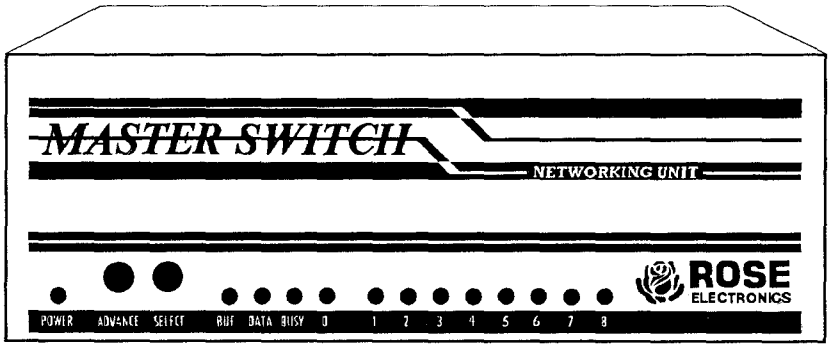
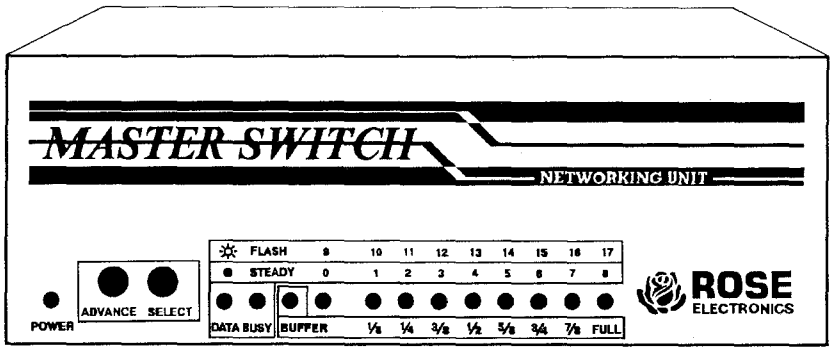
MASTER SWITCH

NETWORKING UNIT

INSTALLATION
AND
OPERATION MANUAL





ROSE ELECTRONICS

PO BOX 742571 • HOUSTON, TEXAS 77274 • (713) 933-7673

Limited Warranty

Rose Electronics warrants the MASTER SWITCH™ to be in good working order for one year from the date of purchase from Rose Electronics or an authorized dealer. Should this product fail to be in good working order at any time during this one year warranty period, Rose Electronics will, at its option, repair or replace the Unit as set forth below. Repair parts and replacement units will be either reconditioned or new. All replaced parts become the property of Rose Electronics. This limited warranty does not include service to repair damage to the Unit resulting from accident, disaster, abuse, or unauthorized modification of the Unit, including static discharge and power surges.

Limited Warranty service may be obtained by delivering this unit during the one year warranty period to Rose Electronics or an authorized repair center providing a proof of purchase date. If this Unit is delivered by mail, you agree to insure the Unit or assume the risk of loss or damage in transit, to prepay shipping charges to the warranty service location, and to use the original shipping container or its equivalent. You must call for a return authorization number first. Under no circumstances will a unit be accepted without a return authorization number. Contact an authorized repair center or Rose Electronics for further information.

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WARNING: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

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Table of Contents

Introduction

This manual contains information for the installation and operation of the **MASTER SWITCH™**. It is a versatile product for interconnecting your computers and peripherals using the common serial (RS232) and parallel (Centronics) interfaces of your equipment. The switch accepts over 20 commands for controlling the flow of data. It may also be used automatically or be controlled by interactive menus. Applications for the switch include office automation, CAD/CAM, machine control, data collection, data communications, telecommunications, retail point-of-sale, and others.

Included with each unit is the **MasterLink™** utility diskette for use with PCs. MasterLink is a memory resident program to send commands to or access menus from the switch. MasterLink is popped-up from any program via a hot key. The diskette also contains utilities for configuration, batch file operation, problem diagnosis, and cable testing. Optional **MasterNet™** software for PCs allows directory operations, file transfer, electronic mail, and other capabilities.

Initial installation involves connecting the computers and peripherals to the switch using common serial and parallel cabling. The switch is then configured to match the types of devices connected and their communication parameters. Commands are sent by several different methods, depending upon the application, to automate the flow of data.

The product is available in different variations of the number of ports, port type (serial or parallel), and amount of buffer memory. Please refer to *APPENDIX A* for a description of the part number and available options.

Features

- Connect any port to any port using serial or parallel ports
- Supplied with MasterLink utility disk for PCs
- Optional MasterNet software allows file transfer and electronic mail among PCs
- Operates automatically, by command, or interactive menus
- Works with all computers—PCs, minicomputers, and mainframes
- Works with all peripherals—printers, plotters, modems, and others
- Port contention for connecting to first available of a group of ports
- All ports programmable as inputs, outputs, or both
- Up to four megabyte buffer supports up to 64 queued jobs
- Job control menu can cancel, suspend, and release queued jobs
- Computers and terminals can access port connection menu
- Printers can automatically connect, initialize, and form feed
- Modem support includes auto hang up and commands for protocol and timeout
- Menu driven configuration saved in non-volatile memory
- Front panel displays buffer capacity, data flow, and busy states
- Diagnostic tests for internal memory and port loopback

First Steps

Congratulations! You have chosen one of the best intelligent peripheral sharing devices on the market. The paragraphs below summarize the steps to integrate the Master Switch into your environment.

Contents

You should have received the Master Switch system unit, a power adapter, this Master Switch installation and operations manual, and a MasterLink utilities diskette with documentation. If you have a MSU or MSN unit, then you should have also received a serial cable. Save the cardboard box and its styrofoam inserts. If you have ordered any additional cables they usually arrive in the same package.

Connecting the Cables

Cabling is one area to which you must pay careful attention. Incorrect cabling can cause wasted effort when it could be done right the first time. Do not use any cable that happens to be around. Consult the cabling guides in this manual for the correct pinouts. If you are not sure, give us a call, we will be happy to assist you.

Configuring the Master Switch

The Master Switch is a versatile unit. It can be configured to match the type of equipment that you have. To configure the switch requires connecting a computer or terminal to the configuration port on the Master Switch - port 0.

If you have a PC, then you run a supplied configuration program to setup the Master Switch. The parameters are saved in the Master Switch. From time to time as you change the configuration of your equipment, you may need to adjust the configuration of the Master Switch. You do not have to have a PC to use the switch or configure it.

Configuring your Computers

The final step is to make sure that your computer's software is configured to access the features of the Master Switch. This involves setting up the proper communication settings for serial ports and providing a method to issue commands to the Master Switch. The commands are typically issued from PCs by the pop-up utility, MasterLink, or from batch files. If you use serial ports on PCs, it is required to setup the AUTOEXEC.BAT file with the proper DOS MODE statements.

If You Have A Problem

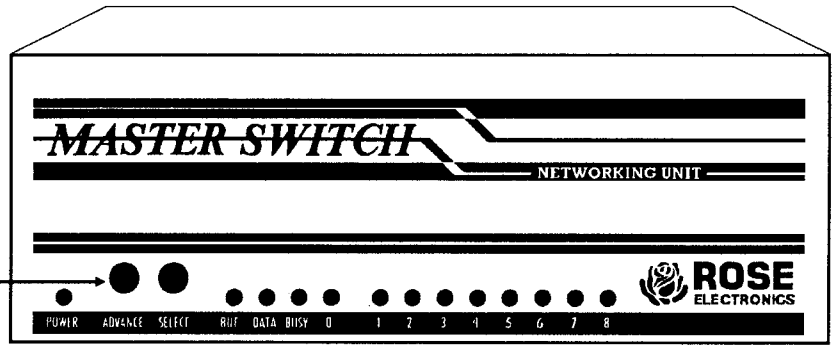
Well we certainly hope all goes well with your installation, but if there is a problem, we are only a phone call away. If you have already installed the switch and something is not right, it can be helpful to be at the switch location and at the computer connected to port 0 on the Master Switch when you call. The front panel of the Master Switch is very useful to diagnose problems that can occur.

Where to Go From Here

We would like to think that you would read the rest of this manual. It may not be the most exciting reading material, but at least scan through it for the key points. Use it to get the correct cabling information. Thank you for choosing Rose Electronics and the Master Switch.

MS Series Front Panel Display And Control

The Master Switch front panel gives visual feedback about its operation. The advance and select switches choose which information the LEDs display.



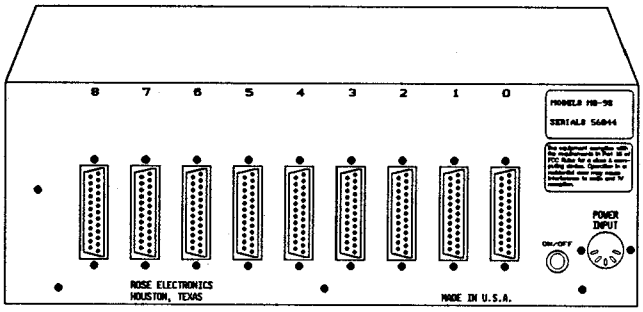
Pushing the select switch freezes the display on either buffer, data, or busy. Pushing the advance switch causes the display information to rotate between buffer, data, and busy.

When the buffer light is lit, LEDs 1-8 show how much buffer is used. When the data or busy light is lit, LEDs 0-8 show activity on the corresponding port.

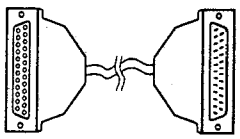
In addition to the functions noted above, the switches and LEDs are also used to enter and display various diagnostic modes or show error conditions. The Master Switch is electronically controlled; the switches and LEDs are used only in initial setup or for diagnostics. To see more information, about the LEDs and switches, refer to the section on *THE FRONT PANEL*.

MS Series Rear Panel – All Serial Ports

The diagram below shows the connector arrangement for model # MS-9S. It has nine serial ports. The MS-5S is similar but doesn't have ports 5-8. The serial cables shown below are the most common ones. For other cables see *Appendix A*.

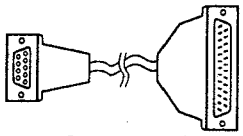


Serial 25 pin PC to MS-9S
Rose part# CAB-PCRSx



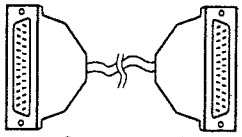
2	–	3
3	–	2
7	–	7
5-6-8	–	20

9 pin PC to MS-9S
Rose part# CAB-ATRSx



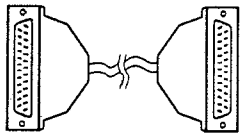
2	–	2
3	–	3
5	–	7
1-6-8	–	20

Serial printer to MS-9S
Rose part# CAB-PRRSx



2	–	3
3	–	2
7	–	7
20	–	6

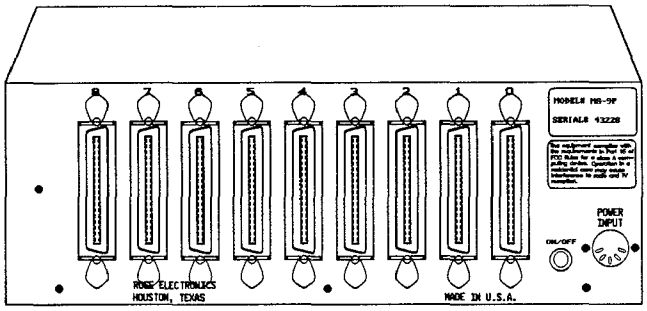
Modem to MS-9S
Rose part# CAB-SMMx



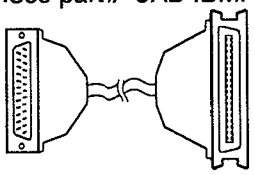
2	–	2
3	–	3
6	–	6
7	–	7
20	–	20

MS Series Rear Panel – All Parallel Ports

The diagram below shows the connector arrangement for a unit with nine parallel ports, the MS-9P. The MS-5P is similar but does not have ports 5-8.

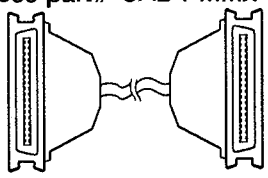


Parallel 25 pin PC to MS-9P
Rose part# CAB-IBMPx



Pinout is that of a standard PC parallel printer cable.

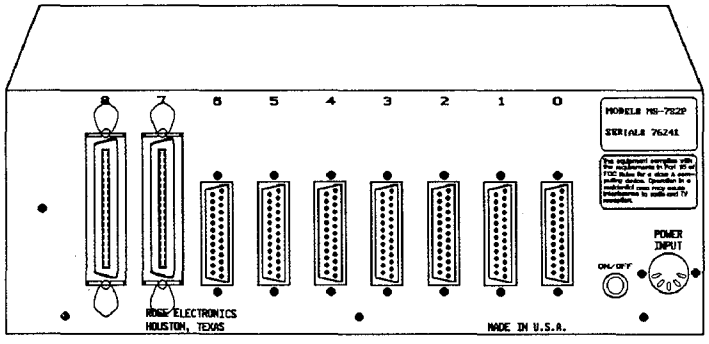
Parallel printer to MS-9P
Rose part# CAB-PMMx



Cable has Centronics male connectors on each end.

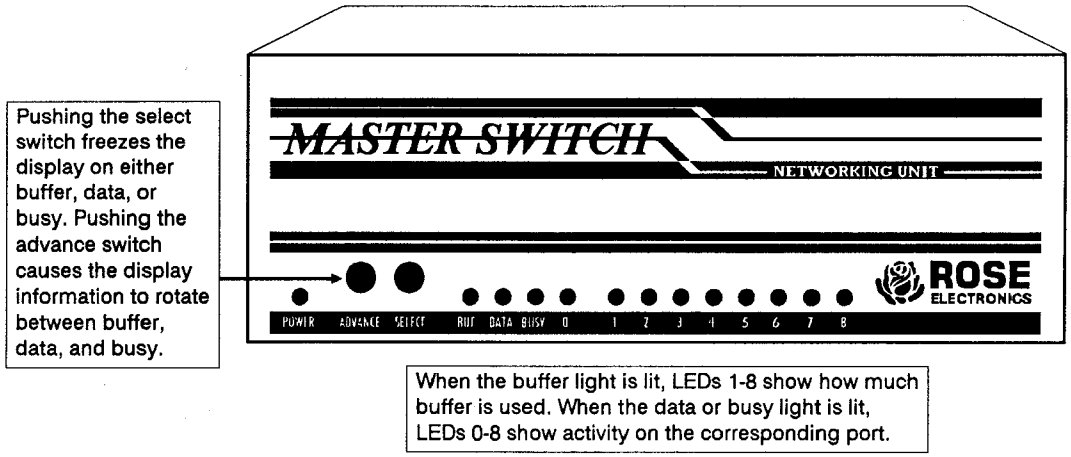
MS Series Rear Panel – Serial And Parallel Ports

The diagram below shows the connector arrangement for a unit with 7 serial ports and 2 parallel ports, the MS-7S2P. Other units have a similar connector arrangement. The cables used are the same ones used for the MS-9S and the MS-9P. See the two previous diagrams.



MSU Series Front Panel Display and Control

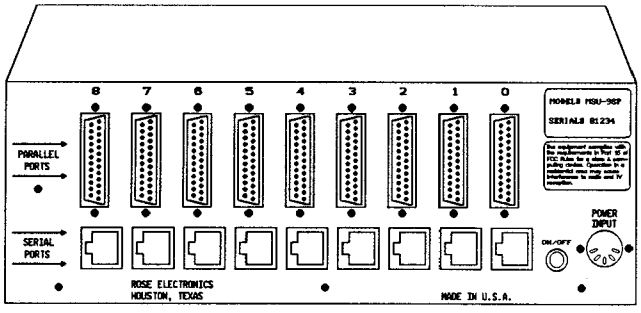
The Master Switch front panel gives visual feedback about its operation. The advance and select switches choose which information the LEDs display.

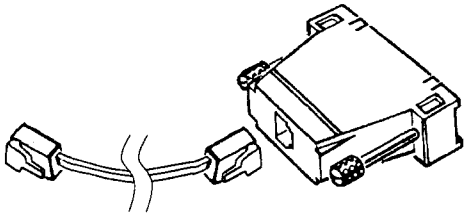


In addition to the functions noted above, the switches and LEDs are also used to enter and display various diagnostic modes or show error conditions. The Master Switch is electronically controlled; the switches and LEDs are used only in initial setup or for diagnostics. To see more information, about the LEDs and switches, refer to the section on *THE FRONT PANEL*.

MSU Series Rear Panel

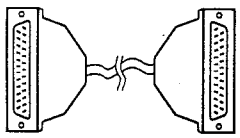
The diagram below shows the connector arrangement for a unit with nine programmable serial/parallel ports, the MSU-9SP. The MSU-6SP does not have ports 6-8. The MSU-3SP does not have ports 3-8.





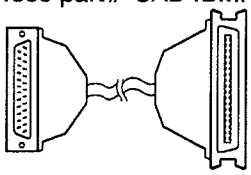
Serial devices connect with a modular adapter and a straight-through telephone cable.

Parallel PC to MSU-9SP
Rose part# CAB-SMMx



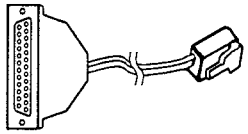
All 25 pins must be wired straight through.

Parallel printer to MSU-9SP
Rose part# CAB-IBMPx



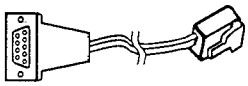
Pinout is that of a standard PC parallel printer cable.

Serial 25 pin PC to MSU-9SP
Part# ACC-PCRX, CAB-04RJ



Cable consists of an adaptor and a 4 conductor telephone cable.

Serial 9 pin PC to MSU-9SP
Part# ACC-ATRX, CAB-04RJ

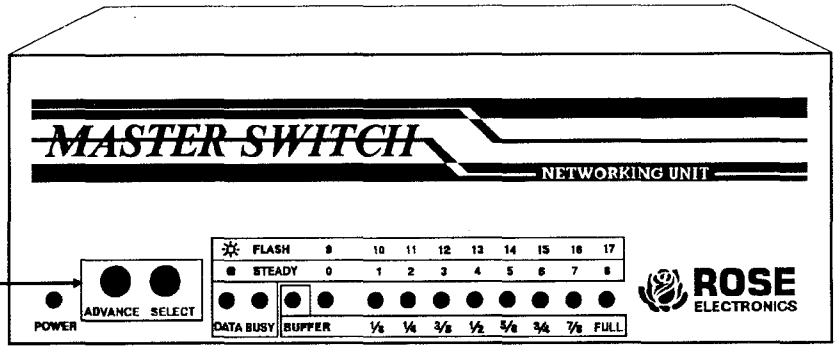


Cable consists of an adaptor and a 4 conductor telephone cable.

MSN Series Front Panel Display and Control

The Master Switch front panel gives visual feedback about its operation. The advance and select switches choose which information the LEDs display.

Pushing the select switch freezes the display on either buffer, data low or high, or busy low or high. Pushing the advance switch causes the display information to rotate between buffer,

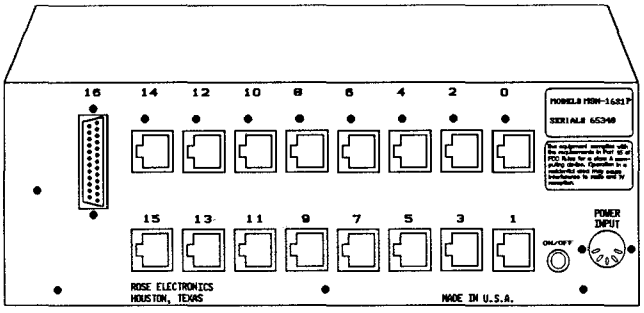


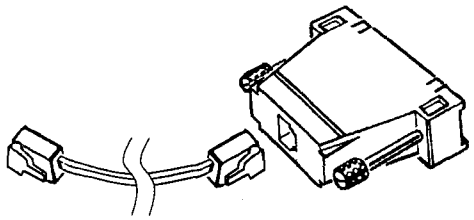
When the buffer light is lit, rightmost LEDs show amount of buffer used.
When the data or busy light is solidly lit, LEDs show activity on ports 0-8.
When the data or busy light is flashing, LEDs show activity on ports 9-17.

In addition to the functions noted above, the switches and LEDs are also used to enter and display various diagnostic modes or show error conditions. The Master Switch is electronically controlled; the switches and LEDs are used only in initial setup or for diagnostics. To see more information, about the LEDs and switches, refer to the section on *THE FRONT PANEL*.

MSN Series Rear Panel

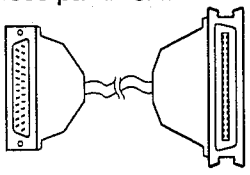
The diagram below shows the connector arrangement for a unit with 16 serial ports and 1 parallel port, the MSN-16S1P. The other models are similar but do not have the higher numbered serial ports.





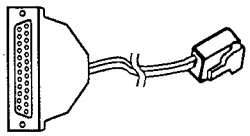
Serial devices connect with a modular adapter and a straight-through telephone cable.

Parallel printer to MSU-9SP
Rose part# CAB-IBMPx



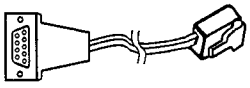
Pinout is that of a standard PC parallel printer cable.

Serial 25 pin PC to MSU-9SP
Part# ACC-PCRX, CAB-04RJ



Cable consists of an adaptor and a 4 conductor telephone cable.

Serial 9 pin PC to MSU-9SP
Part# ACC-ATRX, CAB-04RJ



Cable consists of an adaptor and a 4 conductor telephone cable.

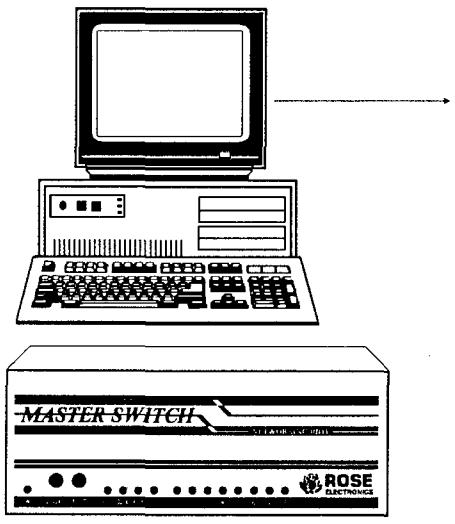
Quick Setup Summary

There are two ways to configure the Master Switch. The first is with the MSCONFIG program. MSCONFIG is a program for a PC that asks you questions and answers about your equipment configuration. It then loads these parameters into the Master Switch's configuration menu. This method is required for units with no serial ports, such as models MS-9P and MS-5P.

The second method is to directly access the Master Switch's configuration menu through a serial port. This can be done through the MasterLink terminal emulator or any other terminal emulator or even a dumb terminal. See the following page for this method.

Using a PC - Running MSCONFIG

1. Cable your computer to port 0 with the proper cable. Refer to the previous section or *APPENDIX B* for the proper cable. For MSU units use the serial port.
2. Connect the power adapter and turn the Master Switch on. LEDS will go through the power up sequence.
3. Using the DOS COPY command, load the MasterLink utility programs onto your computer. Run the program called MSCONFIG by typing `MSCONFIG` at the DOS prompt.
4. Answer the questions as prompted by the MSCONFIG configuration program.
5. Upon completing MSCONFIG, connect your other serial or parallel devices.
6. To test the switch, send data from your application program or print program. Data will be routed to the default destination port.
7. If you will be sending commands to the switch, decide how you will be sending the commands (batch files, MasterLink, etc.) and implement those methods. You must also make sure that you set up your serial port for the correct baud rate and LPT1: redirection. This is normally done by putting the DOS MODE command in your AUTOEXEC.BAT file. See the section on *APPLICATIONS* in this manual for how to implement these methods.

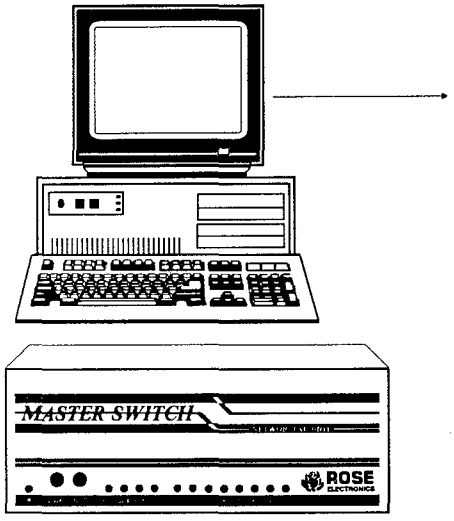



```
Pre-Configuration Setup                Master Switch Configuration Program version 2.02

    Which of these ports is hooked up to port 0 of your Rose switch

    For Rose switches whose port 0 is serial (includes all MSU units):
    1. COM1:
    2. COM2:

    For Rose switches whose port 0 is parallel:
    3. LPT1:
    4. LPT2:

        Which one (1-4):
```

Initial screen upon running MSCONFIG program

Directly Accessing the Master Switch Configuration Menu

1. Cable your computer or terminal to port 0 with the proper serial cable. Please refer to the previous section or *APPENDIX B* for the proper cable.
2. Connect the power adapter and turn the Master Switch on. LEDS will go through the power up sequence.
3. Set your terminal or computer running a terminal emulator to 9600 baud. Type the five characters !@#$C. The configuration menu should appear.
   Note: the MasterLink diskette for PCs has a terminal emulator which is an alternate method of configuring the Master Switch. To run it, load the Masterlink utility programs onto your computer and run the MSLINK terminal emulator by typing `MSLINK /1` for COM1 or `MSLINK /2` for COM2. The MasterLink window will appear. Hit the F9 key to go to the terminal emulator and type !@#$C.
4. You will now be prompted to enter a choice of two character select codes.
   Enter TY to change the port type (computer, printer, modem).
   Enter PR to change the protocol of ports.
   Enter DE to choose the default destinations of your computers or modems.
   Enter SA to save the changes.
   Enter EX to exit the configuration menu. A configuration termination message appears. Hit the escape key twice to exit the Masterlink terminal emulator.
   Refer to the *CONFIGURATION MENU* for further information.
5. Connect your other serial or parallel devices.
6. To test the switch, send data from your application program or print program. Data will be routed to the default destination port.
7. If you will be sending commands to the switch, decide how you will be sending the commands (batch files, MasterLink, etc.) and implement those methods. You must also make sure that you set up your serial port for the correct baud rate and LPT1: redirection. This is normally done by putting the DOS MODE command in your AUTOEXEC.BAT file. See the section on *APPLICATIONS* in this manual for how to implement these methods.




```
Master Switch configuration rev 4.8      Copyright (C) 1986-89 Rose Electronics
Memory = 256K  Timeout =  20 sec.  Minutes =  2 min.  Prefix = !@#$

PORT TYPE      NAME    DEST    PRI  TE  FF   INIT   PROTOCOL
   0 Computer  PORT0   PORT8   Low  On                9600,N,8,1,DTR  ,Half
   1 Computer  PORT1   PORT8   Low  On                9600,N,8,1,DTR  ,Half
   2 Computer  PORT2   PORT8   Low  On                9600,N,8,1,DTR  ,Half
   3 Computer  PORT3   PORT8   Low  On                9600,N,8,1,DTR  ,Half
   4 Computer  PORT4   PORT8   Low  On                9600,N,8,1,DTR  ,Half
   5 Computer  PORT5   PORT8   Low  On                9600,N,8,1,DTR  ,Half
   6 Computer  PORT6   PORT8   Low  On                9600,N,8,1,DTR  ,Half
   7 Computer  PORT7   PORT8   Low  On                9600,N,8,1,DTR  ,Full
   8 Printer   PORT8                    Off
   A Group     GROUPA          Members are: 8
   B Group     GROUPB          Members are: 8
               Menu access     Members are: 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
```

Initial screen upon accessing MASTER SWITCH configuration menu from the MasterLink terminal emulator

Installation and Cabling

Unpacking the Unit

The following items are supplied with each Master Switch.

1. The Master Switch system unit
2. A power adapter
3. This Master Switch installation and operations manual
4. A MasterLink utilities diskette with documentation
5. With MSU and MSN units, a serial cable to a 25 pin PC is provided

Save the original shipping box for possible future use.

Locating the Unit

The location of the unit is normally chosen to minimize the length of cable running to it. Often if the main use is to share a printer, the switch is placed directly next to the printer. It is recommended that the computer or terminal used to configure the unit be placed near the unit. This simplifies installation and maintenance.

Cabling

Cabling requires connecting the proper cables from the Master Switch to your computers and peripherals. **Over 75% of installation problems are associated with incorrect cabling. Please be sure you are using the correct cabling.** Cables are supplied separately and are available from Rose Electronics. Recommended cable pinouts for popular devices are shown in *APPENDIX B*. You can call us to get cable pinouts for those devices not listed. Cabling also includes connecting the external wall mount adapter to an AC receptacle and connecting the other end to the power input on the Master Switch.

Proper cabling of the Master Switch is required to have trouble free installation and operation. All cables should be shielded with the shield terminated at both ends. Serial cables should not be in excess of 100 feet. Parallel cables should not be in excess of 25 feet.

Rear Panel Connectors

All Master Switches have a 5-pin DIN jack on the rear. This is for the power adapter only. There are three other possible types of connectors on the switch: RJ45 (8-conductor phone type jack), DB25F (25 pin D-subminiature female connector), and Centronics (36 pin female connector).

A RJ45 jack is always a serial port. A Centronics jack is always a parallel port. A DB25F jack on an MSN or MSU series unit is an "IBM PC" type parallel port; on any other type of Master Switch it is a serial port.

Power Adapter

The power adapter should be plugged into a surge protector along with all your other computers and peripherals. It is not required, but is recommended. It may be convenient to plug it into a power strip which has a separate power switch, so that the unit powers up at the same time as the other computers and peripherals on the power circuit.

Serial Devices

Since there are conflicting standards on RS232 cabling, caution must be observed when interconnecting your equipment with the Master Switch. A few popular cabling pinouts are given in *APPENDIX B*. The Master Switch pinout is given in *APPENDIX C*.

Serial cabling can be routed in excess of 100 feet with caution. The maximum distance that a cable may be run is dependent upon the construction of the cable and its routing. Routing near fluorescent lights or machines that may create electrical noise, such as elevator motors or air conditioning compressors, should be avoided. There is a tradeoff between cable length and baud rate. The further you run the slower you must go. With low capacitance cable, runs up to 250 feet at 9600 baud will usually work, but it is not guaranteed. Rose Electronics can construct the proper cabling to your specified length.

PCs With Serial Ports

The cabling to the serial ports of your PCs is well defined. Please refer to *APPENDIX B* for the proper pinouts. There are two common types of connector styles. The first is a 25 pin D male connector. The second is a 9 pin D male connector. Some of the multiport serial boards may have 25 pin female connectors but these would be grouped together by four or eight. Parallel ports are normally a 25 pin female D connector. A common problem in configuring that is related to cabling is to determine which 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, consult the person who set up the computer system for the information.

Other Computers With Serial Ports

Please refer to *APPENDIX B and C* for help in determining the pinout. If you are using the XON/XOFF protocol only 3 wires on the Master Switch are necessary—Transmit, Receive, and Ground. If you are using hardware handshaking, wire the DTR signal on the Master Switch to the buffer full input signal on the computer.

Printers With Serial Ports

Please refer to *APPENDIX B and C* for help in determining the pinout. If you are using the XON/XOFF protocol only 3 wires on the Master Switch are necessary—Transmit, Receive, and Ground. If you are using hardware handshaking, wire the buffer full signal on the printer to the DSR signal on the Master Switch.

Modems

Please refer to *APPENDIX B* for modem cabling. The pinouts on modems are fairly standard. On MS Series units, a one to one (straight through) cable is used to connect a modem to the Master Switch. On MSN and MSU Series units, a straight through 6-conductor RJ11 cable (Rose part number CAB-06RJx, where x is the length in feet), and an adapter (Rose part number ACC-MORX) is used. Master Switch uses its DSR input as a printer busy signal for printers and data carrier detect signal for modems. If you will be using a communication program which requires the carrier detect to go high when the modem connects, then the modem should be configured to have DSR (pin 6 on the modem) follow the modem carrier. On a Hayes compatible 1200 baud modems this is done with dip switches.

On a 2400 baud Hayes compatible modem, this is done by issuing the AT&S1 command. The AT&W command should be used to save the setting.

Other Serial Devices

Please refer to *Appendices B and C* for help in determining the pinout.

Parallel Devices

A parallel port may be configured to be either a computer or a printer port. You should not connect any cables unless the device to be connected matches the configuration of the port.

The factory default is set for the highest numbered parallel port to be a printer port. All other parallel ports are configured as computer ports. The default destination of all computer ports is the highest numbered port.

There is a distance limitation on parallel printer cables. A safe distance is 25 feet or less. This distance may be exceeded with caution. The maximum distance that a cable may be run is dependent upon the construction of the cable and its routing. Shielded cable should be used. Routing near fluorescent lights or machines that may create electrical noise, such as elevator motors or air conditioning compressors, should be avoided. Typically a cable run for 100 feet will work reliably but there is no guarantee. Rose Electronics can construct the proper cabling to your specified length.

Parallel Computers (MS Series Units)

The parallel computer to Master Switch cables are the same ones that would normally connect your computer to your printer. You probably already have one of these cables. The Master Switch uses industry standard female Centronics connectors, the same as used on most parallel printers. So, instead of connecting your computer cable to your printer, connect it to the parallel port on the Master Switch which is configured to be a computer port.

Parallel Computers (MSU Series Units)

Parallel ports on MSU series units use the DB25F connector, which is the same as a parallel port on an IBM PC. To connect a parallel computer to such a unit, you need a 25 pin straight through cable with male DB25 connectors on both ends. Note that while the MSN series unit has the same type of connector, it is permanently configured as a printer and may not be used as an input from a computer.

Parallel Printers (MS Series Units)

The Master Switch to printer cable should have 36 pin male Centronics connectors at each end. Connect this cable from your printer to the parallel port on the Master Switch which is configured to be a printer port.

Parallel Printers (MSN And MSU Series Units)

As mentioned above, MSN and MSU series units have DB25F 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 cable. To connect a printer that has a DB25F connector for parallel input you need a 25 pin straight through cable with male connectors on both ends.

Configuration

The Master Switch may be configured with a PC by a series of questions and answers under the control of a program called MSCONFIG on the MasterLink utilities diskette. The Master Switch may also be configured through its native configuration menu which requires a terminal or terminal emulator. The MasterLink program on the MasterLink utilities diskette has a terminal emulator feature.

For configuration you must determine the method to be used:

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) on the MasterLink utility diskette.
2. For terminals or serial computers running a terminal emulation program, use the configuration menu.
3. For PCs with parallel ports, use MSCONFIG on the MasterLink utility diskette.
4. For other computers with parallel ports see the section on *CONFIGURING WITH A PARALLEL PORT.*
   Note: When using a PC to configure the Master Switch, the examples below assume the hard disk is drive C: and there are two floppy disks called A: and B:. You can use the appropriate drive letters for other than this configuration.
   Note: MSU Series 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.

Configuration Through The MSCONFIG Program

The MasterLink utility diskette contains a program called MSCONFIG.EXE to configure the Master Switch. The program is designed to ask questions in a logical order about your equipment and transparently pass the proper responses to the Master Switch configuration menu. The questions concern the type of devices, their communication settings, names, and other parameters. The program is smart enough to also 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 MasterLink utilities to your computer and run the MSCONFIG program.

1. First make a copy of the diskette for backup purposes. With the MasterLink utility diskette in drive A and a formatted diskette in drive B issue the DOS command

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

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

2. If you will be using MasterLink on a hard disk, load the files on your hard disk into a separate directory otherwise continue to step 3.

`MD C:\ROSE`	Make a sub-directory on the hard disk called ROSE (or any other sub-directory)
`COPY A:*.* C:\ROSE`	Copy the MasterLink files onto the hard disk from drive A

3. Change to the MasterLink directory as the DOS default drive and run the program.

For hard disk	*For floppy diskette*	
`CD C:\ROSE`	`A:`	Set default drive and directory
`MSCONFIG`	`MSCONFIG`	Execute Master Switch configuration program

4. You will be prompted for all further responses. For further information refer to the MasterLink manual.

Configuration Through The MASTERLINK Terminal Emulator

The MasterLink program called MSLINK on the utilities diskette has as one of its features a terminal emulator. You can run the MSLINK terminal emulator and access the Master Switch configuration menu. The example below does not load MasterLink as a memory resident program, but uses a command line option to run MSLINK as a normal program.

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

1. Make sure that you have made a copy of the MasterLink diskette as described in step 1 above.
2. Change to the MasterLink directory as the DOS default drive

For hard disk	*For floppy diskette*	
`CD C:\ROSE`	`A:`	Set default drive

3. Run MasterLink from DOS but do not load memory resident

For COM1:	*For COM2:*	
`MSLINK /1`	`MSLINK /2`	Executes MasterLink as a normal program MasterLink window appears
Hit `F1` key	Hit `F1` key	F1 calls terminal emulator and sends configuration menu command

4. The configuration menu should appear. Refer to the section on *THE CONFIGURATION MENU* for operating the configuration menu. When exiting, terminate the menu with EX. To return to DOS, hit the escape key twice.

Configuration Through A Terminal Or 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 of the Master Switch. 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. Load your terminal emulator software (if applicable).

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

3. Enter the five characters ! @ # $ C.

4. The configuration menu should appear. Refer to the section on *THE CONFIGURATION MENU* for operating the configuration menu. When exiting, to terminate the menu with EX. To return to DOS, hit the escape key twice.

Note: The communication parameters in step 1 reflect the factory default settings and apply if the unit has not been previously configured. Otherwise the communication parameters must be set to the previously configured parameters.

Configuration with a Parallel Port

Configuring with a parallel port without the use of the MSCONFIG program involves creating the entries to the configuration menu in a file and then sending that file to the Master Switch port 0. The entries in the file correspond to those that

the configuration menu accepts. Refer to *THE CONFIGURATION MENU* for forming the correct entries. An example is shown below. Line feeds are ignored. A carriage return is shown with the symbol (CR).

This example of the file contents shows how to change port 6 to a printer and turn port 6's form feed on. Comments shown on the right should not be included in the file.

! @ # $ C(CR)	Issue the configuration command
TY (CR)	Change the type of a port
6 (CR)	Port to change is port 6
P (CR)	Change to printer
N (CR)	Do not continue with next port
FF (CR)	Change the form feed of a port
6 (CR)	Port to change is port 6
Y(CR)	Yes, do enable the form feed
N (CR)	Do not continue with next port
EX(CR)	Exit the configuration menu
! @ # $ P	Print the configuration to the default destination for verification

The following steps summarize how to configure the Master Switch from a parallel port

1. Create the file containing the configuration parameters as described above.
2. Send the file to the Master Switch port 0.
3. Use the print configuration command to verify the results of the configuration.

The Configuration Menu

Two sample configuration displays (one for a unit with 7 serial ports and two parallel ports and one for a unit with 16 serial and one parallel port) are displayed in TABLE 1. 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 and 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.

For example replying NA for name would prompt you for the names of the ports:

```
Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,GR,MA,SA,EX) NA
Port  0  Enter port name (up to 8 characters) HAL  Next port (Y/N) Y
Port  1  Enter port name (up to 8 characters) JANE  Next port (Y/N) Y
Port  2  Enter port name (up to 8 characters) ERIC  Next port (Y/N) Y
Port  3  Enter port name (up to 8 characters) ANNE  Next port (Y/N) N
```

Possible responses to the prompt are listed in parentheses. 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 to a prompt will leave that parameter unchanged except for the initialization string entry, which will clear the string. Replying with a return only to a Y/N (yes/no) prompt will be interpreted as a no or leaves the parameter unchanged. You will be prompted for all responses and messages for invalid responses will be given.

Table 1
Configuration Menu Display MS and MSU Series Units

```
Master Switch configuration rev 4.7   Copyright (C) 1986-89 Rose Electronics
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 ROBERT   NULL     Low  On                19200,N,8,1,DTR    ,Half
   3 Computer IRENE    NULL     Low  On                19200,N,8,1,DTR    ,Half
   4 Computer ERIC     NULL     Low  On                19200,N,8,1,DTR    ,Half
   5 Computer NANCY    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)
```

Configuration Menu Display MSN Series Units

```
Master Switch configuration rev 5.3  Copyright (C) 1986-89 Rose Electronics
Memory =  2MB   Timeout =  20 sec.   Minutes  =   2 min.   Prefix = !@#$
PORT TYPE     NAME     DEST     PRI  TE  FF  INIT     PROTOCOL
   0 Computer HAL      NULL     High On                19200,N,8,1,DTR    ,Half
   1 Computer JANE     NULL     Low  On                19200,N,8,1,DTR    ,Half
   2 Computer ERIC     NULL     Low  On                19200,N,8,1,DTR    ,Half
   3 Computer ANNE     NULL     Low  On                19200,N,8,1,DTR    ,Half
   4 Computer JASON    NULL     Low  On                19200,N,8,1,DTR    ,Half
   5 Computer ACCTG    NULL     Low  On                19200,N,8,1,DTR    ,Half
   6 Computer LAB      NULL     Low  On                19200,N,8,1,DTR    ,Half
   7 Computer SAPPHIRE NULL     Low  On                19200,N,8,1,DTR    ,Full
   8 Computer DIAMOND  NULL     Low  On                19200,N,8,1,DTR    ,Full
   9 Computer HOT_DOG  NULL     Low  On                19200,N,8,1,DTR    ,Full
  10 Computer GX14     NULL     Low  On                19200,N,8,1,XON    ,Full
  11 Computer UNIX-1   NULL     Low  On                19200,N,8,1,DTR    ,Full
  12 Computer UNIX-2   NULL     Low  On                19200,N,8,1,DTR    ,Full
  13 Computer UNIX-3   NULL     Low  On                19200,N,8,1,DTR    ,Full
  14 Modem    MODEM    NULL     Low  On                 2400,N,8,1,DTR P  ,Full
  15 Printer  PLOTTER                   Off            9600,N,8,1,DTR    ,Full
  16 Printer  LASER                     Off .E        Parallel
   A Group    UNIX       Members are: 10 11 12
   B Group    GROUPB     Members are: 16
Menu access         Members are: 14 15 16 A
Enter choice (TI,MI,PX,TY,NA,DE,PY,TE,PR,FF,IN,GR,MA,SA,EX,HE=help)
```

TIMEOUT

The timeout is used to automatically disconnect a device from its destination. This is most commonly used for an automatic connection to share a printer. Each port uses this timeout value as the period to measure data activity. When no data activity occurs for this timeout period, the port is disconnected if the source port or destination port is not busy. For serial ports, the data activity period includes data which is transmitted from the destination.

The factory default is 20 seconds, but may be changed to be from 1 to 254 seconds. To change the timeout, enter TI to the choice prompt and 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
```

MINUTES TIMER

The minutes timer is similar to the other timeout, but it is measured in minutes and is invoked from the port connection menu or from the ! @ # $ T 2 command. Refer to the *PORT CONNECT MENU* and *TIMEOUT COMMAND* for more information.

The factory default is 2 minutes, but may be changed to be from 0 to 254 minutes. To change the minutes timeout, enter MI to the choice prompt and enter the new value in minutes.

```
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
```

PREFIX

The prefix is a series of up to 8 characters that identifies data being sent to the Master Switch as a command and not as data. All commands are preceded by this string of characters. The factory default is the four characters ! @ # $. The prefix may be changed to be up to 8 characters long. The prefix is normally only changed to chain Master Switches together. If the factory default is to be changed, the prefix should be changed to an unlikely sequence of characters that would not normally occur in a data stream. A valid command is stripped out of the data stream and not sent to the destination device. A new prefix is not stored in the non-volatile memory until save is issued. To change the prefix, enter PX to the choice prompt and enter the new prefix. A carriage return or null 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) !@#2
```

TYPE

The type identifies to the Master Switch 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 to be a printer. To connect a plotter or device for data collection, use printer as the device type and set the duplex in the protocol to full. To change the type enter TY to the choice prompt. Enter the port number from 0 to 8, then enter the device type C, P, or M. You may configure the type for the next port by answering Y to the next port prompt or N to return to the main 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
```

NAME

The name provides a familiar identification for a port. The name is used in the job control menu and status commands. The name can be up to 8 characters long. You should not use imbedded spaces or special characters in the name since it is used by MasterNet and can also be printed. To change the name, enter NA to the choice prompt. Enter the port number from 0 to 8 and then the 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
```

DESTINATION

The destination is the default device to which data will be sent when the Master Switch is initially powered up. You may not choose the destination to be itself or a parallel computer. Ports configured as printers do not have destination parameters. You may enter A or B for group A or B. To set the null destination, enter 9 on MS or MSU Series units, or N on MSN Series units. The data from a port will be discarded when its destination is the null destination. The data will be sent to the first available port of a group when the destination is a group. To change the destination, enter DE to the choice prompt. Enter the port number followed by the destination port number.

```
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
```

PRIORITY

The priority allows a port to override the order of queued jobs. 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 a lower 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 be either a low or a high priority. Ports configured as printers may not be configured for this parameter. To change the priority, enter PY to 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
```

TIMEOUT ENABLE

This sets the default timeout enable. The timeout enable command allows a connection to be made uninterruptible. This is most suited for connecting to modems where an automatic disconnection is not desired. It is also useful for extended sessions where there may be no data activity for periods of time longer than the timeout duration, such as communicating to a mainframe or a plotter. Normally you would always set the default timeout enable to Y and disable it by command (see *TIMEOUT ENABLE COMMAND* in the operation section). Ports configured as printers may not be configured for this parameter. To change the timeout enable mode, enter TE to the choice prompt. Enter the port number followed by Y to enable the timeout or N to disable the timeout. Refer to the *TIMEOUT ENABLE COMMAND* in the operation section for further information. **Note:** setting this parameter to N may cause a device to be locked into one computer.

```
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
```

PROTOCOL

The protocol is only configurable for serial ports. The protocol consists of the baud rate, parity, word length, number of stop bits, and flow control. You may configure the protocol separately for each port. The port is reconfigured to the new protocol but is not saved in non-volatile memory until save is issued. When asked for flow control and the response is X for XON/XOFF, there are three additional prompts—refer to the section on *XON/XOFF PROTOCOL* for further information. The pulse DTR low prompt supports DTR drop for modem hangup or computer disconnection—refer to the section on *DTR PULSE* for more information. To change the protocol, enter PR to the choice prompt and answer the subsequent prompts. The duplex prompt controls the data flow to a destination. Generally modems, plotters, and mini-computer ports are set to full duplex. PCs and printers are set to half duplex. See *HALF DUPLEX AND FULL DUPLEX PROTOCOL* for more information.

```
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)*
Enter baud rate
(19200,9600,7200,4800,3600,2400,1800,1200,600,300,150,134.5,110,75,50)**
1200
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/XOFF) X
Robust on ? (Y=yes,N=no)***
XON/XOFF codes into a port control its transmit data ? (Y=yes,N=no)†
Pulse DTR low for 2 seconds upon disconnection ? (Y=yes,N=no)‡
Enter duplex (F=Full,H=Half)   Next port (Y/N)
```

** This question only appears on MSU series units. Entering just a carriage return leaves the serial/parallel status of the port unchanged. If port 0 is changed to parallel, it is not actually changed until the EX command is used, at which time the message "Port 0 changed to parallel" will print.*

*** The baud rate selections for MSN series units are (19200,9600,4800,2400,1200,600,300,150,75).*

****This prompt appears when responding with X to the flow control prompt. When enabled it displays in the menu as* R *following the XON field.*

†This prompt appears when responding with X to the flow control prompt. When enabled it displays in the menu as T *following the XON field.*

‡This prompt appears when responding with either D or X to the flow control prompt. When enabled it displays in the menu as P *following the DTR or XON field.*

FORM FEED

The form feed is used only for ports configured as printers to eject to the next page following the end of a job. When enabled the last character of a print job is examined. If it is a form feed no action is taken so as not to waste paper, however, if it is not a form feed, one is added. This parameter may not be used for computer or modem ports. To change the form feed, enter FF to the choice prompt, give the port number and answer yes to enable the form feed or no 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
```

INITIALIZATION STRING

The initialization string when enabled is sent at the beginning of a job. If the destination is a computer the string comes from the originator of the conversation. If the destination is a printer, the printer port originates the string. This string is sent at the beginning of each new job. The string may be up to 8 characters long (64 characters on MSN Series units). To change the initialization string enter IN to the choice prompt and enter the port number and string. Entering return only will disable the sending of the string. Non-printable characters such as escape may be entered and will be displayed on the configuration menu as periods. Carriage return, line feed, or a null may not be part of the string on MS and MSU units.

MSN units allow carriage return and line feed by preceding the entry of these characters with a null character. On MSN Series units only, the initialization string can also be altered by the use of the Z command. Strings set by the use of the Z command will appear on the menu, but only the first eight characters are visible.

```
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 64 characters)  .E
Next port (Y/N) N
```

GROUPS

There are two groups—group A and group B. Each group can have up to 16 ports which belong to a group. When connecting to a group, the first available port is connected to. The example below shows configuring group A to have ports 5, 6, and 8 as its members. 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 to the choice prompt, give the group number A or B, then enter up to 8 ports which are members of the group. Hit return only to terminate selecting members of the group. If later you want to add or change members, you must re-enter all ports.

```
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
```

MENU ACCESS

Menu access is used to determine which destinations will appear on the port connection menu. The configuration entries are similar to the group entries. To select the destinations, enter MA to the choice prompt. Then enter up to 8 ports which will appear in the port connection menu. Hit return only to terminate selecting ports. If later you want to add or change members, you must re-enter all ports.

```
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
```

SAVE

Save is used to store the prefix and protocol in non-volatile memory. All other parameters are stored instantly in non-volatile memory. Subsequently powering up the unit will use the newly saved parameters as configuration settings. The intention of the save is to allow configuring your equipment with temporary

parameters. Changing the protocol and prefix to values which are not compatible with your application software can potentially prevent you from accessing the unit. The previous parameters stored in non-volatile memory can be restored by cycling the power to the Master Switch if the save has not been issued. There is also a provision to restore the default parameters to the unit, discussed in *DIAGNOSTICS.* To save the parameters, enter SA to the choice prompt. A prompt to enter yes or no to prevent accidental entry has been included. You must answer Y to 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
```

EXIT

Exit is used to terminate the configuration menu and return port 0 to the active state. Enter EX to the choice prompt. An exit message is then displayed.

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

HELP (MSN Series units only)

MSN Series units do not display a list of the two character menu commands on the screen due to space restrictions. The HE command prints all of the two letter command descriptions similar to the list at the bottom of the MS and MSU series configuration menus. It also gives a brief description of each item.

Table 2
Master Switch Command Set

COMMAND	NAME	DESCRIPTION
0-8	Set destination to port	Set destination to a single port to which data will be routed
9	Set destination to null	Set destination to null; all incoming data will be discarded
A-B	Set destination to group	Set destination to group; data routed to first available port in group
C	Configuration menu	Access configuration menu (valid from port 0 only)
Dxx	Set remote destination	Set destination of one port to another port (valid from port 0 only)
Fxxxxxx	Format	Set protocol of a port (baud rate, flow control, etc)
Ixx	Identify	Return configuration information about ports
J	Job control menu	Access job control menu - view queue, cancel, hold, & release jobs
KLL	Kill (cancel)	Remove a port's last job from the queue
M	Port connect menu	Access port connect menu for interactive connection to a port
Nx	Net	Interrupt print job in progress and connect to a computer port
P	Print configuration	Print configuration menu to current destination(valid on port 0 only)
S	Status	Return the status of the job queue
Tx	Time out enable/disable	Control time out enable/disable and command recognition
Vxxx	Verify	Returns serial signal information, sets DTR high or low
Xx	Set extended destination	Same as connect command, but supports more than 9 ports
Zxx..xx	Set initialization string	Changes initialization string (MSN units only)
=xxx	ASCII set destination	Same as connect command, but takes 3 ASCII digits (MSN only)

Operation

Following proper configuration of the Master Switch, it is ready for operation. There are many potential applications for the switch and how it is used. TABLE 2 on the previous page lists the commands and what they do. Refer to *THE COMMANDS* and *APPENDIX D* for specific details of each command. TABLE 3 lists methods of sending the commands. Explained in the *APPLICATIONS* section are the methods of combining the commands and the methods of sending them that are suited to each particular application.

Table 3
Methods Of Sending Commands

1. **From a batch file** – The commands are sent by invoking a batch file that sends the commands.
2. **From MasterLink** – MasterLink is designed to easily send the commands. It is invoked from a hot key. MasterLink also contains a terminal emulator, so that you can interactively communicate with the switch.
3. **From MasterNet** – MasterNet can also easily send the commands. Many of the menu commands are built into MasterNet. It is also invoked from a hot key.
4. **From an application program** – Many word processor or spreadsheet programs have initialization strings. They can be programmed to contain the commands.
5. **Designed into a program** – A program may be written to send the commands.
6. **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.
7. **By printing** – A file containing the commands is printed through a copy or print command.
8. **Imbedded in a file** – The command characters are intermixed with text.

The Commands

The commands give the Master Switch a lot of flexibility and power to control the flow of data. Each command is described here as to what it does and how it is used. A command consists of the prefix, a command character, and optional command operands. For example, the command to set your destination to port 7, using the factory default prefix, is the five characters ! @ # $ 7.

NOTE: The commands consist of ASCII characters and non-ASCII data bytes. Since the non-ascii characters are not printable, they will be shown in the examples as an underlined decimal number. All examples also use the factory default prefix.

Non-ASCII data bytes (underlined decimal numbers in the examples, such as 27)are entered on a PC by holding down the ALT key, typing the byte value on the numeric keypad (not the top row), and then releasing the ALT key. To enter such values using other devices refer to your device's manual.

Set Destination To Port Command

Syntax: PREFIX + ascii port number 0-8 *Example:* ! @ # $ 7

The set destination command selects a new destination. Invalid destinations are your own port or a parallel computer. Any invalid characters will be sent to the current destination. Note that the set destination command does not make a connection. The connection is made by sending data to a port. If the destination is busy because another port is already connected or the port is flow controlled off, then any data sent will be stored in the Master Switch's buffer. When the destination port becomes ready, the stored data will be sent to the port.

Set Destination To Null Command

Syntax: PREFIX + ascii character 9 *Example:* ! @ # $ 9

Port 9 is designated as a null port. Any data directed to this port will not be transmitted or queued. No jobs will be created and no record in the status display will be noticed. The destination in the configuration display will be shown as NULL. This command is useful in eliminating the pickup of noise from computers that are turned off. If prior to turning the computer off, the null destination command is sent and any noise appearing as data signals will be discarded. When the computer is turned on again, a new (non-null) destination may be assigned.

Set Destination To Group Command

Syntax: PREFIX + ascii character A or B *Example:* ! @ # $ A

Port A and port B are special group ports. They must be configured to consist of a group of ports with the configuration menu. When setting the destination to a group, the data will be sent to the first available port in that group. Available means not in current use by another port. Suppose group A is configured to consist of port 7, a printer, and port 8, another printer. If someone on port 3 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.

Configuration Menu

Syntax: PREFIX + ascii character C *Example:* ! @ # $ C
Restriction: valid from port 0 only

The configuration command is used to access the configuration menu from port 0 only. This command was described previously in the section on configuration. This command may be used while the system is on-line. Default destinations of active ports should not be changed. The MasterLink configuration program uses the configuration menu by asking questions and answers and providing the proper prompts to this menu. The configuration menu is also used when port 0 is a parallel port. There is no response or echoing of commands like there is with a serial port. The print configuration command can be used to print the configuration data.

Set Remote Destination Command

Syntax: PREFIX + ascii character D + non-ascii port number 0-63 + non-ascii new destination port 0-63
Example: ! @ # $ D 1 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. This command is active only from port 0. Its usual application is for the switching, patching, or interconnection of instruments, terminals, console ports, data communications equipment, telecommunications equipment, or other devices. If a current job is in progress on a port and its destination is changed the current job is terminated and a new job is started.

Format Command

Syntax: PREFIX + ascii character F + nbbpwsc where
n (for MS,MSU series) is the port number to be changed; ascii port number 0-8 or M for my port
n (for MSN series) is the port number to be changed; ascii port number 0-9, binary value 0-15, or M for my port
(To format ports 10-15 on an MSN series unit the binary values must be used).
bb is the first two numbers of the baud rate

1H = 115.2K	19 = 19200	96 = 9600	72 = 7200	48 = 4800	36 = 3600
24 = 2400	18 = 1800	12 = 1200	60 = 600	30 = 300	15 = 150
13 = 134	11 = 110	75 = 75	50 = 50		

p is the parity	N = None	E = Even	O = Odd	M = mark	S = Space
w is the word length	8 = 8 bits	7 = 7 bits	6 = 6 bits	5 = 5 bits	
s is the number of stop bits		1 = 1 bit	2 = 2 bits		

c is the flow control type

D = DTR	X = XON/XOFF
F = Full duplex	H = half duplex
P = Pulse DTR	p = Don't pulse DTR
R = Robust on	r = Robust off
T = XON transmit control on	t = XON transmit control off
L = Loopback mode on(MSN only)	l = Loopback mode off(MSN only)

, may be used in a field where it is not needed to change that parameter
Example: ! @ # $ F812E71X *port 8 set to 1200 baud, even parity, seven bits, 1 stop bit, and XON/XOFF*
Example: ! @ # $ F M , , , , , H *port sending command changes to half duplex; other parameters unchanged*
Example: ! @ # $ F12 19N81D *port 12 (on an MSN) set to 19,200 baud, no parity, 8 bits, 1 stop bit, DTR/DSR*
Restriction: valid from serial ports only; operates only on your port or modem ports; 1H valid only for MSN; 50,11,13,18,36,72 valid only for MS and MSU.

The format command is used to change the serial protocol of a port by command. This is a temporary setting different than the configuration setting. The only ports for which this command is allowed are your own port or a modem port, all other

ports are disallowed. Regardless of whether the port is a valid port or not and the syntax is correct or not the format command will be stripped out of the data stream. Note that when you change the format from your own port the result will take place immediately and you must change the baud rate of your terminal or computer to continue communication. The new rate is never saved in non-volatile memory. When the unit is powered off, the default state programmed during configuration is restored to all ports. The command is useful to change the protocol of a modem. Since modems at varying locations may have differing protocols, you can use this command to change the modem's communications protocol. The other application is to adapt to programs which have a fixed baud rate and can not be changed. The M parameter as the port number is especially useful here since it is not necessary to know which port you are. The comma used as a place holder is also useful to change only certain parts of the protocol. The format command will not affect a port which has a connection in progress.

The loopback mode (valid only on MSN series units) places the subject port into 'loopback mode'. Any characters sent to to a port in this mode will be echoed back to the sender. This mode may be exited with a format command including a lower case 'l', as in the syntax description, or with a break.

Identify Command

There are 7 variations of this command. They are identify my port number, destination, ROM revision level, name of a port, number of ports installed, type of port (printer, computer, full/half duplex), and configuration (serial, parallel, or empty). The Master Switch returns a response to each of these commands. All alphabetic characters in operands must be upper case. Invalid commands will be treated as data .

IDENTIFY MY PORT NUMBER
Input Syntax: PREFIX + 3 ascii characters I M E
Output response: single non-ascii byte port number from 0-63
Example input: ! @ # $ I M E *Example output:* 5 *indicates your port number is port five*
Restriction: valid from serial ports only

IDENTIFY DESTINATION
Input Syntax: PREFIX + 2 ascii characters I D + single non-ascii port number 0-63 or ascii M for my port
Output response: single non-ascii byte from 0-63, or ascii A or B or non-ascii byte value 127 for null
Example input: ! @ # $ I D M *Example output:* 8 *indicates your destination is port eight*
Restriction: valid from serial ports only

IDENTIFY ROM REVISION LEVEL
Input Syntax: PREFIX + 3 ascii characters I R E
Output response: two ascii characters representing revision level of ROM
Example input: ! @ # $ I R E *Example output: 40 indicates revision level 4.0 is installed*
Restriction: valid from serial ports only

IDENTIFY NAME OF PORT
Input Syntax: PREFIX + 2 ascii characters I N + non-ascii port number or ascii A or B (group) or M (my port)
Output response: 8 ascii characters (a name length less than 8 characters is padded with trailing spaces)
Example input: ! @ # $ I N 4 *Example output:* SAMUEL *indicates name of port four is SAMUEL*

Restriction: valid from serial ports only

IDENTIFY NUMBER OF PORTS INSTALLED
Input Syntax: PREFIX + 3 ascii characters I Q P
Output response: single non-ascii byte from 0-63
Example input: ! @ # $ I Q P *Example output:* 9 *indicates there are 9 ports installed, also see note below*
Restriction: valid from serial ports only
Note: MS and MSU series units report the *highest port number*, while MSN series units report the *total number of ports installed*. Thus a 4 response from a MS or MSU series unit indicates five ports installed (0,1,2,3,4), while a 9 response from a MSN series unit indicates nine ports installed.

IDENTIFY TYPE OF PORT
Input Syntax: PREFIX + 2 ascii characters I T + non-ascii port number 0-63 or ascii M for my port
Output response: non-ascii byte from 0-7 made up of three 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: ! @ # $ I T 7
Example output: 6 *– which means bit2 = 1, bit 1 = 1, bit0 = 0 and indicates port 7 is a half duplex modem*
Restriction: valid from serial ports only

IDENTIFY CONFIGURATION OF PORT
Input Syntax: PREFIX + 2 ascii characters I C + non-ascii port number 0-63 or ascii M for my port
Output response: single ascii character S for serial, P for parallel, X for empty
Example input: ! @ # $ 2 *Example output:* S *indicates port two is a serial port*
Restriction: valid from serial ports only

Job Control Menu

Input Syntax: PREFIX + single ascii character J
Output response: Interactive job control menu entered
Example: ! @ # $ J
Restriction: valid from serial ports only

The job control menu is used to interactively view the job queue and cancel, suspend, and release jobs. Individual jobs can be manipulated. 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 exits from the job control menu. Issuing the job control menu does not terminate the job in progress like the status command does. It puts a job in progress on hold while the job control menu is in progress. The job that was is in progress is returned to normal status when the menu is exited.

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 displays a list of all the jobs in the system. This display is identical to the one in the status command. Please refer to the *STATUS*

COMMAND for a description of the show queue display. Enter SQ to the prompt and the job queue will be shown.

```
Enter choice (SQ,SJ,RJ,CJ,EX)sq
JOBNUM  SOURCE    DEST      STATUS   PRIORITY  TIMEOUT  LENGTH
     0  KLINGON   LASER     Connect  Low       Off           0
     1  ROMULAN   LASER     Hold     Low       On            6
```

This message will be displayed if there are no jobs in the queue:

```
No jobs in the queue
```

SUSPEND JOB

The suspend job allows a particular job or all jobs from your port to be suspended. A suspended job is inhibited from transmitting and takes exclusive use of its destination port. Enter SJ to the prompt. Enter N for a particular job to be suspended 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) hj
Enter suspend type (N-number A-all) n
Enter job number (0-63) 3
```

RELEASE JOB

The release job undoes what the suspend job does. It restores a suspended job to an active state and allows it to continue transmitting to its destination. Release job releases a particular job or turns off the suspension of future jobs from your port. Enter RJ to the prompt. Enter N for a particular job to be released 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 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 choice (SQ,SJ,RJ,CJ,EX) cj
Enter job number (0-63) 2
```

The following message appears if the job is properly canceled.

```
Job canceled.
```

The following message appears if the job does not exist.

```
Job does not exist.
```

The following warning messages may appear but will not prevent you from canceling 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)?
```

The following warning messages indicate the job you have selected was not canceled.

`Job not canceled.` *If N response to (Y/N)? prompt above.*

`Job is on hold. Cancel not allowed.` *Jobs on hold from other than your port can not be canceled.*

`Job is in net transaction. Cancel not allowed.` *A net job can not be canceled.*

`Port is busy. Cancel not allowed.` *The port is in progress of issuing a command.*

EXIT
The exit terminates the job control menu and returns to the previous state before the job control menu was entered.

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

Kill (cancel) Command

Input Syntax: PREFIX + three ascii characters KLL
Example: ! @ # $ K L L *commands last job from my port to be canceled*

The cancel command is used to remove a job from the job queue. The cancel job command applies to the last job sent to the port to which the cancel command is sent. This command can be used multiple times to cancel previous jobs.

Port Connect Menu

Syntax: PREFIX + ascii character M *Example:* ! @ # $ M
Restriction: valid from serial ports only

The port connection menu gives a list of destinations, which were previously set from the menu access setup of the configuration menu. You choose a destination by entering the name of the port to connect. You are notified and connected to the port immediately if it is available. Several other responses are possible depending on availability of the port and whether you are connecting or disconnecting. The PREFIX + M command is used alternately to enter the menu or terminate a connection. Once connected through the menu the only commands which the unit will process are the job control menu, the identify command, the net command, and the port connect menu command (which exits from the connection and displays a disconnect message). The minutes timer is used to govern automatic disconnect timeout. If no data is sent in either direction for the duration of the timeout and either port is not busy then you will automatically be disconnected with a disconnect message. Upon exiting the menu you are automatically connected to the null port.

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
```

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  1 with job number  1
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 no modem carrier present*

INTENTIONAL DISCONNECTION
`Disconnected from DRAFT` *! @ # $ M was entered.*

DISCONNECTION DUE TO TIMEOUT
`Disconnected from DRAFT due to timeout` *No data entered for the duration of the minutes timer.*

NO DESTINATION CHOSEN, ONLY A CARRIAGE RETURN ENTERED
`Enter name of destination`
`No destination chosen, menu exited`

Net Command

This command is used by MasterNet to interrupt a print job in progress and make a computer to computer connection. Status is returned that determines whether the computer port to connect is busy or not. The syntax of this command is not currently documented.

Print Configuration Command

Syntax: PREFIX + ascii character P *Example:* ! @ # $ P
Restriction: valid from port 0 only

This command is used to send a copy of the switch's configuration to the current destination. This command is valid from port 0 only. The configuration data may be routed to any valid port by selecting a new destination with the set destination command prior to issuing this command.

Status Command

Syntax: PREFIX + ascii character S *Example:* ! @ # $ S
Restriction: valid from serial ports only

The status command displays all active and queued jobs. It can be accessed from a serial port only with a terminal or terminal emulator. Issuing the status command will terminate any job in progress. A sample display is shown in TABLE 4. The jobs are displayed in ascending order of destination port. First the name of the port requesting the status and its current destination is displayed. A description label is then shown to describe the contents of each column. If only the label is displayed, then no jobs are present.

Table 4
Queue Status 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

A number is assigned to every job. This number is displayed in the job number field. The source is the name of the port originating the job. The destination is the port to which the data was sent.

The status field can be any of several values. See TABLE 4A for a list of the values and what they mean.

Table 4a
Queue Status Value Descriptions

Connect	Job is both receiving and transmitting
Receive	Job is receiving but destination in use
Transmit	Job is transmitting but finished receiving
Queued	Job is finished receiving but destination in use
Busy	Job is waiting for its destination port to become ready
Waiting	Job transmitted all data but destination became busy, or job started from port connect menu waiting for destination, or job connected through port connect menu without sending data
Suspend	Job is suspended through the job control menu
Hold	Job is frozen either through the job control menu, by being your current job when entering job control, because computer involved in MasterNet action, or initialization string transmission in progress

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 shows how many bytes of memory the job is using.

Timeout Command

Syntax: PREFIX + ascii character T + ascii character n which can be either 0 1 2 or 3
if n = 0 then the timeout is disabled
if n = 1 then the timeout is enabled
if n = 2 then the minutes timeout is enabled and commands are ignored
if n = 3 then the seconds timeout is enabled and commands are ignored
Example: ! @ # $ T 0 *disable the timeout on my port*

The timeout command is used to enable or disable the timeout or disable command recognition. The timeout enable part of the command is used when a

connection with no data activity is to be maintained for periods longer than the timeout duration. The timeout is normally disabled (n=0) when communicating with a modem or a gateway to a mainframe. The timeout is normally enabled (n=1) when used to communicate with a printer. Disabling command recognition is used when a prefix might occur in a stream of binary data. The enable minutes timer and ignore commands function (n=2) could be used for downloading binary files through a modem. The enable seconds timer and ignore commands function (n=3) could be used for downloading fonts to a printer.

The timeout enable or disable state would still be in effect from the previous timeout command when connecting to a new destination. A port which is connected with an n=0 operand will never timeout.

Notice: It is the responsibility of the issuer of this command to terminate the connection to the port or enable the timeout to allow other users to access the port.

Verify Command

These commands are used for diagnostic purposes to verify that serial cables are correctly hooked up. The verify echo command 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. The verify input can determine if a port's inputs are high or low. The 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.

VERIFY ECHO
Input Syntax: PREFIX + 3 ascii characters V E E + 1 byte of any value
Output response: complement of byte value
Example input: ! @ # $ V E E 55 *Example output:* 200 *echoes complement of input value*
Restriction: valid from serial ports only

VERIFY INPUT
Input Syntax: PREFIX + 2 ascii characters V I + single non-ascii port number 0-63 or ascii M for my port + 0 *Output response:* single ascii character 0 for low(negative voltage) or 1 for high (positive voltage) on DSR

Example input: ! @ # $ V I 2 0 *Example output:* 1 *indicates DSR on port number two is high (positive voltage at pin)*
Restriction: valid from serial ports only

VERIFY OUTPUT
Syntax: PREFIX + 2 ascii characters V O + single non-ascii port number 0-63 or ascii M for my port + 0 for set to low (negative voltage at pin) or 1 for set to high (positive voltage at pin)
Example: ! @ # $ V O 4 0 *Commands port 4 DTR to go low (negative voltage at pin)*
Restriction: valid from serial ports only

Extended Connect Command

Syntax: PREFIX + ascii character X + non-ascii port number 0-63
Example: ! @ # $ X 5 *sets my destination to port 5; same as sending command ! @ # $ 5*

This command is the same as the destination command but is used to support units with a number of ports greater than 9.

Load Initialization String Command (MSN Series Units Only)

Syntax: PREFIX + ascii character Z + 0-63 character initialization string + 0 (null)
Restriction: Null is not allowed in the 0-63 character string
Example: ! @ # $ Z Printout from ROGER'S PC 12 0 *sets a banner page with form feed on the sending port*

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 strings set on a printer. Each string set by this command affects only the computer that set it; other ports are not affected. A string set by this command may 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.

Ascii Connect Command (MSN Series Units Only)

Syntax: PREFIX + ascii character = + ddd where ddd is a three-digit ascii number 000-016
Restriction: Leading zeros are significant and three digits must be sent regardless of the port number
Example: ! @ # $ = 015 *sets destination to port 15*

This command, which functions exactly as the normal extended connect command, allows connection to ports numbered higher than 8 without using any binary or control characters. This is useful for procedures using batch files or from mainframe computers which have difficulty handling binary characters.

Other Features

DTR/DSR and XON/XOFF Protocols

The DTR protocol is also known as hardware handshaking, which refers to a separate signal line often alternately called busy or ready which is used to meter the flow of data. A device like a printer can not 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 which indicates the printer is busy. When the printer has done its printing and it can accept more data, it changes that signal line to indicate ready. On the computer there is a corresponding input that accepts the busy/ready signal and inhibits 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 full conditions.

The XON/XOFF protocol is similar but it does not use a separate signal line. Instead it uses two special data bytes (XON - decimal 17) and (XOFF - decimal 19) intermixed with the data. When a computer receives an XOFF code it is being instructed to halt transmitting. When an XON 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 ready during its processing.

The Master Switch can be programmed to use either of these protocols independently on each port. Since the Master Switch has a buffer, the flow control signals are asserted only when the Master Switch's buffer becomes full and as it empties. The Master Switch will flow control each port independently as the protocol requires. The DTR protocol is still active, even though the XON/XOFF protocol is enabled, for ports configured as computer and printer types.

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 the DTR to hang up a modem. The Master Switch 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 the Master Switch 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. By using this method one less wire in the cable from the computer to the Master Switch is necessary. The DTR pulse is also active at a computer port if its so configured. At the termination of the job, the computer which originated the job will have its DTR pulsed.

Robust XON/XOFF

Robust XON is a variation of the XON/XOFF protocol. It can be configured on a port by port basis. Instead of sending an XOFF code when the buffer becomes busy and sending an XON when the buffer is ready, once a second an XON or XOFF is sent. If the Master Switch's buffer is full it sends an XOFF every second. When the buffer can accept more data, continuous XON's are sent once a second. This protocol is used to prevent lockup of a port due to a missed XON. This can be useful when linking over a modem. The protocol may also be required by certain programs which expect the robust XON/XOFF protocol.

XON Transmit Control

This is another variation of the XON/XOFF flow control protocol. When a computer communicates to a printer, XON/XOFF flow control signals need be sent only in one direction from the printer to the computer. In some cases it is desired to ignore flow controls being transmitted, but act on flow control signals being received. One such case is a computer sending graphics file to a printer. In the graphics data stream there may be numerous instances of the XON and XOFF codes which are not intended to be flow control codes, but are data representing part of an image. In this case the XON and XOFF 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 transmit flow control disabled. The printer, however, would have its XON transmit control enabled. Two computers talking to one another through a Master Switch might have their XON transmit control enabled. In this way the computers can control the flow of information, but they could not exchange any data streams that contained the XON/XOFF codes.

Half Duplex And Full Duplex

The duplex setting concerns the flow of information to a serial port. The duplex applies only when a port is a destination. A full duplex destination means that the port becomes a slave port upon being connecting by another port. Once it has become a slave port, its commands are not recognized until the destination is disconnected. Its command input is then enabled and it may then be the initiator of a conversation. All data from a slaved port is automatically sent to the originator. This is useful for modems, minicomputer ports, or plotters, where once a connection is established the data from the destination needs to be sent back to the source. The other case is where a destination is a half duplex port. The half duplex destination will never have its commands disabled. Its data will always be sent to its destination. When a half duplex port receives a message from another port, it can respond to the message by setting its destination to that port and sending a reply. This is the way that MasterNet works. For a port which is configured to be a printer port and half duplex, all data sent by it to the Master Switch is ignored. Half duplex is the default configuration for a serial printer.

Initialization String

The 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 most common string to be sent is the printer reset command, usually Escape E or Escape @. Refer to your printer manual for the characters to be sent. It is the printer's port that is configured to have the initialization string.

There is a variation of the initialization string when the destination is a computer or modem and not a printer. The initialization string that is sent is the source port's string. This can be used for the destination port to identify where a message came from.

As an example assume port 1, a computer, has an initialization string of 'one', port 2 is a computer, and port 8, a printer, has an initialization string of 'eight'. When port 1 sends the string 'hello' to port 8, 'eighthello' will be sent out port 8. When port 1 sends the string 'goodbye' to port 2, 'onegoodbye' will be sent out port 2.

Initialization Strings On MSN Series Units

Initialization strings on a MSN Series unit may be up to 64 characters long and may be used to perform more complex tasks such as setting a font, page layout, etc. A MSN Series unit's initialization string(s) may be changed by command (see

'Set initialization string command' under 'The Commands'). Also, on a MSN Series unit if an initialization string is set for a computer, the computer's string will override the printer's string.

Form Feed

The form feed is 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 are well behaved and send a form feed, then enabling this feature is unnecessary. If most of your applications do not send a form feed, then you can enable the form feed option. When it is enabled it is set to not waste paper. It will look at the end of a job and if a form feed exists it will not add one, otherwise it will. This is very useful for sending page prints, which often do not have form feeds, and for laser printers which must get a form feed to eject the page.

Often this feature will not work properly because an application does not send a simple form feed character. It may send either a series of line feeds, or the form feed is embedded in a string with other settings and thus the form feed is not the very last character of the job. In this case excess paper will be used, so it may be desired to disable the form feed.

Buffer Characteristics

The Master Switch uses an intelligent algorithm to allocate memory. The buffer is dynamically allocated which means that any port can utilize as much buffer as required. The buffer is reclaimed to be used again as the data in the buffer is sent to its destination. As the memory becomes full, the 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. Ports which are receiving only and have not been connected to their destination are given allocated memory only when enough memory is available to allow the other active ports to continue. The only case where lockout could occur is where all destinations are busy and the buffer is full so that no buffer can be reclaimed. The buffer is divided into 256 memory allocation units. Each input port will always have 1 or 2 memory units allocated to it.

Job Allocation

Up to 64 jobs may be dynamically allocated. This is not the same as the memory allocation. Each job is stored in memory as a separate entity and subject to be connected to its destination as priority, queue position, cancel status, and external device flow control apply.

The Front Panel

The front panel is used to display information on buffer capacity, data flow, busy states, errors, and diagnostic information. The LEDS display the information. What the LEDs display is controlled by the two switches, advance and select. The front panel display is very useful for initial installation and diagnosing problems that may occur.

Power Up Sequence

When the power switch to the unit is turned on, Master Switch goes through a power up self-test which tests the main functions of its electronics. The leftmost LED labeled power should glow green and the other red LEDs should all turn on. Then the unit will cycle through four tests lighting up LEDs 1 through 4 as each test is performed. Errors are indicated by the BUF, DATA, and BUSY LEDs lighting along with one of the numbered LEDs which corresponds to the error number. TABLE 5 shows the LED display sequence upon powering up. TABLE 6 shows the error displays.

Operational Display

Following the successful completion of its power up test, Master Switch is ready for operation and displays information on its LEDS. It alternates between displaying three states – buffer, data, and busy. The current display state is shown by one of the BUF, DATA, or BUSY LEDs being lit. A state is displayed for five seconds, then the next state is displayed. The corresponding LED is lit when its state is being displayed.

Controlling the Display with the Advance and Select Switches

The display can be quickly cycled through its three possible display states of buffer capacity, data flow, and busy, by pressing the advance switch. The display can be stopped on any of the three states by pressing the select switch. The scan can then be resumed by pressing the advance switch.

Buffer Display

This is the first of the LED display states to be entered following the four power up tests. The BUF LED is lit indicating buffer information is being displayed and the LEDS labelled 1-8 indicate the percentage of total buffer used. How the LEDs show unused buffer capacity is shown in TABLE 7. With the exception of MSN Series units, the normal empty (initial) condition is for LED 1 to be flashing, indicating a small amount of memory has been allocated for receiving data. MSN Series units, when empty, just show the BUF LED with all other LEDS off.

Data Display

The data display shows the transfer of data on all the ports. The DATA LED is lit indicating data flow information is being displayed. If any of LEDs 0-8 is lit it indicates that data is being transferred either in or out of the port with the LED lit. If a port is actively connected to its destination both the source and destination LEDs will glow steadily or flash as the data is transferred.

On a MSN Series unit data information for ports 0-8 is displayed when the DATA LED is steadily on. When the DATA LED is flashing data information for ports 9-17 is displayed.

Table 5
LED Power Up Display

	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
4th	○	○	○	○	○	○	●	○	○	○	○	○	Test 3 Static ram
5th	○	○	○	○	○	○	○	●	○	○	○	○	Test 4 Non-volatile RAM
6th	●	○	○	○	☼	○	○	○	○	○	○	○	Unit Operational
6th	○	●	○	○	○	○	○	○	○	○	○	○	MSN Unit Operational

Table 6
LED Error 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 Non-volatile RAM

LEGEND:

○ indicates LED is not lit

● indicates LED is lit

☼ indicates LED is flashing

Table 7
LED Buffer Capacity 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 on MSN Series unit these LEDs would be off (○)

Busy Display

The busy display indicates the flow control information on the port. The BUSY LED is lit indicating data flow information is being displayed. For parallel printers, the printer's busy line is displayed on the corresponding LED 0-8. If the LED is continuously lit it means the printer is off line or disconnected. If it flashes it indicates normal transfer. If it is off then the printer is ready or may be powered off. For parallel computers normal transfer conditions will display the LED as either continuously on or flashing. Off means no data is being transferred. For serial ports the LED indicates the state of the DSR signal, the DTR signal, or XON/XOFF state. When the LED is on it means the external device is asserting DSR low or XOFF, or the Master Switch is asserting DTR low or XOFF due to a buffer full condition.

As with the data display, on a MSN Series unit when the BUSY LED is steadily on, busy information for ports 0-8 is displayed. When the BUSY LED is flashing, busy information for ports 9-17 is displayed.

Chaining the Units Together

The units may be chained together to allow connection of more ports than exist on one unit. There are several methods of doing this. You can connect parallel or serial ports together on one or more boxes. The serial to serial cable for Master Switches is shown in *APPENDIX B.*

You can select a port on another box by changing the prefix on that second box and combining the commands together. A set destination to port command would consist of the prefix of the first box + the port to which the second box is attached + the prefix of the second box + the desired port on the second box.

For example, assume two boxes are connected together through port eight. Change the prefix on box #2 to a different prefix than the factory default, for example ! @ # 2. You are on port #4 on box #1 and want to connect to port #6 on box #2. Send the command ! @ # $ 8 ! @ # 2 6 to make the connection. The first ! @ # $ 8 connects you to port 8 on the first box which is connected to the second box. The ! @ # 2 6 connects you to port #6 on the second box.

There is a side effect to be aware of. If you issue the command above and later another port on box #1 issues a command for example ! @ # $ 8 ! @ # 2 5 which means connect to port 5 on box #2, your current destination is now port 5. Therefore, a new destination command must be issued every time you wish to send data to a port on the second box. The other point to note is that only one person on box #1 could access a port on box #2 at a time. The data would still queue up, however.

Chaining to an MSN Series Unit

On MSN series units chaining is done in the same way; however the commands used are different due to the special commands for ports higher than eight. If the prefix on the first MSN unit was ! @ # $, and the second unit was set to ! @ # 2 as in the first example, you would use the = command (extended ascii connect) for the chaining. Assuming the cable connecting the two units is connected to port 12 on the first unit and port 10 on the second unit, to connect from the first unit to a printer on port 14 of the second unit you would send ! @ # $ = 0 1 2 ! @ # 2 = 0 1 4.

Chaining from an MSN Series Unit

If you are connected to a MSN series unit that is chained to other units, there is a workaround to the problem of not knowing what your final printer destination is. Instead of sending the set destination command to the second unit every time you print, use the Z command (the set initialization string command) to set an initialization string that contains the set destination command to be sent to the second unit. Every time you print, this command will be sent to the second unit automatically. To change the destination simply reissue the Z command with a new set destination command. An example assuming your unit's prefix is ! @ # $ and the second unit's prefix is % ^ &* is: To print on the second unit's port 5, issue the Z command as follows: ! @ # $ Z % ^ & * 5 0 . This would cause % ^ & * 5 to be sent to the second unit every time you print.

Applications

The key to using the Master Switch is to blend the commands with convenient methods for sending them. If you've read the previous sections, you found that there are over 20 commands and 8 ways of sending them. To simplify the process of implementing these methods, several of the common applications will be described with examples. A lot of the examples will use PCs and the DOS operating system to illustrate the applications. Most of the techniques are usable by other computers and operating systems as well.

In the examples below, the names of the DOS devices, LPT1: and COM1: are used, you could also use LPT2: or COM2:.

Setting Up the Serial Port on your PC

You must make sure that your PC is configured correctly to send data from the serial port. This involves redirection, the DOS MODE command, and potentially adjusting your application software.

Redirection of a Parallel Port to a Serial Port

Redirection refers to the ability for data directed to a parallel port to be sent instead to a serial port. DOS contains a built-in command (the MODE command) to do this. MasterLink has this redirection capability too, which can be accessed from its pop-up window. The print screen operation from DOS is initially set to go to the parallel port. If printing out the serial port, it 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 to use the serial port according to the program's installation procedure. If you use this method, the application can not access a local printer attached to the parallel port of the PC. The application can not use a baud rate different than its installed settings.

2. You can initialize your application to use the parallel port and redirect it to the serial port. This method is more flexible and allows you to easily select an optional local printer attached to the parallel port of the PC or a printer on the Master Switch. It also allows you to run at different baud rates than the possible settings of the program. This is especially useful to run at 19200 baud for those programs which have no ability to configure to this baud rate. This method is not applicable to programs which require a serial port, such as a communication program.

Using the DOS MODE Command

When using the serial port on the PC, you must initialize the communication parameters. From DOS you must enter the appropriate MODE command to initialize your serial port. For example the command to set serial port one to 9600 baud is `MODE COM1:9600,N,8,1,P`. If you will be redirecting data as described above then you should use the MODE command to redirect data form the parallel port to the serial port. For example the command to redirect data from parallel port one to serial port one is `MODE LPT1:=COM1`. These commands are normally included in your AUTOEXEC.BAT file used to initialize your computer when it is booted.

Setting Up your PC Application Software

Your application software must be set up to match the protocol of the port on the Master Switch connected to your PC. If you will be using redirection, you must install your program to use the parallel port. If your program is installed to use the serial port, the communication setting of the serial port must match that of the Master Switch exactly. The baud rate, word size, parity, and number of stop bits must match exactly. With regard to treatment of the serial port, there are three main types of application programs:

1. Some programs have no communication parameter settings, they use the settings from the DOS MODE command. This is the most flexible and transparent program to use.

2. Some programs have as part of their configuration a communication parameter setting, which must be set properly. Examples of this type of program are LOTUS 1-2-3 (can be set up for serial or parallel), almost all communication programs (can be set for serial only), and many others. 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. With this type of program, you must set the Master Switch to match the program's settings. An example of this type of program is Autocad, Ventura Publishing, and others. This is the least flexible of the programs and may require the use of the Master Switch's format command. Some programs, such as Ventura, can be setup to use the parallel port and then redirected to the serial port. Plotters on Autocad can not be set to the parallel port and redirected. Also they are usually set to use XON/XOFF protocol. You must set the protocol of the Master Switch to match the program's fixed settings.

Running your PC at 19200 Baud

Versions of DOS earlier than revision 3.3 do not have the ability to set the baud rate to 19200 or greater. We have provided a utility, called B19200, on the MasterLink diskette, to set the baud rate of either COM1 or COM2 to 19200. It does not alter the parity, length, or stop bits. It uses the current settings for these parameters. See the example below on its usage. Also look in the MasterLink manual for more information.

Using a Batch Shell to Set the Baud Rate

You can create a 'batch shell' to change the communication settings of a port and then set it back. The example below shows a batch program that uses the format command to change from DOS's setting of 19200,N,8,1 to Autocad's fixed setting of 9600,E,7,1. The first send command also sets the destination to port 7 (a plotter). When the program is finished it restores the port to 19200 and set the destination to port 8 (a laser printer). Note the use of the program B19200 to set the baud rate from 9600 to 19200. The example also uses the SEND utility provided on the MasterLink diskette.

```
SEND 1 !@#$7!@#$FM96E71X   Select port 7 and set Master Switch to
                               9600,E,7,1,X. XON/XOFF is enabled.
MODE COM1:96,E,7,1,P       Make sure the DOS baud rate and the
                               Master Switch baud rate are the same.
ACAD                       Run Autocad.
MODE COM1:96,E,7,1,P       Make sure the DOS baud rate and the
                               Master Switch baud rate are the same.
SEND 1 !@#$8!@#$FM19N81D   Select port 8 and set Master Switch to 19200,N,8,1,D.
                               XON/XOFF is disabled.
```

```
MODE COM1:96,N,8,1,P      Set DOS COM1: to 9600,N,8,1,P.
B19200 1                  Set DOS COM1: to 19200,N,8,1,P.
```

Printer Sharing

Most printer sharing with the Master Switch 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.

Selecting a Printer From PCs with DOS Batch Files

DOS has several ways to send a command to the Master Switch, such as PRINT, ECHO, or COPY. 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 only send files or characters typed into the keyboard. On the MasterLink utility diskette we have provided a program called SEND, which sends a string without a carriage return or line feed. While COPY could be used, SEND simplifies using DOS batch files.

First decide which devices you wish to be able to connect and what their port numbers are. For example let's assume you want to connect to port 7, a laser printer, and port 8, a dot matrix printer. Let's name the laser printer LASER and the dot matrix DRAFT.

Create the following batch file called SELECT.BAT

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

At the DOS prompt type SELECT LASER to set the destination to port 7 of the Master Switch on COM1 port. Type SELECT DRAFT to to set the destination to port 8 of the Master Switch on COM1 port.

Alternately create two files one called LASER.BAT and the DRAFT.BAT.

The file called LASER .BAT should have:

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

The other file called DRAFT.BAT should have

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

At the DOS prompt type LASER to select the laser and type DRAFT to select the dot matrix printer.

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

Printer Sharing From PCs with Masterlink

Selecting your printers with MasterLink is even easier. You must run MasterLink SETUP to configure it to your equipment. MasterLink is a versatile utility that will allow you to pop-up from any program and send any command to the Master Switch. You can also access the Master Switch's menu from MasterLink. For more details please refer to the MasterLink manual.

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 the Master Switch. You can use the DOS MODE command `MODE LPT1:=COM1` to redirect printer output to the COM1 port. You can use the MODE command to also un-redirect the print to COM1 by issuing

`MODE LPT1:=,,P` to DOS. Any programs which are set to use the COM1 port can not be sent to the LPT1 port. MasterLink has the ability to do pop-up redirection with its macro functions. It is a much simpler and more flexible way than the DOS MODE command. See the MasterLink manual for more information.

Selecting a Printer from Word Processing Software

Many of today's software packages have a flexible method for customizing the printer drivers used with the package, such as WordPerfect. They may have initialization strings where one can add a destination command at the beginning. Please refer to your word processing manual for more information.

Print Intensive Environments

If you are producing large volumes of print, the grouping feature may be useful to spread out the output to multiple printers of the same model. You can set your destination to a group (must be previously configured), and it will automatically go to the first available printer.

Sharing Modems

The Master Switch is designed to have all the features required to share a modem. A mixture of the format command and timeout enable command are usually the only commands necessary in addition to the set destination command.

Matching The Baud Rate

Using a communication program requires you to match the baud rates of the program and the Master Switch. Normally the program sets the baud rate to match the remote modem's baud rate. For the purpose of the following examples, assume that DOS and the Master Switch are set to 9600 baud and that we want to dial out at 2400 baud on a modem attached to the Master Switch. There are two ways to set up the rates.

1. Leave the switch at 9600, set the communication program to 9600. This requires setting up the modem port to run at 2400 baud.
2. Set the switch at 2400, leave the communication program at 2400. This requires issuing a format command to set the Master Switch to 2400. You must then run the program, and when done restore the Master Switch and PC to 9600.

Use Of The Timeout

Control of the timeout is normally required to have a modem communication session. Print data normally comes in bursts. 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 with mostly interaction with screen oriented data. It could also be uploading or downloading of binary files. In the case of mainframe-terminal interaction, a timeout command of !@#$T0 would be sufficient. This would turn the timeout off and you could still issue commands. Or one could connect with the port connect menu. This would set the timeout to the minutes timer. In the case of the uploading and downloading of binary files, we should turn command recognition off and timeout via the minutes timer. This is a timeout command of !@#$T2. This will prevent collisions with the prefix, especially when a block of data ends with a prefix character, which the Master Switch will hold.

Data Carrier Detection by the MASTER SWITCH

Communication programs detect successful connection to a remote modem in two ways. The older programs, for example Crosstalk, require a data carrier signal to be present at the PC. Newer programs, for example Procomm, that use Hayes compatible modems detect carrier by a string sent from the modem and do not need the carrier detect signal.

A port on the Master Switch programmed to be a modem port can pass the data carrier signal back to the computer. The cabling must be set correctly, and the modem must be set correctly to get the signal. The carrier signal from the modem must go to DSR of the Master Switch. The Master Switch passes it through to pin 20 on the corresponding computer port. The PC must receive it on its DCD pin (pin 8 for DB25 connector, pin 1 for DB9 connector). The carrier signal on the modem normally is present on either pin 6 or pin 8 on the modem.

If using a straight through cable, so that pin 6 of the modem is wired to pin 6 of the modem, on a Hayes compatible 1200 baud modem, dip switch 6 must be set to up. This is a requirement of the modem to pass the carrier signal. Note that on these type of 1200 baud modems pin 6 and pin 8 are normally wired together. The 2400 baud Hayes compatible modems have no dip switches. You must 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.

For the Master Switch to pass the carrier detect signal to the connecting computer, a job must exist. This is accomplished by sending a dummy character to the modem. The dummy character must be sent after the appropriate destination command to set the modem as the destination.

Modem Pooling

Modem pooling refers to the ability to connect to a group of modems and connect to the first available modem. This is done by using the set destination to group command. The group must have been previously configured to have several modem ports as members of the group. You could connect through the port connect menu or by command.

Verifying Connection to a Modem

You may wish to automate access to a modem. You may have several computers contending for a modem and wish to know if a port is available before a program is executed. You can use the MSTAT utility on the MasterLink utility diskette. See the MasterLink manual for more information about MSTAT. You could also use the port connection menu to connect to the modem.

An Example Of Modem Sharing

Assume you have a 2400 baud modem. The modem is on port 6 of the Master Switch. Your communication program is named PROCOMM. The computer's COM1: port is connected to a Master Switch port (which one doesn't matter to this method) that normally runs at 9600,N,8,1. The SEND.EXE program from the MasterLink utility diskette is used. The following batch file connects to the modem and runs PROCOMM:

```
MODE COM1:96,N,8,1,P        Set DOS COM1: to 9600,N,8,1 to ensure a match
                              with the switch's baud rate
SEND 1 !@#$FM24N81D         Set Master Switch port to 2400 baud to match
                              speed of comm program
```

```
MODE COM1:24,N,8,1          Make sure the DOS baud rate and the
                                Master Switch baud rate are the same
SEND 1 !@#$6                Set destination to the modem's port
SEND 1 !@#$T0-              Turn the timeout off and send a dummy
                                character to start the job
PROCOMM
MODE COM1:24,N,8,1          Make sure the DOS baud rate and the
                                Master Switch baud rate are the same
SEND 1 !@#$T1               Turn the timeout back on and terminate
                                the job (will pulse DTR on modem)
SEND 1 !@#$FM96N81D         Set Master Switch back to 9600,N,8,1,D
MODE COM1:96,N,8,1,P        Set DOS COM1: back to 9600,N,8,1,P
SEND 1 !@#$8                Set destination back to a printer on port 8
```

This batch file could be called RUNCOMM.BAT. Instead of typing PROCOMM to run PROCOMM, you would type RUNCOMM and this batch file would automatically send the required commands to connect to the modem.

Plotter Sharing

Sharing a plotter is similar to sharing a printer. The destination must be chosen and the data rates and protocol must match exactly. The cabling must be correct. Often the XON/XOFF protocol is used; this must be set up to match as well.

Spooling Plotter Jobs

Often plotters are queried by the plotting programs for a parameter from the plotter such as paper size. This requires the plotter to be configured as a full duplex printer, so that any responses sent by the plotter will be sent back to the computer. You can not successfully spool (stack up several jobs) from a plotting program which requires this feedback from the plotter every time a sheet of paper is loaded. The reason you can not stack up the jobs is that the computer expects a response from the plotter, but it is still plotting data from the previous job and there is still more data in the buffer to process. You could plot to disk and spool the plot files, however.

Buffering Plotter Jobs

The idea of having a buffer is to free up the computer, so that the computer can continue working. The buffer should handle the plotting to completion. There are variances in this situation however. Some applications are very slow and when coupled with a fast plotter, the plotter will keep up with the data coming from the computer. It is impossible to buffer this type of data flow condition. The buffering action depends upon the speed 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. The amount of buffering action is totally dependent on the application environment.

Spurious Characters From Power Up

The set destination to null command is especially useful to prevent computers that are powered on and off from sending spurious data. The computer power up or down state may produce a transient which sends spurious data to the Master Switch. The Master Switch routes this spurious data to its current destination, which may appear as a few extra characters at the top of page. If the destination is null, then the transient characters are ignored. A good method of implementing

this feature is to add it to a batch file with your hard disk parking utility, if you have one. Then when you shut the computer off, you send the null destination to the switch and park the hard disk. Create a file called F.BAT:

```
SEND 1 !@#$9        Send the set destination to null command
FPARK                    Park the hard disk (if one is present)
```

When powering down type F (invoke F.BAT); the Master Switch will ignore transients and your hard disk will be parked.

When powering on the computer, in the AUTOEXEC.BAT file you can put a SEND 1 !@#$8 to set your destination to port 8 or whatever initial device you want as your default.

Port Contention

Port contention means that a number of ports are trying to access or contend for a smaller number of ports. This is a common situation when there is a multi-user system such as a VAX or a UNIX based system. Since not all terminals may be in use at the same time, you can have more terminals, though they could not all be connected at the same time. Through this technique you can effectively increase the number of terminals in the system. If a port is available on the computer, any terminal can connect to it. If all the ports are busy on the computer, the request is queued up. A message is issued and the connection is made when the a computer port becomes available. See the *PORT CONNECT MENU* for more information. To access this feature you configure the Master Switch to select the member ports of a group, and then put the group in the menu access list.

Data Collection

A common application 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 connect from the computer to the instruments only when the computer sends a command, you should configure the ports as full duplex printer ports. As they transmit data, it is stored in the buffer. When you connect to a port (and send a 'dummy' character to start communication), if there is any data in the buffer, it is sent to your port.

If you want the instruments to automatically send data to you, you should configure them as full duplex computers. Set their default destinations to your main port (port 0). You should configure your computer port as a half duplex computer. You may have a problem in recognizing which data is coming from which instrument. In this case you could set up the initialization string as a port identifier. Then you could tell which port sent the data and possibly send a reply.

The set remote destination command allows you to interconnect instruments or peripherals to each other. You can control from a master port (port 0) the interconnection of your devices.

Diagnostics

Troubleshooting

Common Problems And Solutions

The suggested problems and remedies below are arranged in order of likelihood with the most common problems first. We suggest you check each item in order for the quickest result.

I. Nothing Happens When Sending Data/Abort, Retry error when sending from a PC

- **Master Switch is powered off**
  Check to see that the Master Switch is plugged into a live power outlet and that the power switch is in the ON position.
- **Error state on Master Switch**
  Check the LED display on the Master Switch. If *none* of the red LEDs are lit, the switch is defective; call your dealer or Rose Electronics for assistance. If BUF, DATA, and BUSY are all lit at the same time, the switch is in an error state. See the 'LED ERROR DISPLAY' table for additional information.
- **Improper cabling from computer to Master Switch or from Master Switch to shared device**
  See *APPENDIX B* for proper cable configurations. Try using the MasterLink terminal emulation option 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, then the cable is wrong.
- **Protocol of computer or shared device does not match Master Switch**
  Protocol on serial units is the baud rate, parity type, number of stop bits, bit size of the characters (5, 6, 7, or 8), and the handshaking type (DTR or X-on/X-off). Protocol of your device(s) must match the protocol of the unit. See 'CONFIGURATION' section. Ensure that you have used the proper MODE command to setup PCs connected to the Master Switch or DOS defaults to 2400, N, 8, 1.
- **Printer or computer connected to wrong port.**
  Ensure that the port connected to the sending computer is configured as a computer port.
- **Destination wrong or set to null**
  Use the MasterLink program or other means to get a status report (see 'THE COMMANDS'). If your destination is set to NULL, a modem, another computer, or a unused port, you need to set the destination—before printing—with the proper command.
- **Defective, misconfigured, or wrong COM: port on computer**
  Try using another computer or COM: port. Often serial ports appear to work when printing but will not work under communication programs or MasterLink due to improper IRQ setup. Refer to your computer dealer if you suspect this, or if changing computers solves the problem.
- **Defective port on Master Switch**
  Try using another input port on the Master Switch. If the new port works, and you have checked to ensure that the configuration of both ports is identical, call your dealer or Rose Electronics for assistance.

II. Missing Blocks Of Data On Shared Device and/or Buffer

- **Flow control is not set or wired properly**
  If your device uses X-on/X-off, ensure that the corresponding port is set for X-on/X-off. If you are using DTR you have a miswired cable, see APPENDIX B for proper cable configuration. Usually this error means the printer setting or cable is defective, not the computer setting or cable.

III. Garbled Data Received At Shared Device

- **Protocol does not match**
  See above.
- **Flow control**
  See above.
- **Wiring interference**
  This may occur on computers which are a long distance from the Master Switch. Parallel cables are limited to 25' and should not be run through walls or ceilings. Serial cables over 50' must be shielded with the shield connected to a proper earth ground. Wiring faults may also be caused by loose or bent pins in cable connectors.
- **'Jabbering node'**
  See facing page under item V.

IV. Computer Locks Up

- **Buffer is full**
  Check the unit's LED display when the BUF LED is lit. If the display indicates buffer full, determine the cause of the unit being filled up (usually a printer off line or out of paper), and correct the problem.
- **Accidental connection to modem**
  If you set your destination to a port configured as a modem port, and the modem is not currently connected (NO CARRIER state), the Master Switch will drive the flow control lines of the connected computer low. This will freeze a PC attempting to print. Check your destination with the MasterLink terminal emulator (see 'Destination', previously) and change it to the proper device.
- **Cabling**
  See previous.
- **Flow control improperly wired**
  See previous.

V. Port(s) Do Not Time Out/Shared Device Locks to One User Permanently

- **'Robust' X-on/X-off present.**
  Some printers, particularly the HP LaserJet, send X-on codes at timed intervals. If the device allows, set the robust feature to off. Other options are: disconnect pin 3 on the switch end of the devices's cable; configure the device's port to X-on/X-off; configure the device's port to half duplex.
- **User did not reenable timeout**
  If a user of a shared devices fails to reenable the timeout with the <prefix>T1 command after a modem or mainframe session he will remain connected to the device indefinitely. Use the status command to determine who has control of the device, then have the user send the <prefix>T1 command.
- **Improper wiring**
  A computer which is powered off is making a port busy. Do not connect anything from the computer to pin 6 of the switch's port. Alternately, you

can configure the computer to half duplex. See APPENDIX B for proper wiring of computer cables.

- **'Jabbering node' on powered off computer**
  Under certain conditions a powered off computer sends spurious data over its connected cables. Set the offending station's port to the null destination with the <prefix>9 command to solve the problem. This problem is most common with parallel connections, especially runs over 15'.

VI. Configuration lost (Error 4) frequently

- **Electrostatic discharge**
  Locate the unit away from areas exposed to static discharge. Avoid touching the unit or cables connected to it without first touching a grounded object.
- **'Dirty' or intermittent AC power**
  Use a surge suppressor or UPS device with the Master Switch. Alternately, plug the Master Switch into a dedicated computer outlet.

Power Up Tests

Eprom Program Checksum Test

This test checks the validity of its program by performing a checksum test. A program checksum error shows on the LEDs as error 1 (BUF, DATA, BUSY, and LED #1 lit), as shown in TABLE 6, and will immediately halt the unit indicating a fatal error and that the unit must be serviced.

Buffer Memory Sizing and Read/Write Test

This test determines the amount of buffer memory present and indicates the amount via the status LEDs as shown in TABLE 7 and tests the buffer memory to ensure that all memory locations are operational. Any failure will cause the error 2 condition to be displayed (BUF, DATA, BUSY, and LED #2 lit) indicating that a buffer memory data error has occurred. The unit will not continue its further tests and will halt. An error indicates that the unit requires servicing.

Static Ram Read/write Test

This test verifies the 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. The unit must be serviced if this occurs.

Non-volatile Ram Checksum Test

The fourth and final power up test is for the non-volatile memory. A checksum test is performed. An error shown by the LEDs as error 4 (BUF, DATA, BUSY, and LED #4 lit) indicates that the data in the non-volatile memory has been corrupted. To attempt to rewrite the default parameters push the advance pushbutton. If the error condition goes out, the unit may be powered up again to see if it halts at error 4 again. If it still displays error 4, a fatal error has occurred and servicing is required.

If the unit recovers from the error the configuration parameters have been returned to their default settings and the unit must be reconfigured. This condition does not normally occur. If it does it indicates that possibly the unit has been subjected to a strong static discharge or surge on its incoming power or signal lines. The other possibility is an internal chip failure.

Diagnostic Modes

You can execute some special diagnostic tests to determine if the Master Switch has any problems. There are three groups of tests as shown below. The long tests do a more extensive memory test and do tests on the ports. The short test is similar to the power up test but continuously cycles, and allows reloading of the factory default settings.

The tests continuously cycle and halt if an error is determined. An error is indicated by the BUF, DATA, BUSY, and a numbered LED being lit. The number of the LED indicates which test has failed. If LED #2 is lit, LEDs #5-#8 may also be lit indicating the amount of memory that is installed.

Long Test Without Loopback

This group of tests are entered by pressing the select switch only while powering up the unit with the on/off switch. All equipment should be disconnected from the Master Switch prior to running this test.

Test 1 - EPROM program checksum test is the same as described above.

Test 2 - Dynamic ram test checks the dynamic ram more extensively than the short test or the power up test. The test takes longer to perform. If this test fails (BUF, DATA, BUSY, and LED #2 are lit) than the unit must be serviced. Other LEDs #5-#8 may be lit also indicating the amount of memory that is installed.

The failing board and memory device can be determined by pressing the advance switch. The BUF LED will be lit if the failing board is the base mother board or the bottom-most memory board installed. 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 the LED #0 will be lit for the fourth board. The LEDS 1-8 correspond to the physical placement of the failing chip. If the failing chip is the one all the way to the left, then LED 1 will be lit. If the failing chip is the one all the way to the right, then LED 8 will be lit. The chips in the middle correspond appropriately. Hitting the select switch will retry the test. In order to bypass this test completely, both the advance and the select switched may be pressed.

Test 3 - Same as static ram read/write test above

Test 4 - Same as non-volatile ram checksum test above

Test 5 - Port addressing test checks if the contents of non-volatile memory agree with the port configuration. If this test fails (BUF, DATA, BUSY, and LED #5 are lit) then the configuration memory has been corrupted or a port communication chip has failed.

Reload the factory default settings as described below and retry the test. Make sure there are no cables connected to the Master Switch. Re-run the test, if the test still fails then the unit must be serviced. The advance switch may be pressed to determine which port is the failing port. BUF, DATA, and BUSY will all be lit. The LEDs of all ports which pass will be lit. A failing port will have its corresponding LED off. The select switch may be pressed to execute the test again. In order to bypass this test completely, both the advance and the select switched may be pressed.

Test 6 - Module test ensures that there are no signal shorts on a port, in order for this test to pass, no equipment should be connected to the Master Switch. If this test fails (BUF, DATA, BUSY, and LED #6 are lit) then a port communication chip has failed and the unit must be serviced.

The advance switch may be pressed to determine which port is the failing port. BUF, DATA, and BUSY will all be flashing. The LEDs of all ports which pass will be

flashing. A failing port will have its corresponding LED steadily lit. Ports not installed will have their corresponding LEDs off. The select switch may be pressed to execute the test again. In order to bypass this test completely, both the advance and the select switches may be pressed.

Long Test With Loopback

This test is entered by pressing the advance switch only while powering up the unit with the on/off switch. Special loopback connectors should be connected to each Master Switch port.

Tests 1-5 - These are the same as tests 1-5 of long test without loopback.

Test 6 - The loopback test assures that all port signals are functional. In order for this test to pass, special loopback connectors must be installed on each port, see TABLE 8. If this test fails (BUF, DATA, BUSY, and LED #6 are lit) then a port communication chip has failed and the unit must be serviced.

The advance switch may be pressed to determine which port is the failing port. BUF, DATA, and BUSY will all be flashing. The LEDs of all ports which pass will be flashing. A failing port will have its corresponding LED steadily lit. Ports not installed will have their corresponding LEDs off. The select switch may be pressed to execute the test again. In order to bypass this test completely, both the advance and the select switched may be pressed.

Table 8
Loopback Test Connectors

MS series unit parallel loopback connector
Male 36 pin Centronics connector

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

MS series unit serial loopback connector
Male 25 pin subminiature D connector

2 ------ 3
6 ------ 20

MSU,MSN series unit parallel loopback connector
Female 25 pin subminiature D connector

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

MSU,MSN series unit serial loopback connector
Female 8 pin RJ45 connector

2 ------ 3
4 ------ 6

Short Test

This group of tests is entered by pressing both the advance and select switches while powering up the unit..

Tests 1-4 are exactly the same tests as those performed during the power up sequence. You enter this state for a continuous test of the Master Switch functions or to reload the factory default settings as described below.

Reloading Factory Defaults

There are two ways to reload the factory default configuration. The first is if an error occurs in powering up the unit and the unit halts with error 4 (BUF, DATA, BUSY, and LED #4 lit). To reload the defaults push the advance switch, the unit is then ready for operation.

The other method of reloading the factory defaults is through the special diagnostic mode (short test) of the Master Switch. This mode is entered by powering the unit off and pressing both the advance and select switch and then powering up the unit. Continue to hold the two switches in, while the switch cycles through its normal power up sequence. The switch will halt with LED 4 lit. Release the switches and you load the factory default configuration. The unit stays in the special diagnostic mode and continuously cycles through the 4 tests. To resume normal operation, you must power the unit off and back on. The unit is now set at its factory defaults. You must reconfigure the Master Switch, if necessary, to correspond to your equipment settings.

Note: Resetting a MSU Series unit to factory default sets all of its ports to serial.

Maintenance and Repair

The exterior surface of the unit may be wiped with a damp cloth to keep it clean. The unit does not contain any jumpers or serviceable parts inside. Opening the unit invalidates the warranty except in the case of an authorized memory upgrade or firmware update.

Technical Support and Returning a Unit

If unable to determine the nature of a problem, please call Rose Electronics and ask for Technical Support. Please have available the model number of the unit. If you can be near the unit when calling this is preferable, as we may be able to solve your problem directly over the phone. If we are unable to solve your problem, and determine that the fault is in the unit, then we will issue an RMA (return material authorization number). This number must appear on the outside of all returned products. The unit should be packed in the original container and insured. The unit should be shipped to the address provided by the phone call.

Appendix A Model Number and Options

The Master Switch is available in several models, up to 9 ports, all serial, all parallel, or combined serial and parallel. The base model has a 64K byte buffer expandable to 256KB, 512KB, 1MB, 2MB or 4MB. The available models are described below.

MS - X S Y P / B

B for buffer amount **2X** – 256KB, **5X** – 512KB, **10X** – 1MB
20X - 2MB, **40X** - 4MB (If no amount specified 64K base buffer only)

P for parallel (omit for no parallel ports)

Y number of parallel ports (omit for no parallel ports)

S for serial (omit for no serial ports)

X number of serial ports (omit for no serial ports)

MS for Master Switch networking switch or
MSU for Master Switch Universal Series networking switch or
MSN for Master Switch Networking Series networking switch

Options

Part number	Description
/2X	256KB expansion memory plug in module expandable to 1MB with chips, 4MB with more modules
/5X	512KB expansion memory plug in module expandable to 1MB with chips, 4MB with more modules
/10X	1MB expansion memory plug in module expandable to 4MB with more modules
/20X	2MB expansion memory plug in module expandable to 4MB with more modules
/40X	4MB expansion memory plug in module non-expandable
/RM	5.25" x 19" black anodized rack mount
/TRF220	220 volt AC adapter with VDE plug
/TRF110	110 volt AC floor mount adapter
SW-MN5/4	MasterNet networking software 5 1/4" four-pack (supports up to four PC/XT/AT/386/PS-2 computers)
SW-MN3/4	MasterNet networking software 3 1/2" four-pack (supports up to four PC/XT/AT/386/PS-2 computers)

Appendix B Common Cables

The diagrams below show Master Switch pinouts (MS series or MSU/MSN series) on the left and all other devices on the right. Read across to find the pin out. Connectors mentioned below refer to the connector on the equipment, not on the cable.

Serial Computers

ROSE MS		IBM PC	IBM AT	MAC	MAC+	VAX
25 PIN FEMALE	8 PIN RJ45	25 PIN MALE	9 PIN MALE	9 PIN FEMALE	8 PIN MINI-DIN	25 PIN FEMALE
2	4	3	2	9	5	3
3	6	2	3	5	3	2
7	5	7	5	3-8	4-8	7
20	3	5-6-8	1-6-8	7	2	

Please note that for RJ45 connectors only the center 4 signals (3-6) are needed for computers. This allows the use of common 4-conductor RJ11 cable to make the connection.

Serial Printers

ROSE MS		HP LASER JET	XEROX 4045 LASER	APPLE IMAGEWR.	APPLE IMAGEWR. 2
25 PIN FEMALE	8 PIN RJ45	25 PIN FEMALE	25 PIN FEMALE	25 PIN FEMALE	8 PIN MINI-DIN
2	4	3	3	3	5
3	6	2	2	2	3
7	5	7	7	7	4-8
6	2	20	20	20	1
4	7		5-6-8		

Please note that for RJ45 connectors 6 conductor cables are required to support hardware handshaking.

Serial Printers/plotters

ROSE MS		EPSON	OKIDATA*	HP,CALCOMP	HOU. INST.
25 PIN FEMALE	8 PIN RJ45	MX/RX/FX/EX	82-193	PLOTTERS	PLOTTERS
2	4	3	3	3	3
3	6	2	2	2	3
7	5	7	7	7	7
6	2	11	11	20	20
4	7	6	5-6	5-6	5-6

** Jumper setting for ready on pin 11.*

Other Serial Devices

ROSE MS		HAYES	MULTI-	VT-100	ROSE MS	ROSE MS
25 PIN FEMALE	8 PIN RJ45	MODEM	PLEXERS	TERMINAL	25 PIN FEMALE	8 PIN RJ45
2	4	2	2	3	3	6
3	6	3	3	2	2	4
4	7	4	4			
6	2	6	6		20	3
7	5	7	7	7	7	5
20	3	20	20		6	2

Parallel Devices

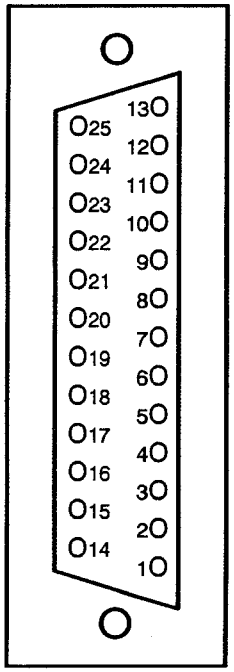
ROSE MS		PARALLEL PRINTER	PARALLEL PC
36 PIN CENTRONICS	25 PIN FEMALE	36 PIN CENTRONICS	25 PIN FEMALE
1 through 14	1 through 14	1 through 14	1 through 14
31	16	31	16
32	15	32	15
36	17	36	17
16,19-30,33	18-25	16,19-30,33	18-25

Use straight through cables or a standard PC parallel printer cable.

Appendix C Connector Pinouts

MSN and MSU Series Pinouts

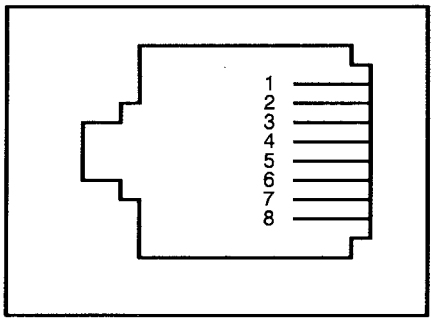
All views shown are from the rear of the unit facing the back panel



MSN and MSU Series Parallel Ports (25 Pin Female)

Pin	Signal	Signal Direction		Description
		Printer	Computer	
1	$\overline{\text{STB}}$	Output	Input	Active handshake signal
2	Data 0	Output	Input	Least 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	Most significant data bit
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 MSU Series, 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 MSU Series, must be low to receive if configured as computer. Low if configured as printer.
18-25	Ground	Common		Ground reference

Overscore on a signal indicates it is active low



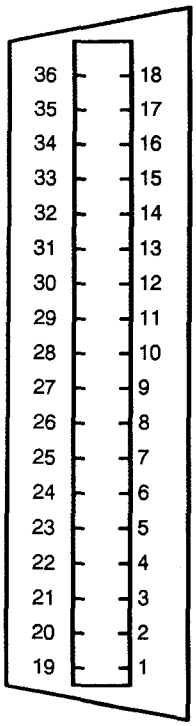
MSN and MSU Series Serial Ports (RJ45 8 Pin Female)

Pin	Signal Name	Acronym	I/O	Description
1	-12 Volts			DC power 10 ma max
2	Data set ready	DSR	Input	Transmit inhibit/carrier
3	Data term ready	DTR	Output	Low when buffer full
4	Transmit data	TXD	Output	Serial data from port
5	Signal ground	GND	Common	Ground reference
6	Receive data	RXD	Input	Serial data to port
7	+12 Volts			DC power 10 ma max
8	No connect			Not used

Pin 3 is the hardware flow control output.
Pin 2 is the hardware flow control input/carrier detect input.
Pin 2 has an internal pullup to set it high when no signal is connected

MS Series Pinouts

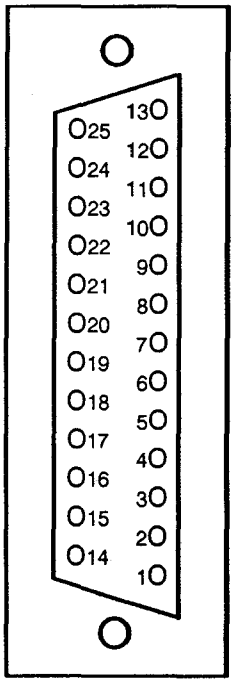
All views shown are from the rear of the unit facing the back panel



MS Series Parallel Ports (36 Pin Centronics Female)

Pin	Signal	Signal Direction		Description
		Printer	Computer	
1	$\overline{\text{STB}}$	Output	Input	Active handshake signal
2	Data 0	Output	Input	Least 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	$\overline{\text{Data 7}}$	Output	Input	Most significant data bit
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
31	$\overline{\text{INIT}}$	Output	Input	Pulsed low on power up if configured as printer.
32	$\overline{\text{ERROR}}$	Input	Output	High if configured as computer
36	$\overline{\text{SELIN}}$	Output	Input	Low if configured as printer.
16,19-30,33	Ground	Common		Ground reference

Overscore on a signal indicates it is active low



MS Series Serial Ports (25 Pin Female)

Pin	Signal Name	Acronym	I/O	Description
2	Transmit data	TXD	Output	Serial data from port
3	Receive data	RXD	Input	Serial data to port
4	Request to send	RTS	Output	High after diagnostics complete
6	Data set ready	DSR	Input	Transmit inhibit/carrier
7	Signal ground	GND	Common	Ground reference
20	Data term ready	DTR	Output	Low when buffer full

Pin 20 is the hardware flow control output.
Pin 6 is the hardware flow control /carrier detect input
Pin 6 has an internal pullup to set it high when no signal is connected.

Appendix D Command Summary

In the command syntax described below prefix indicates the currently programmed prefix. The + sign and spaces are used for descriptive purposes. For example to execute the configuration command with the default prefix you should send the five characters ! @ # $ C.

NOTE: The commands consist of ascii characters and non-ascii binary data bytes. Since the non-ascii characters are not printable, they will be shown in the examples as an underlined decimal number. All examples also use the default factory prefix.

SET DESTINATION TO PORT COMMAND

Syntax: PREFIX + ascii port number 0-8 *Example:* ! @ # $ 7

SET DESTINATION TO NULL COMMAND

Syntax: PREFIX + ascii character 9 *Example:* ! @ # $ 9

SET DESTINATION TO GROUP COMMAND

Syntax: PREFIX + ascii character A or B *Example:* ! @ # $ A

CONFIGURATION MENU

Syntax: PREFIX + ascii character C *Example:* ! @ # $ C

SET REMOTE DESTINATION COMMAND

Syntax: PREFIX + ascii character D + non-ascii port number 0-63 + non-ascii new destination port 0-63
Example: ! @ # $ D 1 2 sets destination of port 1 to port 2

FORMAT COMMAND

Syntax: PREFIX + ascii character F + nbbpwsc where
n is the port number to be changed; ascii port number 0-8 or M for my port
bb is the first two numbers of the baud rate

19=19200	96=9600	72=7200	48=4800	36=3600	24=2400
18=1800	12=1200	60=600	30=300	15=150	13=134
11=110	75=75	50=50			

p is the parity N=None E=Even O=Odd M=mark S=Space
w is the word length 8=8 bits 7=7 bits 6=6 bits 5=5 bits
s is the number of stop bits 1=1 bit 2=2 bits
c is the flow control type

D=DTR	X=XON/XOFF
F=Full duplex	H=Half duplex
P=Pulse DTR	p=Don't pulse DTR
R=Robust on	r=Robust off
T=XON transmit control on	t=XON transmit control off
L=Loopback mode on (MSN only)	l=Loopback mode off (MSN only)

, may be used in a field where it is not needed to change that parameter
Example: ! @ # $ F 8 1 2 E 7 1 X *port 8 set to 1200 baud, even parity, seven bits, 1 stop bit, and XON/XOFF*
Example: ! @ # $ F M , , , , , H *port sending command changes to half duplex; other parameters unchanged*

IDENTIFY MY PORT NUMBER

Input Syntax: PREFIX + 3 ascii characters I M E
Output response: single non-ascii byte port number from 0-63
Example input: ! @ # $ I M E *Example output:* 5 *indicates your port number is port five*

IDENTIFY DESTINATION

Input Syntax: PREFIX + 2 ascii characters I D + single non-ascii port number 0-63 or ascii M for my port

Output response: single non-ascii byte from 0-63, or ascii A or B or non-ascii byte value 127 for null
Example input: ! @ # $ I D M *Example output:* 8 *indicates your destination is port eight*

IDENTIFY ROM REVISION LEVEL

Input Syntax: PREFIX + 3 ascii characters I R E
Output response: two ascii characters representing revision level of ROM
Example input: ! @ # $ I R E *Example output:* 40 *indicates revision level 4.0 is installed*

IDENTIFY NAME OF PORT

Input Syntax: PREFIX + 2 ascii characters I N + non-ascii port number or ascii A or B (group) or M (my port)
Output response: 8 ascii characters (a name length less than 8 characters is padded with trailing spaces)
Example input: ! @ # $ I N 4 *Example output:* SAMUEL *indicates name of port four is SAMUEL*

IDENTIFY NUMBER OF PORTS INSTALLED

Input Syntax: PREFIX + 3 ascii characters I Q P
Output response: single non-ascii byte from 0-63 *MS,MSU highest port number, MSN total number of ports*
Example input: ! @ # $ I Q P *Example output:* 9 indicates there are 9 ports installed (MSN) else high port# is 9

IDENTIFY TYPE OF PORT

Input Syntax: PREFIX + 2 ascii characters I T + non-ascii port number 0-63 or ascii M for my port
Output response: non-ascii byte from 0-7 made up of three 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: ! @ # $ I T 7
Example output: 6 – *which means bit2 = 1, bit 1 = 1, bit0 = 0 and indicates port 7 is a half duplex modem*

IDENTIFY CONFIGURATION OF PORT

Input Syntax: PREFIX + 2 ascii characters I C + non-ascii port number 0-63 or ascii M for my port
Output response: single ascii character S for serial, P for parallel, X for empty
Example input: ! @ # $ 2 *Example output S indicates port two is a serial port*

JOB CONTROL MENU

Input Syntax: PREFIX + single ascii character J
Output response: Interactive job control menu entered

KILL (CANCEL) COMMAND

Input Syntax: PREFIX + three ascii characters KLL
Example: ! @ # $ K L L *commands last job to be canceled*

PORT CONNECT MENU

Syntax: PREFIX + ascii character M *Example:* ! @ # $ M

NET COMMAND

Syntax: PREFIX + ascii character N + non-ascii port number (0-63) *Example:* ! @ # $ N 3

PRINT CONFIGURATION COMMAND

Syntax: PREFIX + ascii character P *Example:* ! @ # $ P

STATUS COMMAND

Syntax: PREFIX + ascii character S *Example:* ! @ # $ S

TIMEOUT COMMAND

Syntax: PREFIX + ascii character T + ascii character n which can be either 0 1 2 or 3
if n = 0 then the timeout is disabled
if n = 1 then the timeout is enabled
if n = 2 then the minutes timeout is enabled and commands are ignored until timeout elapses
if n = 3 then the seconds timeout is enabled and commands are ignored until timeout elapses
Example: ! @ # $ T 0 *disable the timeout on my port*

VERIFY ECHO

Input Syntax: PREFIX + 3 ascii characters V E E + 1 byte of any value
Output response: complement of byte value
Example input: ! @ # $ V E E 55 *Example output:* 200 *echoes complement of input value*

VERIFY INPUT

Input Syntax: PREFIX + 2 ascii characters V I + 1 non-ascii port number 0-63 or M for my port + 0
Output response: single ascii character 0 for lo (negative voltage) or 1 for hi (positive voltage) on DSR
Example input: ! @ # $ V I 2 0 *Example output:* 1 *indicates DSR on port number two is high (positive voltage)*

VERIFY OUTPUT

Syntax: PREFIX + 2 ascii characters V O + 1 non-ascii byte which is port number 0-63 or M for my port + 0 for set to low (negative voltage) or 1 for set to high (positive voltage)
Example: ! @ # $ V O 4 0 *Commands port 4 DTR to go low (negative voltage)*

Commands Available on MSN Series Units Only

EXTENDED CONNECT COMMAND

Syntax: PREFIX + ascii character X + non-ascii port number 0-63
Example: ! @ # $ X 5 *sets my destination to port 5; same as sending command ! @ # $ 5*

LOAD INITIALIZATION STRING COMMAND (MSN SERIES ONLY)

Syntax: PREFIX + ascii character Z + from 0-63 byte init string + 0 (null)
Example: ! @ # $ Z Printout from SYSTEM 44 12 0 *set a banner page with form feed*

ASCII CONNECT COMMAND (MSN SERIES ONLY)

Syntax: PREFIX + ascii character = + three digit ASCII number including leading zeros
Example: ! @ # $ = 0 1 6 *connects to port 16*

Appendix E Factory Defaults

Upon receiving the Master Switch from the factory the following default settings are installed.

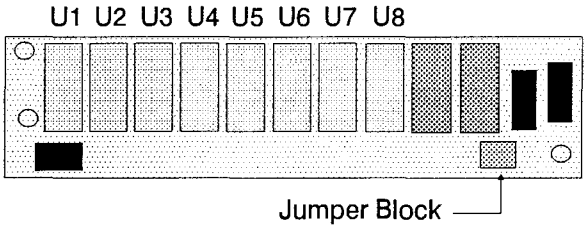
Timeout	20 seconds
Minutes timer	2 minutes
Prefix	!@#$
Type	Highest numbered port is printer, all others are computers
Name	PORTx where x is the port number (0-8)
Destination	Highest numbered port
Priority	Low
Timeout	On
Serial or Parallel (MSU Series only)	All ports serial
Protocol (MS, MSU Series)	Serial: 9600 baud, no parity, 8 bits, 1 stop bit, DTR flow, DTR pulse off computers full duplex, printer (highest numbered port) half duplex
Protocol (MSN Series)	Serial: 9600 baud, no parity, 8 bits, 1 stop bit, DTR flow, DTR pulse off computers half duplex
Type	Highest numbered port: printer, all others: computer
Form feed	Off
Initial string	None
Group A/B	Highest numbered port
Menu access	Highest numbered port

Appendix F 'X' Type Memory Expansion Board

This memory board provides optional, add-on buffer expansion for the Master Switch. Installing this board expands the Master Switch's buffer from the standard 64K to 256K, 512K, or 1 MB. "Stacking" two boards allows the buffer to be increased to 2 MB; four stacked boards will provide a full 4 MB. This board requires the use of 256K x 4 DRAM chips (standard 20-pin DIP type; the speed doesn't matter).

About the Board

This unit consists of a socketed printed circuit board, with spaces for eight DRAM chips. Two 20-pin extensions on the unit's bottom plug directly into the Master Switch's motherboard (where the two DRAM chips for the basic 64K buffer go) or may be plugged into another board for expansion. Two threaded metal spacers are included to secure the board to the motherboard, or to another expansion board.



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.

Installation

Opening the Master Switch

Unplug the Master Switch's power cord. Remove the two screws from either side of the unit, and remove the top cover.

Removing the Standard DRAMs

Remove the two socketed 64K DRAM chips from the Master Switch's motherboard. [They are numbered U13 and U14 on the board, and are positioned vertically near LEDs 7 and 8]. These will not be reused.

Setting the Jumper Block

For each board you're using, position the jumper block's small wire jumper.

- If using only one board, it should be in Position 1 (far left).
- For two boards, the second (top) board's jumper should be at Position 2 (second from left).
- If four boards are to be installed, move the third board's jumper to Position 3 (second from right) and the fourth (top) board's jumper to Position 4 (far right).

Installing Jack Screws on the Motherboard

If your Master Switch does not have threaded spacers (jack screws) on the motherboard, you will have to install them. Rose Electronics can supply you with the appropriate jack screws. Begin by removing the three screws from the lower rear of the Master Switch. Remove any screws from the bottom of the cabinet, noting where they came from. The motherboard and back panel will now separate from the front/bottom cabinet. You may now install the jack screws onto the motherboard, using the memory board as a guide as to which holes to use. Be careful not to use metallic washers of a size such that they short together circuits on the motherboard. Reassemble the motherboard/back panel by reversing the steps taken to remove it.

Installing the Board

Carefully plug the expansion pins of the board (the first board, if using two or four) onto the motherboard's sockets where the 64K chips were removed. Fasten the board down using the two threaded spacers. Screw them into the motherboard's existing spacers (after removing two small Philips-head screws that may be in place]. The spacers should be finger-tight. If using two or four boards, stack them by plugging the expansion pins of one into the expansion sockets of another. Be sure the jumpers are correct. Screw and tighten the spacers for each board.

Finishing Up

Replace the top cover and re-fasten the outside screws. Plug the power cord back in and turn the switch "On". Your Master Switch will now use the full amount of buffer you have installed.

Adding Chips to an Empty Board or Adding Additional Chips

A board can be upgraded from 256K to 512K, from 256K to 1MB, or from 512K to 1MB. To obtain 2MB or 4MB memory additional boards must be installed.

The sockets are numbered 1 thru 8 from left to right. Pin 1 of each socket is at top left; match this with Pin 1 of the chip itself, located to the left of a small indentation at the top end of the chip.

The memory chips are very sensitive to static electricity. Avoid touching their pins. Use an anti-static bag or work pad and/or wrist grounding strap when handling the chips.

- For a 256K buffer, chips must be installed in sockets U1 and U5.
- For a 512K buffer, chips must be installed in sockets U1, U2, U5, and U6.
- For a full 1 MB, chips must be installed in all eight sockets.
- If more than one board is used all sockets on each board must be filled.

Verification of Installation

As usual, when the switch is powered on, it will perform four self-tests including a buffer check (Test #2). If the self-test locates a DRAM problem, the LED display will show an error status on its LEDs. This display not only indicates a particular board but a particular chip or part of a chip that is defective. See the 'Diagnostics' section for more information.

Appendix H General Specifications

Serial ports:

Electrical: RS232 -9 to +9 volts
Protocol: Asynchronous DTR/DSR, XON/XOFF
Baud rate: 50-19200 baud (and 115,200 baud for MSN Series)
Word length: 5, 6, 7, or 8; Stop bits: 1 or 2
Parity: odd, even, mark, space, or none

Parallel ports:

Electrical: TTL levels; Protocol: Centronics compatible STB/ACK/BUSY interface

Size:

10.5" wide X 3.5" high X 5.0" deep

Chassis :

Painted tan aluminum or steel enclosure, rear mounted connectors
Optional rack mount: Black anodized 5.25" X 19", 3 lbs.

Weight:

2-5 ports: 6 lbs, 9 ports: 7 lbs, 13-17 ports: 8 lbs

Power(MS,MSU series units):

110 volts AC in; 16-20VAC CT, 10 VA out; external wall mount adapter (standard)
220 volts AC in; 16-20VAC CT, 10 VA out; external floor mount adapter (optional)
110 volts AC in; 16-20VAC CT, 10 VA out; external floor mount adapter (optional)

Power (MSN series units):

110 volts AC 20 W in; 16-20VAC CT, external wall mount adapter (standard)
220 volts AC 20 W in; 16-20VAC CT, external floor mount adapter (optional)
110 volts AC 20 W in; 16-20VAC CT, external floor mount adapter (optional)

Display:

Port select LEDS: 0-8; Status LEDs: Power, Buffer, Data, Busy

Environment:

0 to 70 degrees C., 0 to 95% relative humidity

Connectors – MS Series

Serial: DB25 female, Parallel: Centronics 36 female

Connectors – MSU, MSN Series

Serial: RJ45 female, Parallel: DB25 female

Signal lines used:

Serial: 4 signals switched (XMIT, RCV, DSR, DTR)
Parallel: 12 signals switched or used as inputs, 5 signals steady or unused

Setup configuration:

Stored in non-volatile memory

Warranty:

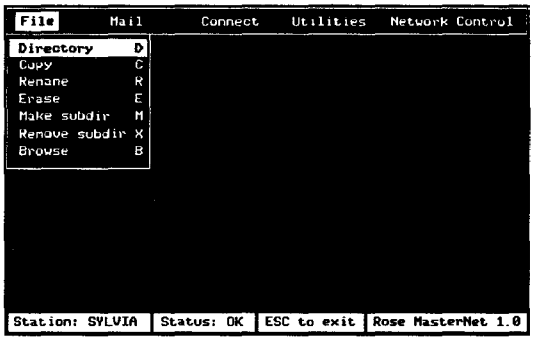
1 year parts and labor
Extended warranty available

DON'T FORGET ABOUT...

MasterNet NETWORKING SOFTWARE

DESCRIPTION

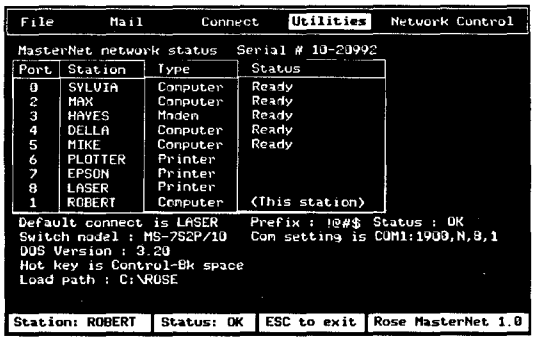
MasterNet™ is a networking program that allows PCs to share one another's disk through directory and file operations. Remote directories may be viewed and files transferred without any user intervention. Full electronic mail features are supported. The program is memory resident and allows instant access to any computer's disk via a screen oriented window. The software is designed to operate on a peer to peer basis via peripheral sharing units such as the Rose Electronics' Master Switch.



MasterNet's main screen.

FEATURES

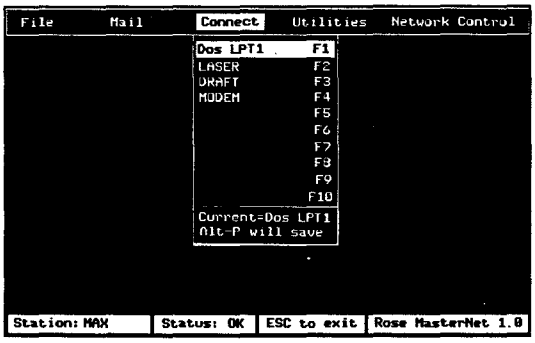
Uses standard serial ports on your PCs
Can be run from DOS command line, batch files, or pop-up
Screen oriented window pops up anytime from hot key
Does not interfere with other applications
File and mail operations run without user intervention
Tie in remote locations with a modem
Operate on any drive on any computer in the network
Examine, create and remove directories
Create, delete, and copy files
Directory and file access security
Compose messages with mail editor
Send messages or file with time and date stamp
Mail chime signals mail has been received
Modem, network printer, and local printer sharing
Job control menu for cancel, hold, and release, of jobs
Terminal emulator utility
Monochrome or color operation
Programmable hot key
Not copy protected



From the MasterNet status screen, you can view the state of the entire network.

APPLICATIONS

Office networking	CAD/CAM	Micro to mainframe
Desktop publishing	Printer sharing	Telecommunications
Campus networking	Factory networking	



This screen connects you to any peripheral device on the network.

ORDERING INFORMATION

SW-MN5/4 MasterNet™ software on 5.25" disk, 4 copies $99
SW-MN3/4 MasterNet™ software on 3.50" disk, 4 copies $99
One copy of MasterNet™ required for each computer

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