port may be configured to be one of the following:

1. Computer
2. Printer
3. Plotter
4. Modem

Select one (1-4) ? **1 [RETURN]**

Enter a name for this device ? **JORDAN [RETURN]**

Enter the default destination port for this device (0-4,9=Null) <Enter=4> ?
[RETURN]

Enter the baud rate for this device <Enter=9600> ? **[RETURN]**

Enter the parity for this device <Enter=None> ? **[RETURN]**

Enter number of data bits for this device <Enter=8> ? **[RETURN]**

Enter number of stop bits for this device <Enter=1> ? **[RETURN]**

Enter handshaking protocol for this device: (D)tr,(X)on/off <Enter=D> ? **[RETURN]**

Now configuring port number 3 which is Serial
This port may be configured to be one of the following:

1. Computer
2. Printer
3. Plotter
4. Modem

Select one (1-4) ? **2 [RETURN]**

Enter a name for this device ? **DRAFT** [RETURN]

Enter the default destination port for this device (0-4,9=Null) <Enter=4> ?
[RETURN]

Enter the baud rate for this device <Enter=9600> ? [RETURN]

Enter the parity for this device <Enter=None> ? [RETURN]

Enter number of data bits for this device <Enter=8> ? [RETURN]

Enter number of stop bits for this device <Enter=1> ? [RETURN]

Enter handshaking protocol for this device: (D)tr, (X)on/off <Enter=D> ? [RETURN]

Enter initialization string for this device <Enter=None> ? [RETURN]

Enable automatic end of job form feed for this printer (Y/N) <Enter=N> ?
[RETURN]

Now configuring port number 4 which is Serial
This port may be configured to be one of the following:

1. Computer
2. Printer
3. Plotter
4. Modem

Select one (1-4) ? **2** [RETURN]

Enter a name for this device ? **LASER** [RETURN]

Enter the default destination port for this device (0-4,9=Null) <Enter=4> ?
[RETURN]

Enter the baud rate for this device <Enter=9600> ? [RETURN]

Enter the parity for this device <Enter=None> ? [RETURN]

Enter number of data bits for this device <Enter=8> ? [RETURN]

Enter number of stop bits for this device <Enter=1> ? [RETURN]

Enter handshaking protocol for this device: (D)tr, (X)on/off <Enter=D> ? [RETURN]

Enter initialization string for this device <Enter=None> ? **.E** [RETURN]

Enable automatic end of job form feed for this printer (Y/N) <Enter=N> ? **Y**
[RETURN]

First-time Configuration has been completed. Select 2 from the main menu to
verify your selections and make any corrections or changes.

Press ENTER to continue. [RETURN]

1. First-Time Configuration
2. Display/Change Current Configuration
3. Print Current Configuration
4. Send Configuration to MicroSwitch
5. Save Current Configuration to Disk
6. Recall configuration from Disk (Cancels changes since last save)
7. Display/Change Printer Groups
8. Exit to DOS

Enter your selection (1-8) <Enter=8> ? **2** [RETURN]

MICROSWITCHES

Current MicroSwitch prefix is: !@#\$

Highest port number: 4

Port	Dest	Name	Configured as	Baud	Parity	Data	Stop	Hndske	InitStr	FrmF
0	4	HUDSON	Computer	9600	N	8	1	Hardware		N/A
1	4	GORMAN	Computer	9600	N	8	1	Hardware		N/A
2	4	JORDAN	Computer	9600	N	8	1	Hardware		N/A
3		DRAFT	Printer	9600	N	8	1	Hardware		Off
4		LASER	Printer	9600	N	8	1	Hardware	.E	On

Change which port number, <Enter> to end, or P for MicroSwitch prefix? **[RETURN]**

MicroSwitch Configuration Program

Version 2.02

1. First-Time Configuration
2. Display/Change Current Configuration
3. Print Current Configuration
4. Send Configuration to MicroSwitch
5. Save Configuration to Disk
6. Recall Configuration from Disk (Cancels changes since last save)
7. Display/Change Printer/Device Groups
8. Exit to DOS

Enter your selection (1-8) ? **4 [RETURN]**

MicroSwitch configuration in progress

Saving configuration

Configuring names

Configuring port types

Configuring initialization strings

Configuring default destinations

Configuring protocols

Configuring form feed(s)

Configuration completed, press ENTER to return to main menu. **[RETURN]**

1. First-Time Configuration
2. Display/Change Current Configuration
3. Print Current Configuration
4. Send Configuration to MicroSwitch
5. Save Configuration to Disk
6. Recall Configuration from Disk (Cancels changes since last save)
7. Display/Change Printer/Device Groups
8. Exit to DOS

Enter your selection (1-8) ? **8 [RETURN]**

Save any changes to disk (Y/N) <Enter=Y> ? **Y [RETURN]**

B:\>

8. Troubleshooting

8.1 Determining What the Problem Is

There are several ways to diagnose a problem in your MicroSwitch system. If you are using a PC, first use the diagnostic program SHERLOCK on the MicroLink utility diskette. If this isn't possible or doesn't help, see if your problem is included in the following list of problems that commonly occur.

Beneath each problem listed in this section there is a sublist of probable causes, shown in decreasing order of likelihood, with a reference number (like "NR-1") on the left and the cause spelled out on the right. The reference number refers to a corresponding subsection in **Section 8.2** that explains the cause and a possible remedy to the problem. If you exhaust this list and you still can't solve the problem, or if you determine that the MicroSwitch requires service, contact Black Box as described in **Section 8.5**.

8.1.1 GENERAL PROBLEMS

Nothing happens when I try to send data *or*

My commands aren't accepted *or*

I get an "Abort, Retry" error when I try to send from a PC *or*

My PC or terminal locks up

- NR-1 MicroSwitch powered off
- CA-1 Cables not secured
- CI-1 Incorrect destination selected
- CI-2 Incorrect command syntax
- MC-1 Timeout occurred
- EQ-1 Port busy
- NR-2 Port in menu mode
- MC-2 Wrong port type
- PR-1 Protocol problem
- CA-2 Device connected to wrong port
- CA-3 Incorrect wiring
- CI-3 Timeouts off
- CI-4 Job canceled
- NR-3 Wrong PC port
- NR-4 Buffer full
- NR-5 Queue full
- CI-5 Accidental connection to modem
- MC-3 Parallel computer port can't receive
- MC-4 Printer port can't send
- CA-4 Cable too long
- NR-6 Unit in diagnostic mode
- NR-7 Unit in error state

MICROSWITCHES

- NR-8 Wrong ROM revision installed
- NR-9 Bad CO M port
- NR-10 Bad MicroSwitch port

Output data is garbled

- PR-1 Protocol problem
- CA-1 Cables not secured
- MC-5 No initialization string
- MC-6 Invalid initialization string
- CA-3 Incorrect wiring
- CA-4 Cable too long
- CA-5 Interference
- EV-1 Power-up or power-down noise from device
- CI-3 Extra characters from destination command
- MC-7 Prefix collision

Output is cut off midway

- MC-1 Timeout occurred
- GA-1 Cables not secured
- MC-7 Prefix collision
- CI-6 Job canceled

Blocks of data are missing from the output

- PR-1 Protocol problem (flow control)

Output Goes to wrong destination

- CI-1 Incorrect destination selected
- CI-2 Incorrect command syntax

Ports do not time out *or*

A shared device locks to one user permanently

- CI-3 Timeouts off
- EQ-1 Port busy
- PR-1 Protocol problem
- MC-8 Robust X-ON/X-OFF present
- EV-1 Power-up or power-down noise from device
- GA-1 Incorrect wiring

Configuration is lost frequently

- EV-2 ESD (electrostatic discharge)
- EV-3 Low AC voltage

8.1.2 PRINTING PROBLEMS**Different jobs print on the same page**

- MC-1 Timeout occurred
- MC-4 No initialization string
- MC-5 Invalid initialization string
- MC-9 No form feed

Spurious characters at top of page

- CI-2 Incorrect command syntax
- CI-3 Extra characters from destination command
- EV-1 Power-up or power-down noise from device
- MC-5 Invalid initialization string
- PR-1 Protocol problem

Characters added to or missing from body of printout

See the **Output garbled**, **Output cut off**, and **Blocks missing** entries in **Section 8.1.1**.

Printout is totally wrong

- GA-1 Incorrect wiring
- PR-1 Protocol problem

HP laser printer 22 or 40 error

- EV-1 Power-up or power-down noise from device
- PR-1 Protocol problem

8.1.3 PLOTTING PROBLEMS**Plotter stops in middle of job**

See **Output is cut off midway** in **Section 8.1.1**, and add the possibility:

- MC-10 Plotter configured as half-duplex

Plot incorrect

See **Output is garbled** in **Section 8.1.1**.

8.1.4 MODEM PROBLEMS**Modem won't hang up**

- MC-1 Timeout occurred
- MC-11 Modem not configured for pulse DTR

Modem won't connect

- CI-1 Incorrect destination selected
- MC-1 Timeout occurred
- PR-1 Protocol problem

Modem file transfer stops in middle

See **Output is cut off midway** in **Section 8.1.1**.

8.2 Possible Resolutions

8.2.1 CABLING (“CA”)

CA-1 Cables not secured

The cable might have come loose from one or more of the devices attached to your MicroSwitch.

Remedy: Secure the connections with screws or bail locks. Examine the cables for bent or misaligned pins. The socket pins of serial ports with crimp-type female pins are sometimes pushed too far into the connector.

CA-2 Device connected to wrong port

The destination device might be connected to a port on the MicroSwitch other than the one you expected.

Remedy: Compare the current configuration with what you had thought. If the configuration doesn't show any surprises, check the cable runs. If device cables are plugged into the wrong ports, make the necessary corrections.

CA-3 Incorrect wiring

The cabling to a MicroSwitch might have been improperly wired.

Remedy: Try using the MicroLink terminal emulator to check the state of the flow-control lines leading to your PC. The lower left portion of the terminal status line should read “CD=Hi , RI=Lo, CTS=Hi, DSR=Hi”. If CD, CTS, or DSR is “Lo”, the cabling is faulty. Make sure that you are using the correct interface port on your devices and that the pinouts match the cable you have. You should not be using any wiring other than the recommended cable pinouts as shown in **Appendix B**. Some variations are possible, but you should be extremely experienced with RS-232 before modifying the cable.

CA-4 Cable too long

A cable might be too long to carry your data accurately or at all. Parallel cables should not be longer than 20 feet (6.1 m) and serial cables not longer than 50 feet (15.2 m).

Remedy: Try using a shorter cable.

CA-5 Interference

The cable might be picking up interference, making data transmission unreliable.

Remedy: Shield the cable properly to avoid interference. If using twisted-pair wiring, twist the receiver signal with the signal ground. The longer the cable, the greater the possibility of wiring interference. Do not run the line near equipment generating large electrical transients, such as air-conditioning units or compressors.

8.2.2 COMMAND SENT IMPROPERLY (“CI”)

CI-1 Incorrect destination

Your port might be connected to a different destination than the one you expected. If you are connected to the “null port,” it might appear that your device is not working.

Remedy: Issue the correct destination command. If you don't know which port you need, you can connect to your port's default destination by turning the MicroSwitch off and on again. You can check your current destination from serial ports by directly accessing the status display or job-control menu, or by running MicroLink's MSTAT program.

CI-2 Incorrect command syntax

You might not have given your MicroSwitch a valid command.

Remedy: Verify the syntax of the command you're sending, if possible by typing it in by hand. Any mistakes will send spurious characters to your current destination.

CI-3 Timeouts are off

One port's timeouts might be disabled, so that other users can't use that port's destination.

Remedy: Have the person who turned the timeouts off turn them back on again. (If possible, change that user's application so that timeouts are automatically re-enabled when he or she is finished.) If necessary, you could also cancel the job of the port using the destination.

CI-4 Job canceled

Your job might have been canceled by another user who thought you were finished.

Remedy: Try again. In the future, everyone on your system should try to be careful both about canceling other people's jobs and about making sure everyone can get access to resources they need.

CI-5 Accidental connection to modem

If you were trying to print, you might have set your destination to a modem port whose modem is not currently connected (the "no carrier" state). In such a situation the MicroSwitch will drive the flow-control lines of the connected computer low, which will freeze the computer if it attempts to print.

Remedy: Abort the print procedure or, if that's not possible or doesn't work, turn the computer off and then on again. Send the MicroSwitch a "status" command or "identify destination" command before you try again, and change your destination as necessary.

CI-6 Extra characters from the destination command

The extra characters might have been mistakenly included in the command line of the destination command you sent.

Remedy: Verify the syntax of the command you're sending, if possible by typing it in by hand. Any mistakes will send spurious characters to your current destination. Do not send MicroSwitch commands with the DOS commands ECHO or PRINT, because these will add carriage returns, line feeds, and form feeds to the MicroSwitch command line.

8.2.3 EQUIPMENT ("EQ")**EQ-1 Port busy**

A device might be busy (printer warming up, off line, out of paper, etc.), preventing devices from sending data to it.

Remedy: Check the device on your destination port. If a problem is causing the busy condition, correct it.

8.2.4 ENVIRONMENT (“EV”)

EV-1 Power-up or power-down noise from device

Turning your device on or off might have created noise characters that the MicroSwitch interpreted as data and relayed to your destination port.

Remedy: Issue the “set destination to null” command before you turn your computer off. Also see **Section 6.5**.

EV-2 ESD (electrostatic discharge)

Your MicroSwitch or devices connected to your MicroSwitch might have been affected by receiving a power surge or environmental static discharge.

Remedy: Add static mats and power filters to make a clean electrical environment for your computer equipment.

EV-3 Low AC voltage

Your MicroSwitch or attached devices might not be getting enough power to perform reliably.

Remedy: Add a separate dedicated line or a voltage-regulator transformer to your existing power line.

8.2.5 CONFIGURATION (“MC”)

MC-1 Timeout occurred

The timeout set for your port might have occurred, disconnecting you from your destination.

Remedy: If this happened when your destination device became busy, you might not have set your PC’s serial port for “infinite retry.” For a PC’s serial port to keep trying to send when its destination is busy, it must be receive a DOS MODE command containing the “,P” argument. If this isn’t the case or doesn’t help, either put more time on the applicable timer or disable the timeouts. This might frequently prove necessary for your modem connections.

MC-2 Wrong port type

Your port or your destination port might be configured as the wrong type. Ports connected to computers should be configured as computer type, ones connected to printers as printer type, etc.

Remedy: Check the configuration display or, if your MicroSwitch has serial ports, send the “identify type of port” command from a serial port. Reconfigure port types as necessary.

MC-3 Parallel computer port can’t receive

You can’t send data to any parallel port configured as a computer type.

Remedy: If you’re trying to reach a parallel computer, temporarily reconfigure its MicroSwitch port as a printer type. If you’re trying to reach a parallel printer whose port is configured as a computer type, either reconfigure the port or send the data to a different printer.

MC-4 Printer port can’t send

You can’t send data or commands to the MicroSwitch through a port configured as a printer.

Remedy: Either reconfigure the port or send what you have to send through a computer or modem port.

MC-5 No initialization string

Data you sent might have been affected by the previous user’s settings of the printer port.

Remedy: Set an initialization string on the printer’s MicroSwitch port that resets the printer.

MC-6 Invalid initialization string

An incorrect initialization string might have been programmed for the printer, causing it to print spurious characters.

Remedy: Look up the correct initialization string in your printer manual and configure the printer port with this string.

MC-7 Prefix collision

Data you sent might have had a MicroSwitch command in it.

Remedy: Try again, but before you do, use the “timeout enable” command with an argument of 2 or 3 to disable command recognition. Alternatively, you could change the prefix, but only do this temporarily and if all other system users have been notified.

MC-8 Robust X-ON/X-OFF present

The MicroSwitch might not be timing out connections to a printer because the printer’s sending robust X-ON signals.

Remedy: Some printers, particularly HP LaserJet models, send X-ON codes at timed intervals. If possible, turn this feature off. You could also configure the printer’s MicroSwitch port for X-ON/X-OFF flow control or half-duplex operation, or in extreme cases disconnect Pin 3 on the MicroSwitch end of the cable attaching the printer to the Switch.

MC-9 No form feed

If the printout of the current job appears on the same page as the printout of the previous job, it is probably because the previous job did not issue a form feed.

Remedy: Try again, but for the future either change the previous job’s application so that it sends a form feed or turn on your MicroSwitch’s automatic form-feed feature (refer to Section 4.2.10).

MC-10 Plotter configured as half-duplex

The job might have locked up because the plotter’s port is configured for half-duplex. When this is the case, an application program will wait forever for a plotter to answer.

Remedy: Configure your MicroSwitch so that the plotter’s port is full duplex.

MC-11 Modem not configured for pulse DTR

Your computer won’t be able to hang up a modem by dropping DTR if the modem’s port hasn’t been configured for that feature.

Remedy: Configure your MicroSwitch modem port for pulse DTR operation.

8.2.6 NO RESPONSE (“NR”)

NR-1 MicroSwitch is powered off

Your MicroSwitch might have lost power or been turned off.

Remedy: If the POWER LED is dark, try to turn the MicroSwitch on. If it can't be turned on, see if it's unplugged. If its transformer is plugged in and it still can't be turned on, try a different outlet.

NR-2 Port in menu mode

If your port is in either the configuration, port-connection, or job-control menu, it won't respond to commands or data until you exit the menu.

Remedy: Issue the proper port exit characters: “EX” for the configuration or job-control menus, [RETURN] for port-connection menu if you haven't yet made a connection, and “!@#\$M” to disconnect from a port you've connected to with the port-connection menu.

NR-3 Wrong PC port

You might be trying to send data out of the wrong communications port on your PC.

Remedy: Issue the proper DOS MODE command, or set up your application program, for the proper port.

NR-4 Buffer full

Your MicroSwitch's buffer might be full. If so, the Switch won't be able to accept any data or commands.

Remedy: If all the port LEDs are lit when the BUF LED lights, the buffer is full. Correct whatever is causing the busy condition at the destination device(s) (printer offline, out of paper, etc.) to allow some buffer area to be freed.

NR-5 Queue full

Your MicroSwitch's job queue might be full. If this is the case, the Switch will be able to accept data, but not commands.

Remedy: Correct the problem that's causing so many jobs to stack up. It might be that the timeout is too fast, a destination is excessively busy, or a computer is transmitting spurious characters.

NR-6 Unit in diagnostic mode

Your MicroSwitch might be in the diagnostic mode.

Remedy: Turn your MicroSwitch off and back on to exit the diagnostic mode.

NR-7 Unit in error state

Your MicroSwitch might have halted due to an error.

Remedy: If the BUF, DATA, and BUSY LEDs on your MicroSwitch's front panel are all lit at the same time, your MicroSwitch might require service. See Section 9.3.

NR-8 Wrong ROM revision installed

A command has been issued which is not implemented in your current ROM.

Remedy: Check the ROM revision level from the configuration menu or by issuing the “identify ROM revision level” command.

NR-9 Bad COM port

If you're trying to send out of a PC's COM port, the COM port might be bad.

Remedy: Try using another computer or COM port. Often serial ports appear to work when printing but will not work under MicroLink or communications programs because of improper IRQ setup. Contact your computer supplier if you suspect this and changing ports or computers solves the problem.

NR-10 Bad MicroSwitch port

If other options have been ruled out, the device's MicroSwitch port might be bad. Try attaching your device to another port on the MicroSwitch. If the new port works and it is configured exactly the same way as the old port was, contact Black Box Technical Support.

8.2.7 PROTOCOL ("PR")**PR-1 Protocol problem**

The protocol (baud rate, parity, data bits, stop bits, flow control) of your application program or your computer's or terminal's serial port might not match that of the attached MicroSwitch port. Or, if you're using DTR/DSR flow control and output data is being lost, the DTR in the cabling might be miswired.

Remedy: If you suspect DTR miswire, check your cable pinouts against the table in **Appendix B**. Replace the cable if necessary. Otherwise, change the settings of either the program/serial port or the MicroSwitch port.

- PC users: Watch out for applications which use X-ON/X-OFF protocol. Standard DOS uses DTR protocol only. Also watch out for the many applications which do not restore your baud rate when you're finished.
- Terminal users or DEC users: Watch out for the eighth bit being set high.
- Graphics/laser users: Watch out for applications which send binary bit images and use X-ON/ X-OFF flow control. You might have to configure your computer's MicroSwitch port for X-ON transmit control OFF and the printer's MicroSwitch port for transmit control ON.

8.3 Power-Up Tests

The four tests described in this section will be performed by your MicroSwitch, one after the other, when you turn it on.

8.3.1 CHECKSUM TEST OF PROGRAM IN EPROM

First, the MicroSwitch gives its program (stored in EPROM) a checksum test. The binary numbers that represent the program's instructions are added together, and the sum compared with the correct value. If the program passes the test, it is probably valid and the MicroSwitch will go on to the next test. If the program fails, the checksum error will be displayed on the front-panel LEDs as Error 1 (BUF, DATA, BUSY, and LED #1 lit, as shown in Figure 5-2 at the end of **Section 5.3**). In this situation the MicroSwitch will immediately halt. This is a fatal error; the unit must be serviced.

8.3.2 BUFFER MEMORY SIZING AND READ/WRITE TEST

Secondly, the Switch tests its buffer memory. The MicroSwitch will initially light up the numbered LEDs to indicate how much memory is present, as shown in Figure 5-3 at the end of **Section 5.3**. Then the Switch writes to and reads from the memory locations to see if they are operational. If the buffer passes, the MicroSwitch will go on to the next test. If it fails, the error will be displayed as Error 2 (BUF, DATA, BUSY, and LED #2 lit). The unit will immediately halt. This is also a fatal error; the unit must be serviced.

8.3.3 READ/WRITE TEST OF STATIC RAM

Thirdly, the MicroSwitch tests its static RAM. A read/write test is performed on all locations. The unit will halt and display Error 3 (BUF, DATA, BUSY, and LED #3 lit) if there is a problem. This is also a fatal error; the unit must be serviced.

8.3.4 CHECKSUM TEST OF NONVOLATILE RAM

The MicroSwitch's fourth and final power-up test is a checksum test of its nonvolatile memory. If the nonvolatile RAM passes, the unit goes into its normal operational mode. If it fails, Error 4 will be displayed (BUF, DATA, BUSY, and LED #4 lit), indicating that the data in nonvolatile memory has been corrupted.

This error is not necessarily fatal. At this point you can attempt to rewrite the default parameters by pushing the ADVANCE button. If the LEDs go dark, turn the Switch off and then on again to see if it still halts at Error 4. If it does, call Black Box Technical Support; a chip has gone bad and the error is fatal. If, however, the unit recovers from the error, the configuration parameters will have been returned to their default settings; reconfigure the Switch as necessary. Recovery is unusual and indicates that the unit has probably been subjected to a strong static discharge or a surge on its incoming power or signal lines. Investigate this situation carefully, and add static mats or surge protectors if necessary.

8.4 Diagnostic Modes

There are three groups of special diagnostic tests you can run directly on the MicroSwitch to help you determine if it has any problems. The long test sequence consists of extensive memory checking plus tests on the ports. The short test sequence is similar to the series of power-up tests, but it continuously cycles and allows reloading of the factory-default settings. The tests will continuously cycle while you keep the Switch in diagnostic mode unless they find an error. An error is indicated by the BUF, DATA, and BUSY LEDs and a numbered LED being lit. The number of the LED indicates which test has failed. If LED #2 is lit, LEDs #5 through 8 might also be lit, indicating the amount of memory that is installed.

8.4.1 LONG TEST SEQUENCE WITHOUT LOOPBACK

You can start this group of tests by pressing only the SELECT button when you turn on the unit. All equipment should be disconnected from your MicroSwitch prior to running these tests.

Test 1: Checksum test of program in EPROM is the same as in **Section 8.3.1**.

Test 2: Test of dynamic RAM is more extensive than the power-up read/write test of buffer memory, and takes longer to perform. When the sequence reaches this point, you can skip this test by pressing the ADVANCE and SELECT buttons simultaneously. If this test fails (BUF, DATA, BUSY, and LED #2 are lit) then the unit must be serviced. (LEDs #5 through 8 might be lit also, indicating the amount of memory that is installed.)

The failing board and memory device can be determined by pressing the ADVANCE button. The BUF LED will be lit if the failing board is the base motherboard or the bottommost installed memory board. The DATA LED will be lit if the failing board is the second from the bottom. The BUSY LED will be lit for the third board, and LED #0 will be lit for the fourth board. LEDs #1 through 8 correspond to the physical placement of the failing chip. If the failing chip is the leftmost one on the board, then LED # 1 will be lit. If the failing chip is second from the left, then LED #2 will be lit, and so on, all the way to the rightmost chip, for which LED #8 will be lit. At this point you can press the SELECT button to retry this test.

Test 3: Same as read/write test of static RAM in **Section 8.3.3**.

Test 4: Same as checksum test of nonvolatile RAM in **Section 8.3.4**.

Test 5: Port-addressing test checks if the contents of nonvolatile memory agree with the current port configuration. When the sequence reaches this point, you can skip this test by pressing the ADVANCE and SELECT buttons simultaneously. If this test fails (BUF, DATA, BUSY and LED #5 are lit) then either the configuration memory has been corrupted or a port's communication chip has failed.

Reload the factory-default settings, as described in **Section 8.4.4**, and retry the test sequence, making sure there are no cables connected to your MicroSwitch. If this test still fails then the unit must be serviced. Press the ADVANCE button to determine which port is the failing port. BUF, DATA, and BUSY will all be lit, and the LEDs of all ports which pass will be lit. A failing port's LED will be dark. At this point you can press the SELECT button to retry this test.

Test 6: Module test tells you whether there are any signal shorts on a port. No equipment should be connected to your MicroSwitch. When the sequence reaches this point, you can skip this test by pressing the ADVANCE and SELECT buttons simultaneously. If this test fails (BUF, DATA, BUSY, and LED #6 are lit) then a port's communication chip has failed and the unit must be serviced.

Press the ADVANCE button to determine which is the failing port. BUF, DATA, and BUSY will all be flashing, and the LEDs of all ports which pass will be flashing. A failing port's LED will be steadily lit. LEDs corresponding to uninstalled ports will be dark. At this point you can press the SELECT button to retry this test.

End the long test sequence by turning the Switch off and then on again, without pressing either the ADVANCE or SELECT button. The unit will run through its power-up sequence and then be ready for normal operation.

8.4.2 LONG TEST SEQUENCE WITH LOOPBACK

You can start this group of tests by pressing only the ADVANCE button when you turn on the unit. Special loopback connectors should be connected to each MicroSwitch port.

Tests 1 through 5: These are the same as tests 1 through 5 of the long test sequence without loopback in **Section 8.4.1**.

Test 6: The loopback test tells you whether all port signals are functional. For this test to work, special loopback connectors must be attached to each port (see Table 8-1 on the next page). When the sequence reaches this point, you can skip this test by pressing the ADVANCE and SELECT buttons simultaneously. If this test fails (BUF, DATA, BUSY and LED #6 are lit) then a port's communication chip has failed and the unit must be serviced.

Press the ADVANCE button to determine which is the failing port. BUF, DATA, and BUSY will all be flashing, and the LEDs of all ports which pass will be flashing. A failing port's LED will be steadily lit. LEDs corresponding to uninstalled ports will be dark. At this point you can press the SELECT button to retry this test.

End the long test sequence by turning the Switch off and then on again, without pressing either the ADVANCE or SELECT button. The unit will run through its power-up sequence and then be ready for normal operation.

Table 8-1. Loopback-connector pinning.

**DB25 Male Loopback Connectors
for XS Serial Ports**

2.....3
6.....20

**RJ-45 Male Loopback Connectors
for XSP, 17SPN Serial Ports**

2.....3
4.....6

**36-Pin Centronics Male Loopback Connectors
for XP Parallel Ports**

2.....13
3.....32
4.....12
5.....31
6.....36
7.....14
8.....1
9.....11
34.....10

**DB25 Male Loopback Connectors
for XSP, 17SPN Parallel Ports**

1.....8
2.....13
3.....15
4.....12
5.....16
6.....17
7.....10 & 14
9.....11

8.4.3 SHORT TEST SEQUENCE

You can start the short test sequence by pressing both the SELECT and ADVANCE buttons when you turn on the unit. Its Tests 1 through 4 are exactly the same tests as those performed during the power-up sequence, but they cycle continuously. Enter this state for a continuous test of your MicroSwitch's functions or to reload its factory-default settings as described in **Section 8.4.4**.

8.4.4 RELOADING THE FACTORY DEFAULTS

A way to reload the factory-default configuration when Error 4 occurs at power-up has been described in **Section 8.3.4**. But if no error occurs, there are only two ways to get back to the factory-default configuration once a new configuration has been saved in nonvolatile memory. The first is to use the configuration menu and/or a combination of direct commands, which would take some time. The other method is hardware-driven and applies during the short test sequence.

When you turn your MicroSwitch on, press both the ADVANCE and SELECT buttons to trigger the short test sequence. Continue to hold both buttons in while the Switch cycles through Tests 1 through 4. The switch will halt with LED #4 lit. Release the buttons at this point to load the factory-default configuration. The unit will resume cycling through Tests 1 through 4. To go back to normal operation, you must turn the unit off and back on. The unit will now be set to its factory defaults. Reconfigure your MicroSwitch as necessary.

8.5 Calling Black Box

If you determine that your MicroSwitch is malfunctioning, *do not attempt to alter or repair it*. It has no user-serviceable parts. Contact Black Box Technical Support at 724-746-5500.

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; and
- the results of any testing you've already done.

8.6 Shipping and Packaging

If you need to transport or ship your MicroSwitch:

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

Appendix A: Quick-Setup Summary

There are two main ways to configure a MicroSwitch. The first is to use MCONFIG as described in **Section A.1**. MCONFIG is a program for a PC that asks you questions about your equipment configuration. You answer the questions, and the program loads these parameters into the MicroSwitch's configuration menu. This method is required for MicroSwitch XP units. The second method is to directly access the Master Switch's configuration menu through a serial port, as described in **Section A.2**. This can be done through a terminal emulator like the one provided with your MicroLink software or just a dumb terminal.

A.1 Running MCONFIG on a PC

1. Attach your computer to the MicroSwitch's Port 0 (serial Port 0 on XSP units) with the proper cable. Refer to **Section 2.2** and **Appendix B** for the correct cables, adapters, and pinouts. If you're using COM1 or COM2, issue the DOS command "MODE COM1:96,N,8,1" or "MODE COM2:96,N,8,1".
2. Plug in the MicroSwitch and turn it on. The Switch will light its LEDs as it performs power-up testing.
3. Using the DOS command COPY, load the MicroLink utility programs onto your computer. Run the configuration program called MCONFIG by typing "MCONFIG" at the DOS prompt.
4. Answer the questions as MCONFIG prompts you. For an example, see Figure A-1 below.
5. When you complete MCONFIG, attach your other devices. Refer to **Section 2.2** and **Appendix B** for the correct cables, adapters, and pinouts.
6. To test the switch, send data through it. The data will be routed to the default destination port.
7. If everything is satisfactory, your MicroSwitch is ready for normal operation. If you will be sending commands to the switch, decide how you'll be sending the commands (batch files, MicroLink, etc.—see **Chapter 6**). You must also make sure that, if you'll be using it, your PC's serial port is set up for the correct baud rate and LPT1 redirection. This is normally done by putting the appropriate DOS MODE command(s) in your AUTOEXEC.BAT file (see **Section 6.1**).

```

Pre-Configuration Setup           MicroSwitch Configuration Program, version 2.03

Which of these ports is hooked up to Port 0 of your MicroSwitch

For MicroSwitch units whose Port 0 is serial (includes all MSU units):
  1.  COM1:
  2.  COM2:

For MicroSwitch units whose Port 0 is parallel:
  3.  LPT1:
  4.  LPT2:

      Which one (1-4):

```

Figure A-1. Initial screen upon running the MCONFIG program.

A.2 Directly Accessing the MicroSwitch's Configuration Menu

1. Attach your computer or terminal to the MicroSwitch's Port 0 with the proper serial cable. Refer to **Section 2.2** and **Appendix B** for the correct cables, adapters, and pinouts.
2. Plug in the MicroSwitch and turn it on. The Switch will light its LEDs as it performs power-up testing.
3. Set your terminal or computer to 9600 bps (use the DOS command "MODE COM1:96,N,8,1" or "MODE COM2:96,N,8,1" to set a PC's COM1 or COM2 port).
4. On a PC, load and run your terminal-emulation program. If you want to use MicroLink's terminal emulator, load the MicroLink utility programs onto your computer and run MicroLink by typing "MSLINK /1" for COM1 or "MSLINK /2" for COM2. The MicroLink window will appear. Hit the [F9] key to go to the terminal emulator.
5. Type the five characters "!@#\$\$C". The configuration menu should appear, as shown in Figure A-2 on the next page.
6. You will now be prompted to enter a choice consisting of a two-character code. Enter "TY" to change the port type (**C**omputer, **P**rinter, **M**odem), "PR" to change the protocol of ports, "DE" to choose the default destinations of your computers or modems, "SA" to save the changes, and "EX" to exit the configuration menu. A "configuration completed" message appears. (Refer to **Chapter 4** for further information.) If you're using MicroLink's terminal emulator, hit the [ESCAPE] key twice to exit to DOS.
7. Attach your other devices. See **Section 2.2** and **Appendix B** for correct cables, adapters, and pinouts.
8. To test the switch, send data through it. The data will be routed to the default destination port.
9. If everything is satisfactory, your MicroSwitch is ready for normal operation. If you will be sending commands to the Switch, decide how you'll be sending the commands (batch files, MicroLink, etc.—see **Chapter 6**). You must also make sure that, if you'll be using it, your PC's serial port is set up for the correct baud rate and LPT1 redirection. This is normally done by putting the appropriate DOS MODE command(s) in your AUTOEXEC.BAT file (see **Section 6.1**).

MICROSWITCHES

```
MicroSwitch configuration rev. 5.3
Memory = 256K   Timeout = 20 sec.   Minutes = 5 min.   Prefix = !@#$

PORT TYPE      NAME      DEST      PRI  TE  FF  INIT      PROTOCOL
0 Computer ANITA   NULL      Low  On                19200,N,8,1,DTR  ,Half
1 Computer DIANE  NULL      Low  On                19200,N,8,1,DTR  ,Half
2 Computer HAL   NULL      High On                19200,N,8,1,DTR  ,Half
3 Computer ERIC  NULL      Low  On                19200,N,8,1,DTR  ,Half
4 Computer NANCY NULL      Low  On                19200,N,8,1,DTR  ,Half
5 Computer ROBERT NULL      Low  On                19200,N,8,1,DTR  ,Half
6 Modem  MODEM   NULL      Low  On                2400,N,8,1,XON P T,Full
7 Printer DRAFT                    On  .@                Parallel
8 Printer LASER                    Off .E                Parallel
A Group  GROUPA   Members are: 8
B Group  GROUPB   Members are: 8
Menu access      Members are: 6 7 8

TI - TIMEOUT VALUE  MI - MINUTES      PX - PREFIX      TY - TYPE
NA - NAME           DE - DESTINATION  PY - PRIORITY    TE - TIMEOUT ENABLE
PR - PROTOCOL       FF - FORM FEED   IN - INIT STRING GR - GROUP LIST
MA - MENU ACCESS    SA - SAVE CHANGES EX - EXIT

Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,GR,MA,SA,EX)

CD =Hi|RI =Lo|DSR=Hi|cTS=Hi| Format= 9600 8 1 None | ESC=return to menu
```

Figure A-2. Initial screen upon accessing the configuration menu from MicroLink's terminal emulator. (Name fields and other values have been changed from their defaults in this example.)

Appendix B: Cable Pinouts

The tables in this section show MicroSwitch pinouts on the left and all other devices on the right. Read across to find the pinout. Connector genders are those of the device port, not of the cable.

Serial Computers

MicroSwitch XS DB25 F	MicroSwitch XSP, 17SPN* RJ-45 F	IBM PC/XT, PS/2 compatible DB25 M	IBM PC/AT compatible DB9 M	Apple Macintosh compatible 8-pin mini-DIN F	DEC VAX DB25 F
2	4	3	2	5	3
3	6	2	3	3	2
7	5	7	5	4, 8	7
20	3	5, 6, 8	1, 6, 8	2	

**MicroSwitches XSP and 17SPN: Only the center 4 signals (Pins 3 through 6) are absolutely necessary for communication with computers. If your application doesn't require any other signals, you might be able to use 4-wire RJ-11 cable to make your computer connections.*

Serial Printers, Plotters

MicroSwitch XS DB25 F	MicroSwitch XSP, 17SPN* RJ-45 F	HP LaserJet compatible DB25 F	Xerox® 4045 compatible DB25 F	Apple compatible 8-pin mini-DIN F	Many plotters DB25
2	4	3	3	5	3
3	6	2	2	3	2
4	7		5, 6, 8		5, 6
6	2	20	20	1	20
7	5	7	7	4, 8	7

**MicroSwitches XSP and 17SPN: To support hardware handshaking with printers, your RJ-45 cable must have at least 6 wires with computers. If your application doesn't require any other signals, you might be able to use 4-wire RJ-11 cable to make your computer connections.*

MICROSWITCHES

Other Serial Devices

MicroSwitch XS DB25 F	MicroSwitch XSP, 17SPN RJ-45 F	Many modems, multiplexors DB25 F	VT100 compatible terminals DB25 F	MicroSwitch XS DB25 F	MicroSwitch XSP, 17SPN RJ-45 F
2	4	2	3	3	6
3	6	3	2	2	4
4	7	4			
6	2	*		20	3
7	5	7	7	7	5
20	3	20		6	2

**Which modem or mux pin, if any, you should connect to your MicroSwitch's DSR (DB25 Pin 6 or RJ-45 Pin 2) will vary. Modems and muxes should be attached to MicroSwitch ports configured as modem-type. MicroSwitches expect a carrier-detect signal on modem-port DSR. Muxes may or may not send such a signal; consult your mux manual. Many modems send carrier-detect (DCD) on Pin 8; for MicroSwitch XSP and 17SPN units, our Modem Adapter is wired to this pin. But many modems, especially Hayes.compatibles, can be set to have their DSR (Pin 6) correspond to (follow) carrier-detect. If your modem can be set in this way and you have a MicroSwitch XS, this will allow you to make your modem connection with straight-through RS-232 cable. Consult your modem manual.*

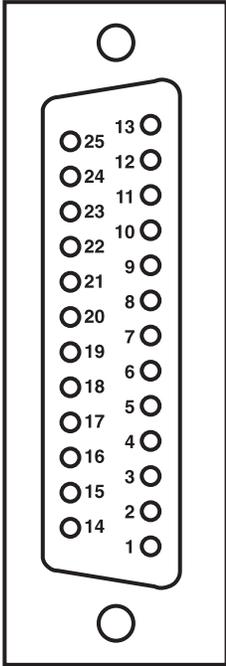
Parallel Devices

MicroSwitch XP 36-pin Centronics F	MicroSwitch XSP, 17SPN* DB25 F	Parallel printers 36-pin Centronics F	Parallel computer ports DB25 F	MicroSwitch XP 36-pin Centronics F	MicroSwitch XSP, 17SPN DB25 F
1-14	1-14	1-14	1-14	1-14	1-14
31	16	31	16	31	16
32	15	32	15	32	15
36	17	36	17	36	17
16, 19-30, 33	18-25	16, 19-30, 33	18-25	16, 19-30, 33	18-25

**MicroSwitch 17SPN: The parallel port (Port 16) can't be connected to a computer or another MicroSwitch 17SPN. If you connect it to a MicroSwitch XP, data will be able to flow only one way (17SPN to XP) across the link.*

Appendix C: Connector Pinouts

All views shown are from the rear of the MicroSwitch, facing the back panel. Views are not to scale.

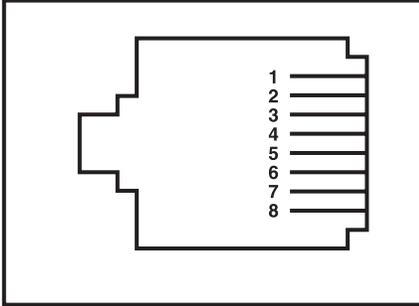


C.1 MicroSwitch XSP, 17SPN Parallel Ports

Pin	Signal	Signal Direction		Description
		Configured as Printer	Configured as Computer	
1	$\overline{\text{STB}}$	Output	Input	Active handshake signal
2	Data 0	Output	Input	Least significant data bit
3	Data 1	Output	Input	↓ Most significant data bit
4	Data 2	Output	Input	
5	Data 3	Output	Input	
6	Data 4	Output	Input	
7	Data 5	Output	Input	
8	Data 6	Output	Input	
9	Data 7	Output	Input	
10	$\overline{\text{ACK}}$	Input	Output	Active handshake signal
11	BUSY	Input	Output	Active handshake signal
12	PE	Input	Output	Low if configured as computer
13	SELECT	Input	Output	High if configured as computer
14	$\overline{\text{AF}}$	Output	Input	High if configured as printer
15	$\overline{\text{ERROR}}$	Input	Output	High if configured as computer
16	$\overline{\text{INIT}}$	Output	Input	On XSPs, must be high to receive if configured as computer; pulsed low on power-up if configured as printer
17	$\overline{\text{SELIN}}$	Output	Input	On XSPs, must be high to receive if configured as computer; low if configured as printer
18-25	Ground	Common	Common	Ground reference

Overscore on a signal indicates it is active low.

C.2 MicroSwitch XSP, 17SPN Serial Ports

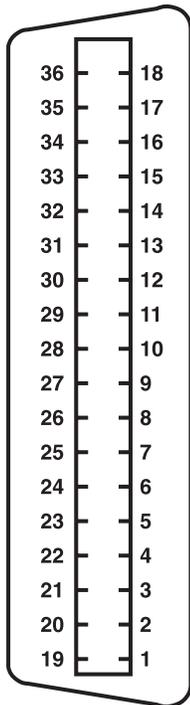


Pin	Signal Name	Abbrev.	Direction	Description
1	-12 volts			DC power, 10 mA max.
2	Data Set Ready	DSR	Input	Transmit inhibit/carrier
3	Data Terminal Ready	DTR	Output	Low when buffer full
4	Transmit Data	TD	Output	Serial data from port
5	Signal Ground	SGND	Common	Ground reference
6	Receive Data	RD	Input	Serial data to port
7	+12 volts			DC power, 10 mA max.
8	No connection			Not used

Pin 2 is the hardware-flow-control input/carrier-detect input. It has an internal pullup to set it high when no signal is connected.

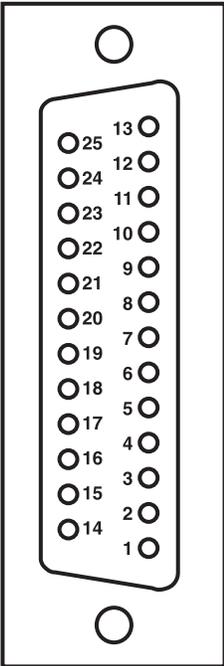
Pin 3 is the hardware-flow-control output.

C.3 MicroSwitch XSP, 17SPN Parallel Ports



Pin	Signal	Signal Direction		Description
		Configured as Printer	Configured as Computer	
1	STB	Output	Input	Active handshake signal
2	Data 0	Output	Input	Least significant data bit ↓ Most significant data bit
3	Data 1	Output	Input	
4	Data 2	Output	Input	
5	Data 3	Output	Input	
6	Data 4	Output	Input	
7	Data 5	Output	Input	
8	Data 6	Output	Input	
9	Data 7	Output	Input	
10	$\overline{\text{ACK}}$	Input	Output	Active handshake signal
11	BUSY	Input	Output	Active handshake signal
12	PE	Input	Output	Low if configured as computer
13	SELECT	Input	Output	High if configured as computer
14	$\overline{\text{AF}}$	Output	Input	High if configured as printer
15	$\overline{\text{ERROR}}$	Input	Output	High if configured as computer
16	$\overline{\text{INIT}}$	Output	Input	On XSPs, must be high to receive if configured as computer; pulsed low on power-up if configured as printer
17	$\overline{\text{SELIN}}$	Output	Input	On XSPs, must be high to receive if configured as computer; low if configured as printer
16, 19-30, 33	Ground	Common	Common	Ground reference

Overscore on a signal indicates it is active low.



C.4 MicroSwitch XS Serial Ports (DB25 Female)

Pin	Signal Name	Abbreviation	Direction	Description
1	-12 volts			DC power, 10 mA max.
2	Data Set Ready	DSR	Input	Transmit inhibit/carrier
3	Data Terminal Ready	DTR	Output	Low when buffer full
4	Transmit Data	TD	Output	Serial data from port
5	Signal Ground	SGND	Common	Ground reference
6	Receive Data	RD	Input	Serial data to port
7	+12 volts			DC power, 10 mA max.
8	No connection			Not used

Pin 2 is the hardware-flow-control input/carrier-detect input. It has an internal pullup to set it high when no signal is connected.

Pin 3 is the hardware-flow-control output.

Appendix D: RS-232 Signals

RS-232 signals passed back and forth during serial communication between your MicroSwitch and the equipment connected to it can be classified into four groups: transmit and receive signals, flow-control signals, enable signals, and signal grounds.

Group 1, transmit and receive signals, are responsible for carrying data between devices. Your MicroSwitch's Receive Data (DB25 Pin 3 or RJ-45 Pin 6) must be wired to your equipment's Transmit Data pin. Your MicroSwitch's Transmit Data (DB25 Pin 2 or RJ-45 Pin 4) must be wired to your equipment's Receive Data pin. A device such as a printer which does not send data to your MicroSwitch does not require any connection to the MicroSwitch's Receive Data pin except when X-ON/X-OFF flow control is used.

Group 2, flow-control signals, are used to regulate the flow of data. Printers use a Busy Out signal to stop computers from sending them data faster than they can print. Computers get this signal on a Busy In pin. Modems don't utilize hardware-generated Busy signals for flow control. Instead, they use software flow-control protocols such as X-ON/X-OFF and block-oriented schemes. Printers and computers can also utilize software flow-control protocols.

Printers with DB25 serial ports will usually have their Busy Out signals on Pin 11, 19, or 20, but consult your printer's manual. Computers with DB25 serial ports will usually have Busy In on Pin 5, 6, or 20, but consult your computer's manual. On your MicroSwitch, the printer's Busy Out must be wired to Data Set Ready (DSR, DB25 Pin 6 or RJ-45 Pin 2) and the computer's Busy In wired to Data Terminal Ready (DTR, DB25 Pin 20 or RJ-45 Pin 3) for hardware flow-control to work. Neither Busy In nor Busy Out is required when you use the X-ON/X-OFF protocol. However, DSR on your MicroSwitch is always active and will stop your MicroSwitch from sending data when the signal goes low. This allows a computer to use both X-ON/X-OFF and DTR flow control to support various application programs.

No signals are usually wired from a computer to a MicroSwitch computer-port's DSR, because when data is sent to a computer from a modem or another computer, a block-oriented software protocol is normally used for flow control instead of a hardware handshake. If something is wired from the computer to DSR on the MicroSwitch, don't turn off the computer without setting its destination to null first, because after the computer is turned off, the DSR signal will be in an undefined state that the MicroSwitch might interpret as meaning, "I'm still busy, so don't time me out." The computer would then stay connected to its destination, keeping other ports from accessing the destination device.

When a MicroSwitch's port is configured as a modem port, it does not use DTR as a buffer-in or buffer-out signal. And your MicroSwitch interprets the DSR signal differently for modem ports. It will not stop transmitting data when DSR goes low, but instead passes this signal to the DTR pin of the source port currently connected to the modem. By connecting the modem's Data Carrier Detect pin (DCD, usually DB25 Pin 8) to DSR on your MicroSwitch, the Carrier Detect signal can be sent to the source computer. Wire the MicroSwitch's DTR to both the Busy In and Carrier Detect Input pins on the source computer. This allows the modem to signal the computer when it's made a connection to a remote modem.

Group 3, enable signals, are used to "enable" the transmitter or receiver. This is a modem-support function. Certain computers and printers must receive this signal high before their interfaces will operate. The input pin that receives the signal must be connected to an output pin that normally drives a signal high all the time, either on the computer or printer's own interface or from your MicroSwitch. Request To Send (RTS, DB25 Pin 4) on a MicroSwitch XS will be high when the MicroSwitch is on and may be used as an enable signal for your equipment.

Group 4, signal grounds, are used to protect data signals from electrical surges and interference. MicroSwitches' signal grounds (DB25 Pin 7 or RJ-45 Pin 5) must always be connected to the signal ground pins of the attached equipment.

Appendix E: Command Summary

In the commands' "Syntax" entries below, "PREFIX" stands for the currently programmed prefix. (All of the "Examples" use the factory-default prefix.) The "plus signs" and spaces are used for descriptive purposes only. Don't include them in actual commands.

Some of the commands can include non-ASCII binary characters. Since the non-ASCII characters are not printable (and won't show up on your screen if you type them in at a terminal), they will be shown underlined in the examples below, as the corresponding decimal number: 15, 0, etc.

SET DESTINATION TO PORT

Syntax: PREFIX + ASCII port number 0-8

Example: !@#\$7

SET DESTINATION TO NULL

Syntax: PREFIX + ASCII character 9

Example: !@#\$9

SET DESTINATION TO GROUP

Syntax: PREFIX + ASCII character A or B

Example: !@#\$A

CONFIGURATION MENU

Syntax: PREFIX + ASCII character C

Example: !@#\$C

SET REMOTE DESTINATION

Syntax: PREFIX + ASCII character D + binary source-port number from 0 to 63 + binary new-destination-port number from 0 to 63

Example: !@#\$D1 2 *sets destination of Port 1 to Port 2*

MICROSWITCHES

FORMAT

Syntax: PREFIX + ASCII character F + *nbbpws* where:

n is the port number to be changed:

- For all but MicroSwitch 17SPN: ASCII port number 0-8 or M for “my port”;
- For 17SPN: ASCII port number 0-9, binary port number 0-15, or ASCII M for “my port.”

bb is the first two digits of the baud rate:

19=19200	36=3600*	60=600	11=110*
96=9600	24=2400	30=300	75=75
72=7200*	18=1800*	15=150	50=50*
48=4800	12=1200	13=134.5*	

*can't be selected for 17SPN units

p is the parity: N=none, E=even, O=odd, M=mark, S=space

w is the word length: 8 = 8 data bits, 7 = 7 data bits, 6=6 data bits, 5=5 data bits

s is the number of stop bits: 1 = 1 bit, 2 = 2 bits

c is the flow-control/operation-mode type: The members of each numbered pair of settings are mutually exclusive (choose one or the other, not both). Only one of these settings may be selected each time you send this command:

- | | |
|--------------------------------|-----------------------------|
| (1) D=DTR | X=X-ON/X-OFF |
| (2) F=Full duplex | H=Half-duplex |
| (3) P=Pulse DTR | p=Don't pulse DTR |
| (4) R=Robust ON | r=Robust OFF |
| (5) T=X-ON transmit control ON | t=X-ON transmit control OFF |

MicroSwitch 17SPN only:

- | | |
|------------------------|---------------------|
| (6) L=Loopback mode ON | l=Loopback mode OFF |
|------------------------|---------------------|

You can use commas to skip fields that don't need to be changed. Use one comma to skip each field except *bb*, which requires two commas.

Example: !@#F8 12 E 7 1 X sets Port 8 to 1200 bps, even parity, seven data bits, 1 stop bit, and X-ON/ X-OFF flow control

Example: !@#FM , , , , , H port sending command changes to half duplex, all other parameters are unchanged

Example: ! @#F12 19 N 8 1 D sets Port 12 on a 17SPN to 19,200 bps, no parity, 8 data bits, 1 stop bit, and DTR/DSR flow control

IDENTIFY MY PORT NUMBER**Input Syntax:** PREFIX + 3 ASCII characters IME**Output Response:** Single binary port number**Example Input:** !@#\$IME**Example Output:** 5 *indicates your port is number five***IDENTIFY DESTINATION****Input Syntax:** PREFIX + 2 ASCII characters ID + single binary port number or ASCII M for “my port”**Output Response:** Binary port number, ASCII letter A or B (group), or binary byte value 127 (null)**Example Input:** !@#\$IDM**Example Output:** 8 *indicates your destination is Port 8***IDENTIFY ROM-REVISION LEVEL****Input Syntax:** PREFIX + 3 ASCII characters IRE**Output Response:** Two ASCII characters representing revision level of the MicroSwitch ROM**Example Input:** !@#\$IRE**Example Output:** 40 *indicates revision level 4.0 is installed (your revision level should be 4.0 or higher)***IDENTIFY NAME OF PORT****Input Syntax:** PREFIX + 2 ASCII characters IN + binary port number, ASCII A or B (group), or ASCII M (my port)**Output Response:** 8 ASCII characters (a name shorter than 8 characters is padded with trailing spaces)**Example Input:** !@#\$IN4**Example Output:** SAMUEL [+ two spaces] *indicates name of Port 4 is “SAMUEL”***IDENTIFY NUMBER OF PORTS INSTALLED****Input Syntax:** PREFIX + 3 ASCII characters IQP**Output Response:** Single binary byte**Example Input:** !@#\$IQP**Example Output:** 2 *indicates there are 2 (17SPN) or 3 (XS, XSP) ports installed*

MICROSWITCHES

IDENTIFY TYPE AND OPERATION MODE OF PORT

Input Syntax: PREFIX + 2 ASCII characters IT + binary port number or ASCII M (my port)

Output Response: Binary byte ranging in value from 0 to 7, with three significant bits in the bit positions shown:

bit position 2 = 1 for half-duplex, 0 for full duplex

bit position 1 = 1 for modem, 0 for not a modem

bit position 0 = 1 for printer, 0 for not a printer

Example Input: !@#\$IT7

Example Output: 4 (bit 2= 1, bit 1=0, bit 0=0) *indicates Port 7 is half duplex, not a modem, and not a printer (therefore, a computer port)*

IDENTIFY CONFIGURATION OF PORT

Input Syntax: PREFIX + 2 ASCII characters IC + binary port number or ASCII M (my port)

Output Response: Single ASCII character: S for serial, P for parallel, X for empty (nothing attached to the port)

Example Input: !@#\$IC2

Example Output: S *indicates Port 2 is a serial port*

JOB-CONTROL MENU

Input Syntax: PREFIX + ASCII character J

Output Response: Interactive job-control menu

Example Input: !@#\$J

KILL (CANCEL)

Syntax: PREFIX + three ASCII characters KLL

Example: !@#\$KLL *cancels last job sent from my port*

PORT-CONNECTION MENU

Syntax: PREFIX + ASCII character M

Example: !@#\$M

PRINT CONFIGURATION

Syntax: PREFIX + ASCII character P

Example: !@#\$P

STATUS

Syntax: PREFIX + ASCII character S

Example: !@#\$S

TIMEOUT

Syntax: PREFIX + ASCII character T + ASCII character *n*, which can be either 0, 1, 2, or 3:

if *n* = 0 then timeouts are disabled

if *n* = 1 then timeouts are enabled

if *n* = 2 then the minutes timer is enabled but commands are ignored

if *n* = 3 then the seconds timer is enabled but commands are ignored

Example: !@#\$T0 *disable the timeouts on my port*

VERIFY ECHO

Input Syntax: PREFIX + 3 ASCII characters VEE + one byte of any value

Output Response: Complement of input byte value

Example Input: !@#\$VEE55

Example Output: 200 *echoes complement of input value*

VERIFY INPUT

Input Syntax: PREFIX + 2 ASCII characters VI + single binary port number or ASCII M (my port) + ASCII character 0 (zero)

Output Response: Single ASCII character 0 for low (negative voltage at pin) or 1 for high (positive voltage at pin) on DSR

Example Input: !@#\$VI20

Example Output: 1 *indicates DSR on Port 2 is high (positive voltage at pin)*

VERIFY OUTPUT

Syntax: PREFIX + 2 ASCII characters VO + single binary port number or ASCII M (my port) + ASCII character 0 for “set to low” (negative voltage at pin) or 1 for “set to high” (positive voltage at pin)

Example: !@#\$VO40 *forces Port 4 DTR to go low (negative voltage at pin)*

SET EXTENDED DESTINATION

Syntax: PREFIX + ASCII character X + binary port number

Example: !@#\$X5 *sets my destination to Port 5; same as sending command !@#\$5*

Example: !@#\$X13 *sets my destination to Port 13; can't be done with the “set destination to port” command*

MICROSWITCHES

These two commands are for the MicroSwitch 17SPN only:

SET INITIALIZATION STRING

Syntax: PREFIX + ASCII character Z + initialization string from 0 to 64 characters long + 0. (null)

Example: !@#\$ZPrintout from Roger's PC12 0 sets a banner page with form feed on the sending port

Example: !@#\$Z0 disables a string that was previously set with this command

SET ASCII DESTINATION

Syntax: PREFIX + ASCII character = (equals sign) + *ddd* (three-digit ASCII port number 000 to 016)

Example: !@#\$=015 sets destination to Port 15

Syntax: PREFIX + ASCII character = (equals sign) +*ddd* (three-digit ASCII port number 000 to 016)

Example: !@#\$=015 sets destination to Port 15

Appendix F: Factory Defaults

When you receive your MicroSwitch from the factory, the following default settings are in force:

Timeout (Seconds Timer): 20 seconds

Minutes Timer: 2 minutes

Prefix: !@#&

Type: Highest-numbered port is printer; all others are computers

Name: PORT *X*, where *X* is the port number

Destination: Highest-numbered port

Priority: Low

Timeout: On

Serial or Parallel (XSP only): All ports serial

Serial Protocol (XS, XSP, 17SPN):

All: 9600 bps, no parity, 8 data bits, 1 stop bit, DTR/DSR flow control, DTR pulse off;

XS, XSP: computer ports full duplex, printer port (highest-numbered port) half-duplex;

17SPN: computer ports half-duplex

Form Feed: Off

Initialization Strings: None

Groups A and B: Highest-numbered port is the only member

Menu Access: Highest-numbered port is the only member

Appendix G: Memory-Expansion Boards

You can expand your MicroSwitch's buffer with optional memory-expansion boards. Installing one of these boards expands the buffer from the standard 64K to 256K (part number SL012-C), 512K (part number SL013-C), or 1 MB (part number (SL014-C). Stacking two boards allows the buffer to be increased to 2 MB. Four stacked boards will provide a full 4 MB. These boards require the use of 256K x 4 DRAM (standard 20-pin, 5-volt-only type; the speed doesn't matter). As you install these boards, refer to Figure G-1.

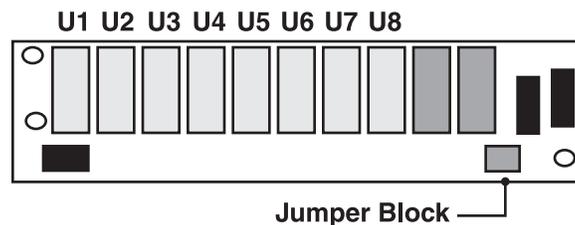


Figure G-1. A MicroSwitch memory-expansion board, showing the expansion slots U1 through U8.

G.1 Description

Each memory-expansion board is a socketed printed-circuit board with spaces for eight DRAM chips. Two 20-pin extensions on the bottom of each board plug directly into your MicroSwitch's motherboard (where the two DRAM chips for the basic 64K buffer are located) or into another expansion board, where two included threaded metal spacers will secure it, as shown in Figure G-1.

CAUTION!

This board is sensitive to static electricity. Handle it only by the edges and only if using a grounding strap or other commercial grounding device. The expansion pins on the underside of the board are delicate. Be careful not to bend or break them during installation.

G.2 Installation

Installing your expansion board(s) is a ten-step process:

1. Unplug your MicroSwitch's power cord.
2. Remove the two screws from either side of the unit and remove the cover.
3. Remove the two socketed DRAM chips from your MicroSwitch's motherboard. The chips are numbered U13 and U14 on the motherboard and are positioned vertically near LEDs 7 and 8. These will not be reused.
4. If you are adding your own chips to an unplugged motherboard, install them at this time. The sockets are numbered 1 through 8 from left to right. Pin 1 of each socket is at the top left. Match this with Pin 1 of the chip itself (located to the left of a small indentation at the top of the chip).

5. Insert the chips according to the following buffer sizes:
 - 256K buffer: Install chips in sockets U1 and U5.
 - 512K buffer: Install chips in sockets U1, U2, U5 and U6.
 - 1 MB: Install chips in sockets U1, U2, U3, U4, U5, U6, U7, and U8. If you are using two or four boards, all boards should contain 1 MB.
6. Position the jumper block's small wire jumper for each board you are using as follows:
 - One board being installed: Position 1 (far left).
 - Two boards being installed: The first board's jumper should be in position 1. The second (top) board's jumper should be in position 2 (second from left).
 - Four boards being installed: The first board's jumper should be in position 1. The second (top) board's jumper should be in position 2 (second from left). Board 3's jumper should be in position 3 (second from right). Board 4's jumper should be in position 4 (far right).
7. Carefully plug the pins of the expansion board (the first board if using two or four) into the motherboard's sockets where the 64K chips were removed.
8. Fasten the board using the two threaded spacers. Screw them into the motherboard's existing spacers (after removing two small Phillips-head screws that might be in place). The spacers should be finger-tight. If you're installing two or four boards, stack them by plugging the expansion pins of one into the expansion sockets of another. Make sure the jumpers are correct (see Step 6). Tighten the spacers for each board.
9. Replace the cover and install the screws.
10. Plug the power cord into the wall socket and turn the power switch ON. The memory-expansion board setup is now ready for operation.

When you turn on the MicroSwitch, it will perform its four normal self-tests, including a buffer check. If the self-test locates a DRAM problem, the error display of the MicroSwitch's LEDs will indicate that a chip is bad. You can determine which chip is defective by running one of the long diagnostic test sequences. Refer to **Sections 5.3** and **8.4** for more information.

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