SERI

Installation and Programming Manual

This Manual describes the SERI SY/MAX Ethernet Rack Master, its uses and set up. It also describes the use of the SERI configuration software.

Effective: 23 September, 2008

NR&D
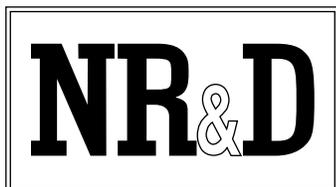
Niobrara Research & Development Corporation
P.O. Box 3418   Joplin, MO 64803 USA

Telephone: (800) 235-6723 or (417) 624-8918
Facsimile: (417) 624-8920
Internet: http://www.niobrara.com

Contents

6 Setup Examples

7 Connector Pinouts

8 Recommended Cabling

9 Sy/Max Module Hardware Description

Figures

Tables

1

Introduction

The Niobrara SERI is a SY/MAX® compatible Ethernet communications module that acts as a remote interface to allow another PLC or SCADA to remotely control SY/MAX I/O via Modbus/TCP. The SERI replaces the SY/MAX CPU (PLC) or Remote Interface (RI) Module in slot 1 of a Class 8030 Type RRK100, 200, or 300 register rack and Class 8030 Type HRK100, 150, or 200 digital rack. See Module Specifications below for the current list of tested I/O modules.

The SERI's powerful data mapper presents both the I/O data and SY/MAX status values to the client as Modbus Holding Registers (4x) to allow operation with the standard Ethernet I/O Scanner in a Modicon Quantum, Premium, M340, Compact, or Momentum PLC. The mapper allows up to 50 entries that associate blocks of Inputs or Outputs to the Modbus registers. Each entry consists of the starting Modbus register number (1-10000), the starting register in the module (1-2048), the count of 16-bit words (1-2048), the direction of operation (Read or Write), and the slot number (1-16 for Register slots and 17-32 for Digital slots). Careful configuration of the mapper will allow the user to logically group all of the Inputs together as well as the Outputs to minimize the number of Modbus/TCP messages required for system control.

A keyswitch is provided to manually halt the local rack or place the unit in memory protected run. While not in memory protected run, the system may be halted, placed into run, or the outputs disabled by adjusting a control register through the LAN or serial port.

The SERI requires the Modbus/TCP client that is allowed to control the system have its IP Address included in a table of four possible entries. A watchdog timer requires the Modbus/TCP client to send writes periodically or the Outputs will be reverted to their default values.

Communication with the LAN is through a standard 10BaseT Cat5 Ethernet port. A standard SY/MAX pinout RS-422 port is also included for ease of configuration and troubleshooting. Configuration of the SERI is accomplished through a built-in web server or the included SERISW32 PC software. The configuration is stored in Flash memory for non-volatile long-term storage.

Specifications

Module Specifications

Mounting Requirements

Register Slot 1 (CPU Slot) of a Square D Class 8030 Type RRK-100, RRK-200, RRK-300, HRK-100, HRK-150, or HRK-200 I/O Rack.

Compatible SY/MAX I/O Modules

Discrete = HIM-101, HOM-221, RIM-101, RIM-331, RIM-731, ROM-221, ROM-271, RDO-732

Intelligent = RIM-121, RIM-125, RIM-126, RIM-131, RIM-144, ROM-121, ROM-122, ROM-141, RAO-208

Niobrara Modules = EPE5, MEB, AIM4, SPE4, IBSM, IBSS, RM14K

Current Draw on SY/MAX power supply

1100 mA

Operating Temperature

0 to 60 degrees C operating. -40 to 80 degrees C storage.

Humidity Rating

up to 90% noncondensing

Pressure Altitude

-200 to +10,000 feet MSL

Ethernet Communication Port

10BaseT RJ45

SY/MAX Communication Port

9 pin female D-connector, RS-422 compatible. Fixed at 9600 baud, 8 data bits, 1 stop bit, EVEN parity. Protocols supported are Modbus RTU and SY/MAX.

Indicator lights

14 LEDs: Green Power, Green Run, Yellow Program, Red Memory, Red Outputs Disabled, Red I/O Error, Red Configuration Error, Red Ethernet Error, Green Ethernet Link, Yellow Ethernet Collisions, Yellow Ethernet TX and RX, Yellow Serial TX and RX.

Physical Dimensions

Single width module.
Wt: 2.5 lb.
W: 1.5 in.
H: 12.8 in.
D: 6.6 in.
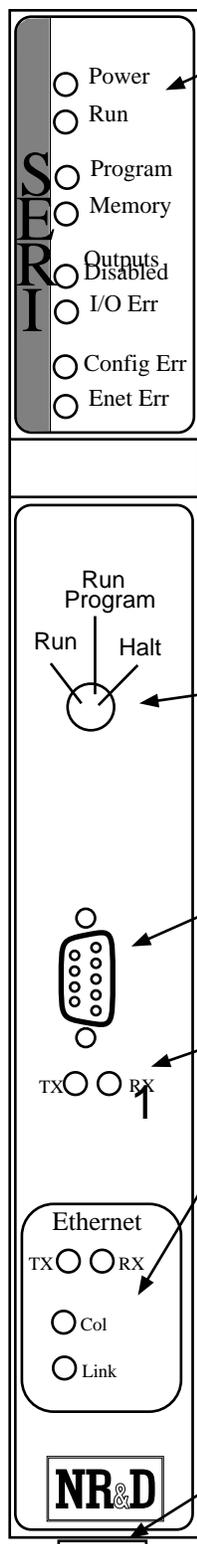
Indicator Lights

Power (Green) - Lights when module is powered.

RUN (Green) - On Solid when SERI controlled by Ethernet client. Flashing when in RUN but no client master connected. Off when in HALT.

Program (Yellow) - On when keyswitch in RUN/Program or Halt. Off when in memory protected RUN.

Memory (Red) - On when RAM does not match Flash or memory corrupt.

Outputs Disabled (Red) - On when outputs are disabled.

I/O Err (Red) - On when a module is reporting a bus fault.

Config Err (Red) - On when mapping error

Enet Err (Red) - On when Ethernet error happens

Keyswitch

The three position keyswitch can force the SY/MAX rack to Halt or memory protected Run.

COMM Port

RS-422 serial port Modbus/RTU and SY/MAX protocols. Also used for firmware upgrades.

Communication Indicators (LEDs)

TX (Yellow) - Lights when data is being transmitted from COMM or Ethernet port.

RX (Yellow) - Lights when data is being received at COMM or Ethernet port.

Col (Yellow) - Lights on Ethernet collision

Link (Green) - Lights when Ethernet link is good.

Ethernet Port

10BaseT connector on the bottom of the module.

Figure 1-1   SERI Front Panel

2
Installation

Warning

Do NOT install or remove the SERI with power applied to the Rack. Turn OFF power at the power supply. SY/MAX racks are not Hot Swappable. Damage to the equipment may occur if the power is on during installation.

Module Installation

1   Remove power from the rack.

2   Mount the SERI in Register Slot 1 (CPU slot) in the rack. (See Figures 2-4 and 2-5 for supported RRK and HRK racks.) Secure the screw at the bottom of the module.

3   Apply power to the rack. The green power light should illuminate and remain lit.

4   The SERI will default to the settings held in non-volatile Flash. Factory default settings are:

a.   Ethernet Port: Modbus/TCP,
IP Address = 10.10.10.10
Subnet Mask = 255.0.0.0
BOOTP/DHCP = OFF
Modbus Index = 255

b.   Serial Port: Dual Slave (Modbus/RTU and SY/MAX)
9600 baud
Even parity
8 data bits

1 stop bit
Modbus Slave = 255

SERISW Software Installation

The CD that is included with the SERI includes the SERISW32 software. Insert the CD into the CD ROM drive of the PC and select the SERI from the install programs and manuals feature.

NOTE: The absolute latest version of SERISW and the SERI firmware may be downloaded from www.niobrara.com.

Default IP Address for the SERI

The SERI defaults to an IP Address of 10.10.10.10 and a subnet mask of 255.0.0.0. BootP and DHCP are disabled by default. To connect to the default SERI via Ethernet, set the IP Address of the PC to a similar IP Address of the SERI (such as 10.10.10.11 with a subnet mask of 255.0.0.0) and enter the URL 10.10.10.10 in a standard web browser.

Serial Connection to the SERI

A physical connection from the personal computer to the SERI may be used with the SERISW32 program to configure the SERI. Usually an RS-232 to RS-422 converter is required for this connection and the Niobrara SC902 smart cable is recommended. The RS-422 port of the SERI provides 5VDC power for the SC902 cable so the external power supply is not required.

Firmware Upgrade

Downloading new firmware to the SERI is accomplished with the FWLOAD utility via the RS-422 serial port. To load new firmware into the SERI, perform the following steps:

1 Remove power from the register rack.

2 Remove the SERI from the register rack.

3 Locate the Load/Normal toggle switch on the top of the SERI. (See Figure 2-1) Move this switch to the LOAD position. Install the SERI back into the register rack.

4 Apply power to the rack. The SERI should perform its startup sequence and display the program and memory LEDs.

5 Connect the personal computer to the COMM port of the SERI. An SC902 cable provides a convenient method for the RS-232<>RS-422 conversion.
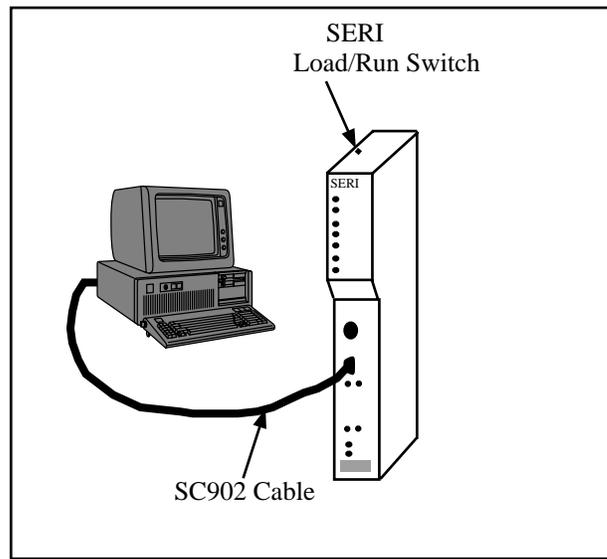
Figure 2-1   SERI Firmware Download

6   From the start menu of the computer select "Start, Programs, Niobrara, SERI, Download SERI Firmware". Fwload will start with the File to load c:\Niobrara\Firmware\seri.fwl selected. (See Figure 2-2)

7   Select the appropriate serial port on the personal computer, then press Start Download.

8   Wait for the firmware download to be completed. A message indicating completion will be displayed on the personal computer.

9   After the completion of the download, remove power from the register rack.

10 Remove the SERI from the rack.

11 Change the LOAD/NORMAL switch back to NORMAL.

12 Install the SERI back into the register rack.

13 Connect power back to the register rack.

Figure 2-2   SERI Firmware Download

Backplane CPLD Upgrade

The backplane interface of the SERI is controlled by a complex programmable logic device (CPLD). It may become necessary in the future to upgrade the program in the CPLD. This is also done using the FWLOAD program. Follow the above instructions for loading the module firmware, except use the file c:\Niobrara\Firmware\srmbackplanexilinx.fwl, as shown in Figure 2-3.
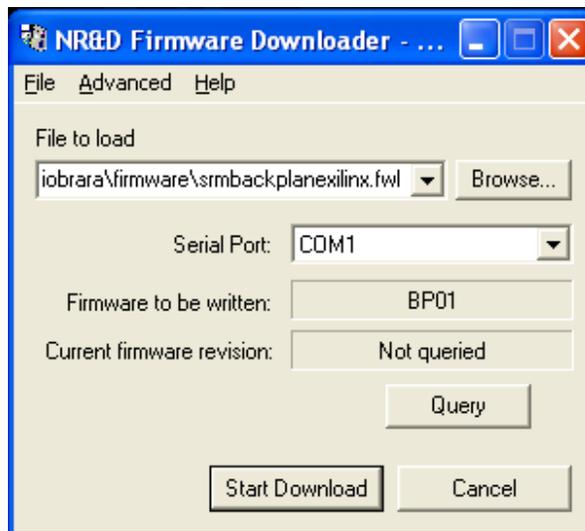
Figure 2-3   SERI CPLD Program Download
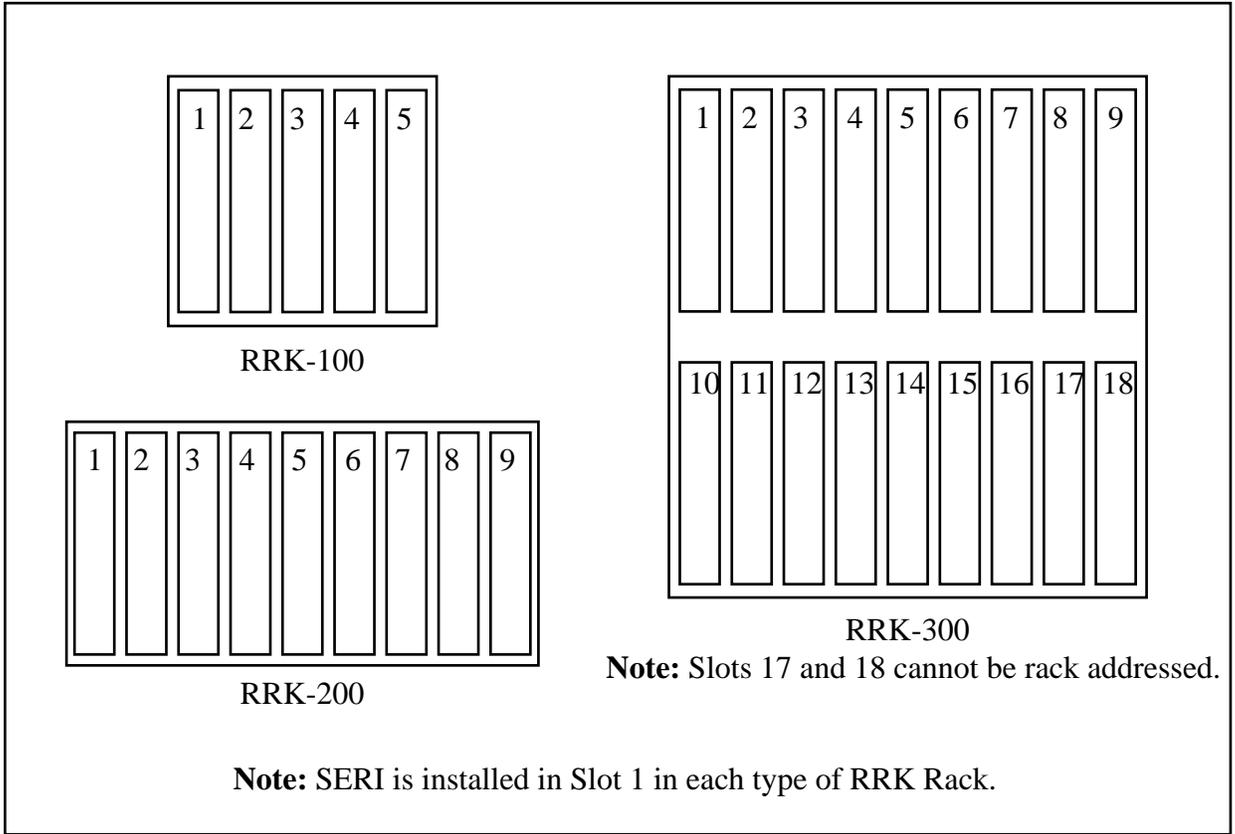
Figure 2-4   RRK Register Racks
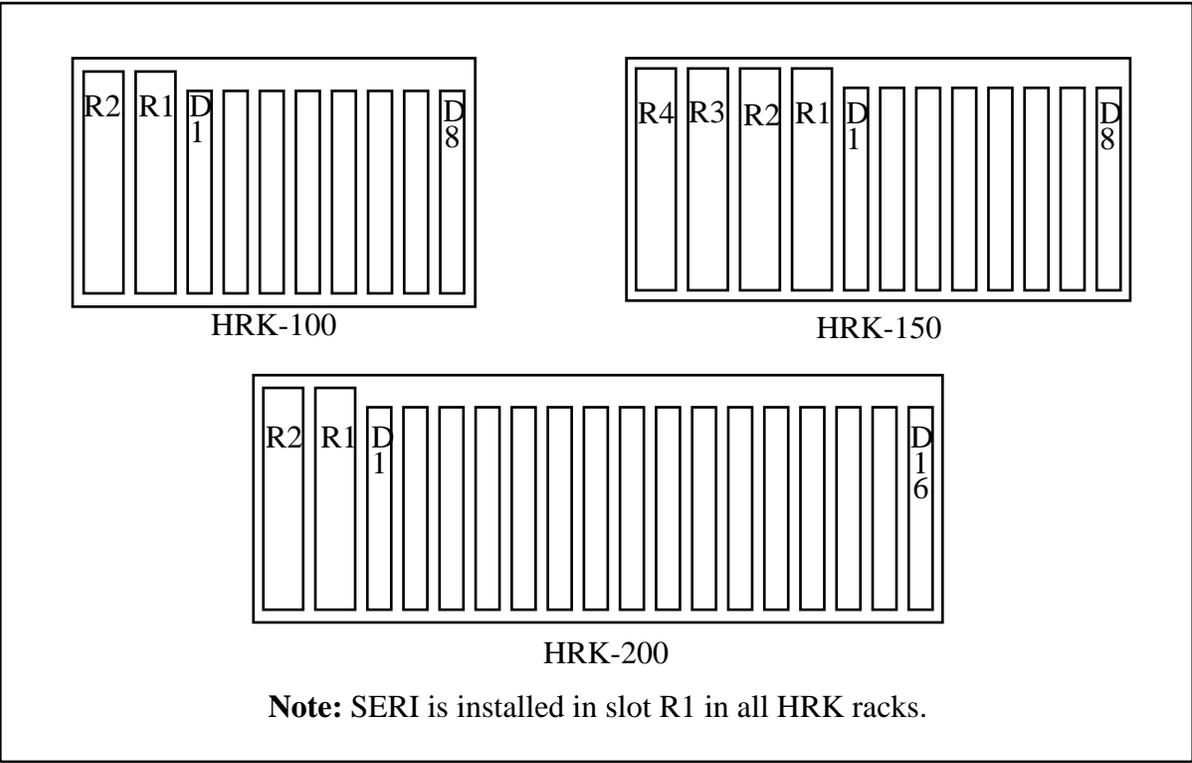
Figure 2-5 HRK Racks

3
Operation

Mapper Overview

The SERI mapper allows up to 50 entries that associate blocks of Inputs or Outputs to a Modbus image table. Each entry consists of the starting Modbus register number (1-10000), the starting register in the module (1-2048), the count of 16-bit words (1-2048), the direction of operation (Read or Write), and the slot number (1-16 for Register slots and 17-32 for Digital slots).

The SERI uses two copies of the Modbus image table while controlling its local rack. One image is used by the internal rack scanner and is updated by reading the Inputs and Status from the rack and provides the data for writing to the Outputs. The other image is used by the internal data server for Modbus operations by the Ethernet and serial port. When the rack scanner is finished updating the rack it swaps images with the data server. Changes to the data server image are not allowed during the image swap. Access to this image table is done by selecting Modbus/TCP Slave Address 0 or 1.

Table 3-1   SERI Modbus Registers for Index 0 and 1

Holding Register Range	Read/ Write	Function	Notes
1..10000	R/W	I/O Mapped data	
10001..20000	R Only	SY/MAX Status of registers 1-10000	
20001...30000	R Only	MSB - Rack Slot Number of 1-10000 LSB - Error flag or registers 1-10000	1-16 is Register Slot 17-32 is Digital Slot 1-16 Error bit 1 means write to a read-only
30001...40000	R/W	Default output states of 1-10000	

Registers 1 through 10000 are the Modbus registers for the SY/MAX mapped I/O. The Modbus/TCP controlling master will read and write these registers to control the I/O. The SERI must receive a write message within the watchdog timeout setting, or the Outputs will revert to the default values.

Registers 10001 through 20000 contain the SY/MAX status data for each of the mapped registers in the first 10000 words. Bits in the status data indicate module type and sometimes information about overflow, blown fuses, overrange, etc. It may be useful for the controlling Modbus/TCP master to poll this data periodically, perhaps at a slower rate than the I/O.

Registers 20001 through 30000 contain the slot number for the appropriate Modbus register and any SERI error conditions for that register. For example if register 20005 has a value of 0A01 (hex) then the SY/MAX register in slot 10 (0A hex) mapped to Modbus register 5 is a read-only Input register but this map entry is trying to write to it.

The default values in registers 30001 through 40000 are valid only for map entries that write Outputs. The value stored here is written to the Output whenever the SERI is halted or running without an active master. For example if register 30021 has a decimal value of 123 then the SY/MAX Output mapped to Modbus register 21 will be set to 123 every time the SERI is halted.

Mapper Configuration

The SERI's internal configuration memory is represented as Modbus Holding Registers accessed through Modbus Slave Address 255. A list of available registers is shown in Table 3-3.

Map Entries

Registers 1 through 200 are the 50 possible map entries.

Table 3-2 gives an example of three entries in the mapper for a Spectrum Controls 8000 RAO-208 Analog output module. This 8 channel module has 20 registers with the first 11 registers outputs, register 12 is an input and then registers 13 through 20 are outputs. These mapper entries will group all of the outputs together into Modbus Holding Registers 101 through 119 and the input will be placed in register 120. The analog card is located in register slot 3.

Table 3-2   Mapper Example for RAO-208 module

SERI Register	Description	Example Data	Example Description
1	Modbus Image Reg Number	101	Modbus reg 101
2	Module Register Number	1	Module reg 1
3	Register Count	11	11 words
4	Direction/Slot number	0003 (hex)	Output in slot 3
5	Modbus Image Reg Number	112	Modbus reg 112
6	Module Register Number	13	Module reg 13
7	Register Count	8	8 words
8	Direction/Slot number	0003 (hex)	Output in slot 3
9	Modbus Image Reg Number	120	Modbus reg 120
10	Module Register Number	12	Module reg 12
11	Register Count	1	1 word
12	Direction/Slot number	0103 (hex)	Read in Slot 3

Table 3-3   SERI Configuration Register List (Index 255)

Register Range	Read/ Write	Function

1..200	R/W	Mapper (50 Entries of 4 words each)
		word 0 - Modbus Register (1-10000)
		word 1 - Module Backplane Register (1-2048)
		word 2 - Register Count (1-2048)
		word 3 - MSB -> Direction
		        - value of 0 indicates write
		        - value of 1 indicates read
		    LSB - > Slot Number (1-32)

1001	R/W	Control Register bit 1 = Halt bit 2 = Disable Outputs **NOTE:** It is recommended to only write this register when a change of state is desired. Continuous writing may cause a dramatic increase in the scan time of the SERI.
1011	R	Status Register bit 1 = Halted bit 2 = Outputs Disabled bit 3 = Running bit 4 = Memory Error (write to a read only register) bit 7 = Key in halt position bit 9 = Key in run position bit 11 = Power Supply battery is low
1012	R	Scan time in ms
1013-1014	R	IP Address of current master. Packed MSW, LSW.
1015	R	"Checksum" of status of first words in rack (changes if modules change)
1021-1036	R	First status word of register slots 1-16
1053-1054	R	Checksum of configuration
1055	R	Configuration mismatches Flash 1=mismatch
2049-2092	R/W	Statistics for Ethernet and port 1
2900-2901	R/W	IP Address of SERI
2902-2903	R/W	Default Gateway
2904-2905	R/W	Subnet Mask
2997	R/W	TCP Backstep
2998	R/W	TCP Downstream Timeout
2999	R/Q	TCP Quiet Timeout
3000-3001	R/W	IPAddress of Allowed Master 0 (Packed MSW, LSW)
3002-3003	R/W	IPAddress of Allowed Master 1
3004-3005	R/W	IPAddress of Allowed Master 2
3006-3007	R/W	IPAddress of Allowed Master 3
3008-3009	R/W	Watchdog timeout in ms (unsigned integer MSW, LSW)
3010	R/W	Rack Type 0=None, 1=HRK100, 4=RRK100, 2=HRK150, 5=RRK200, 3=HRK200, 6=RRK300
3011-3021	R/W	Password for web server null-terminated string
10001-20000	R	Copy of same registers in index 0 and 1 (SY/MAX Status words)
20001-30000	R	Copy of same registers in index 0 and 1 (Slot number/Error)
30001-40000	R/W	Copy of same registers in index 0 and 1 (Default Outputs)

NOTE: It is recommended that register 1001, the Control Register, only be written when a change of state is desired. Continuous writes may cause a dramatic increase in the scan time of the SERI.

The above example with the RAO-208 analog module may be further expanded by setting the default values in registers 9 and 10 to the hex values 2103 and 4152 which set channel 1 to 0-5Vdc, channel 2 to 4-20ma, channel 3 to 0-10Vdc, channel 4 to +/-5Vdc, channel 5 to 0-5Vdc, channel 6 to 1-5Vdc, channel 7 to 0-10Vdc, and channel 8 to +/-5Vdc. To force these default values, simply set registers 30109 to hex 2103 and 30110 to hex 4152.

4
Web Server

The SERI includes a built-in web server for configuration and troubleshooting. Simply direct a web browser to the IP Address of the SERI. The opening page should look something like Figure 4-1.

Main Web Page

The Main page shows the firmware revision of the SERI, the position of the keyswitch, the status of the front panel LEDs, the IP Address of the current master, and a simple table showing the SY/MAX status of the first register of each module in the rack. Links for the Configuration and Statistics pages are presented in a menu on the left side of the page.

Figure 4-1   SERI Web Server Main Page

Configuration Pages
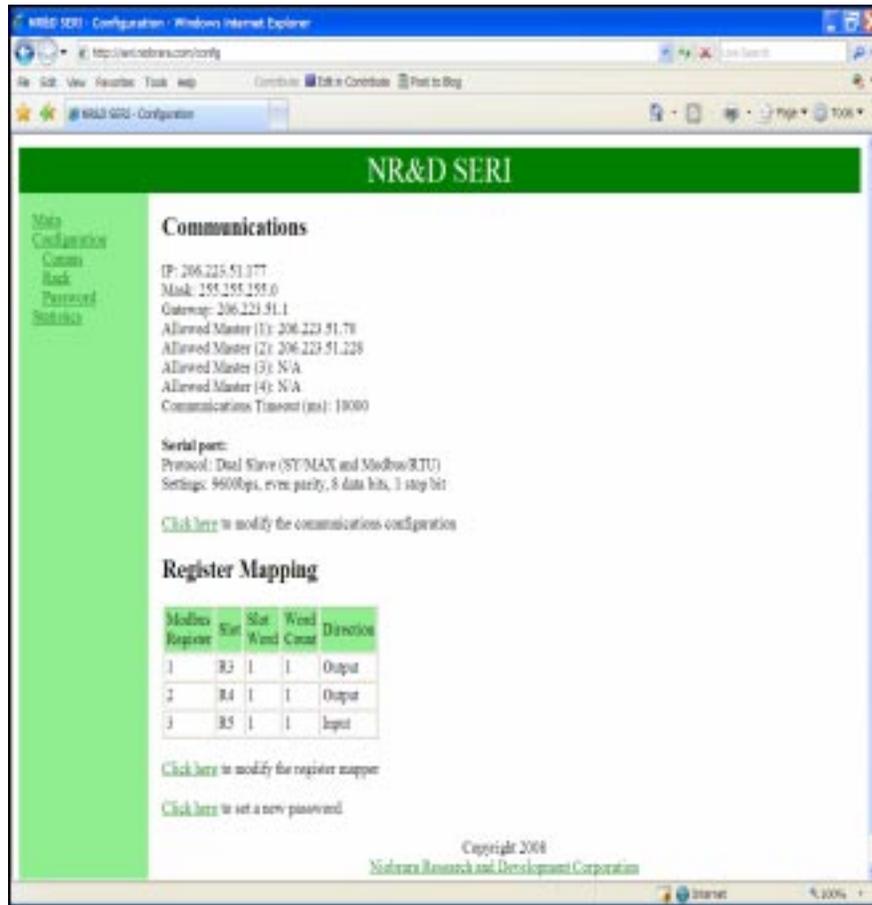
Figure 4-2   SERI Web Server Configuration Page

The Configuration page displays the communications setting for the Ethernet and se-
rial ports as well as the current register map. Any changes to the setup will display a
message in the bottom, center of the screen in red letters "Current setup is NOT saved
to flash!" and "Click to commit changes to flash". Links to change the Communica-
tions settings, the type of Rack, and the Password are provided in the menu on the left
side of the page as well as "Click here" links within the page.

Figure 4-3   SERI Web Server Password Request Page

Selecting the Configuration link will prompt for a user name and password. The user-
name does not matter and may be left blank. The default password is "master" and is
case sensitive.

Comms Configuration Page

Figure 4-4   SERI Web Server Comms Configuration Page

The Comms page allows the IP Address, Subnet Mask, Default Gate, the Allowed Masters, and the Timeout to be configured. Set the IP Address, Subnet Mask, and Default Gate to the local network. The Allowed Masters are the IP Addresses of the devices which will be allowed to control the rack. The SERI may receive commands from up to four Modbus/TCP masters. Any master not configured in this table will be allowed to read the registers in the SERI, but will not be allowed to write the Outputs.

Rack Configuration Page

Figure 4-5   SERI Web Server Rack Configuration Page

The Rack Configuration page shows the existing devices in the rack, allows the type
of rack to be changed, entries to be added into the rack, and mapper entries to be
added.

Figure 4-6   SERI Web Server Change Rack Configuration Page

Use the drop down list to select the rack in which the SERI will be placed. Press the Update button when finished.

Figure 4-7   SERI Web Server Add Rack Entry Page

Add Rack Entry Page allows the setup the physical cards in the rack. The Modbus Register is the starting Modbus register in the SERI. The Slot is the physical slot the card occupies in the rack. Slot Word is the number of words the data is in length. Example the Sy/Max ROM221 contains 16 optically isolated 120VAC outputs, so would require only one word. Word Count is the number of words needed for all the data from the card. The example from above would require only one word. The Direction is either input or output. The above example would be an output.
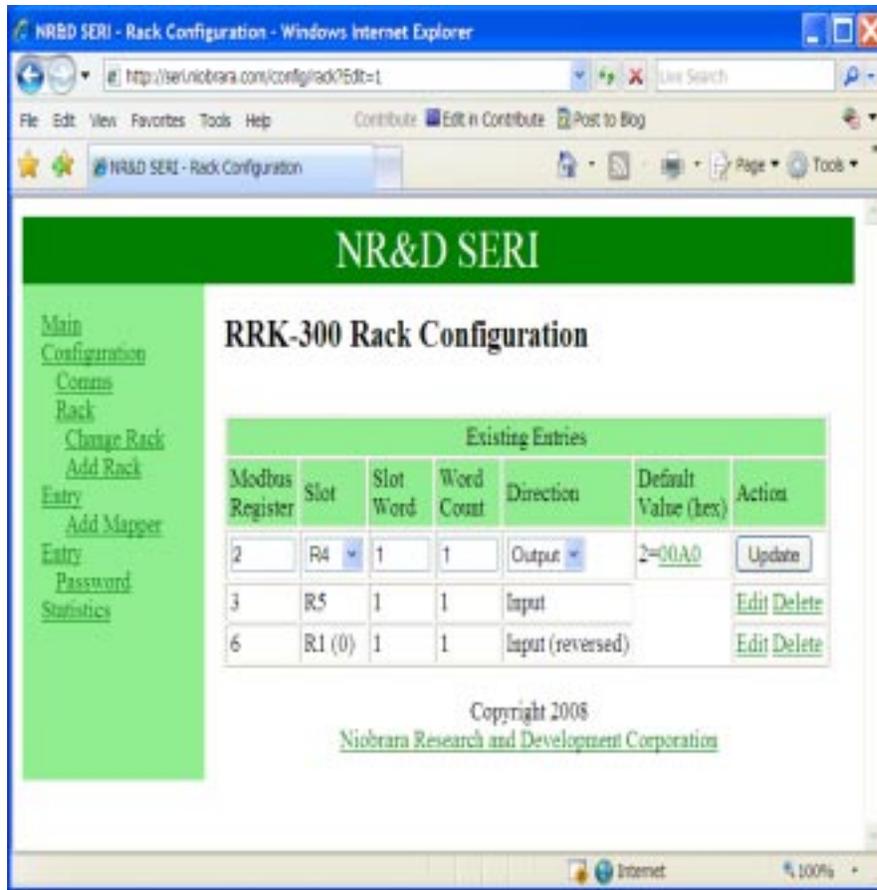
Figure 4-8   SERI Web Server Rack Configuration Edit Page

Entries may be Edited or Deleted by selecting the appropriate link in the Action column. Deleting an entry will remove the entry from the table. Editing an entry will bring up a page which allows the editing of the Modbus Register, Slot, Slot Word, Word Count, Direction, and the Default value of that entry see Figure 4-8. When editing is complete click the Update button.
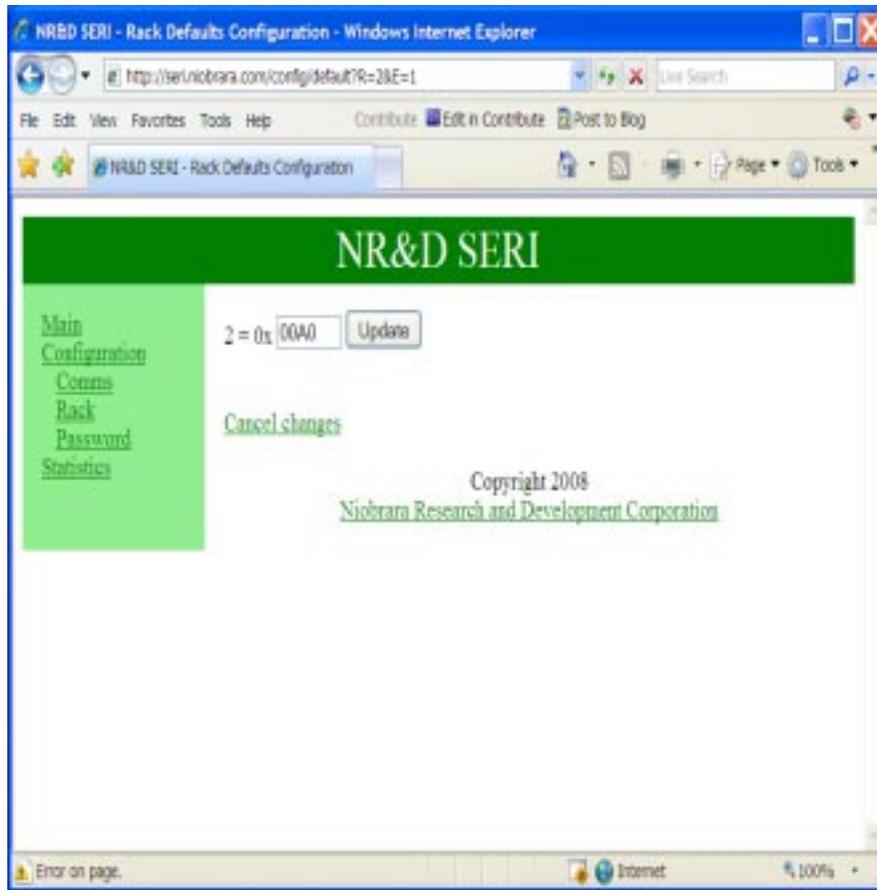
Figure 4-9   SERI Web Server Rack Configuration Edit Value Page

Editing the Default value for the register will bring up a page like the one shown in Figure 4-9. When editing is complete click the Update button.

Figure 4-10   SERI Web Server Add Mapper Entry Page

The Add Mapper Entry page allows the changing or editing of the mapper entries. The Modbus Register is the register in the SERI where the data will be mapped. The Source can be R1 Drop 0 or R1 Drop 255. The Source Address is the starting address of the data. Word Count is the words needed to contain the data. Direction is input, output, input reversed, output reversed.

Change Password Page

Figure 4-11   SERI Web Server Change Password Page

Change Password page allow users to set their own password. Passwords can be up to twenty characters or numbers in length. Passwords are also case sensitive so upper case and lower case characters are different.

Statistics Page

Figure 4-12   SERI Web Server Statistics Page

The Statistics Page shows the statistics about the Module, Backplane, Ethernet, and Serial port. This is a freeze frame look at the statistics. Refresh this screen using the F5 key or the Reload button in the browser to see changing statistics.

5
Configuration Software SERISW32

The SERISW32.EXE software program is provided free of charge to SERI users. This software is used to help configure the operation of the SERI.

Data Entry Keys

Whenever data entry is allowed by the program, certain keys can be used to facilitate data entry. They are:

BACKSPACE	Move cursor left and remove character there
LEFT ARROW	Move cursor to the left one character
RIGHT ARROW	Move cursor to the right one character
DEL	Remove the character under the cursor
INS	Change between insert and overstrike modes of entry
HOME	Move cursor to the left edge of the field
END	Move cursor to the end of the data
Control-F	Move cursor right (Forward) one word
Control-R	Move cursor left (Reverse) one word
Control-D	Delete from the cursor to the end of the field
Control-U	Delete from cursor to the beginning of the field
Control-Y	Delete all characters in the field
ESC	Exit the field without modifying it
ENTER	Accept the contents of the field

When a field is opened for input, the cursor is positioned at the left side of the field. If data is already present in the field, typing any character other than those listed above will cause the field to be blanked allowing entry of new data without first deleting the

old. If it is desired to retain the previous data for editing, make sure the first key you type is an editing key such as a left or right arrow.

Main Menu

The startup screen of SERISW is shown in Figure 5-1. The operational modes are selected by the highlighted menu bar on the fourth line. Selection can be made by moving the cursor to the desired option using the arrow keys and pressing **ENTER**. A short cut is provided: simply type "**N**" for oNline, "**F**" for oFfline, "**U**" for Utility, "**S**" for setup or "**Q**" to quit.
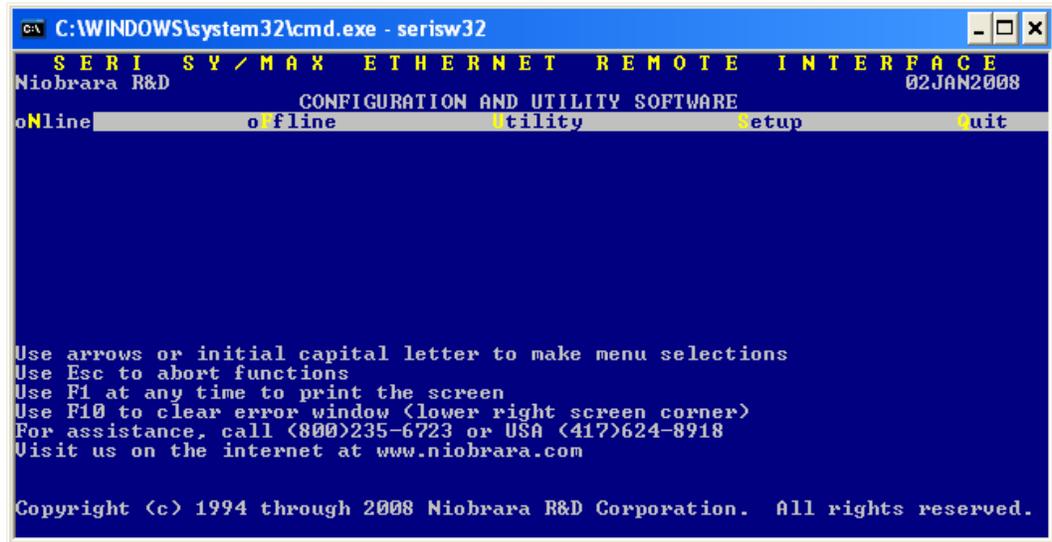
Figure 5-1   Main Menu Screen

oNline

The oNline selection provides a sub-menu for dynamically editing the parameters in the module.

Edit Configuration

Upon selection of Edit, SERISW attempts to connect to the SERI using the Setup parameters defined in the Serial Setup menu. For oNline Edit to function properly, all setup parameters must be correct for the equipment used including the connection type, IP Address, Index, baud rate, parity, checksum, etc. For more information on the Serial Setup parameters see page 44.

Once SERISW has been able to connect to an SERI, the screen should look something like Figure 5-2. The TX and RX lights over the RS-422 port or Ethernet port will be flashing, and the small line in the upper right corner of the screen should be spinning. While oNline, SERISW is continuously polling the SERI and displaying the parameters on the screen. If any parameters are changed, the effect will be immediate and the module will react according to the change. It is important to realize this, as changes made to parameters such as the mode, parity, baud rate, etc. may result in the loss of communication to the SERI.
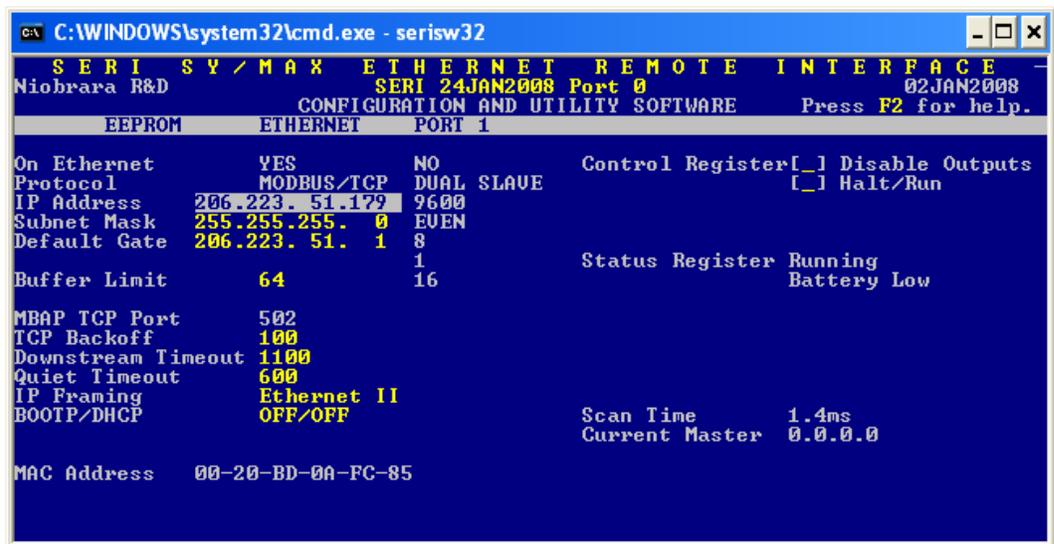
Figure 5-2   oNline Edit

The block cursor is moved about the screen using the arrow keys on the keyboard. Individual parameters may be modified by toggling through the permitted parameters using the -. +, and space bar. Parameters requiring direct value entry, such as the I/O Map table entries, may be edited with the commands listed on page 35. Several Function keys are active while in the online screens and are described below:

- F1 Print - The F1 Function key will allow a direct printing of the screen to a printer or ASCII file. A window will open in the middle of the screen prompting for the destination of the print. The target may be a DOS device may be such as "LPT1" etc. or to an ASCII text file by entering a filename. Pressing Escape will abort the print screen.

- F9 Serial Setup - The F9 Function key will bring up the Serial Setup window for immediate modification of the setup parameters of SERISW. Pressing Escape will exit from the Setup window without making changes.

- F10 Clear Error - When any Error Window appears with a beep, the F10 key may be used to clear that error.

The opening screen of the oNline Edit provides the IP Address parameters for the SERI. Near the top of the center of the screen, the **firmware revision** of the SERI is displayed. The **date** displayed in the upper right hand corner of the screen is the revision of the SERISW32 software. The **Scan Time** of the SY/MAX rack is dynamically displayed in the lower right hand corner of the screen along with the IP Address of the current Master.

The **Disable outputs** item allows an immediate disabling of the outputs on the SY/MAX rack. Toggling this value to [X] causes R[1001].2 to be set in the SERI. Setting this value to [ ] causes this bit to be cleared.

The **Halt/Run** item controls the outputs on the SY/MAX rack. Toggling this value to [X] causes R[1001].1 to be set in the SERI. Setting this value to [ ] causes this bit to be cleared.

The Serial port baud rate is fixed at 9600. The parity is fixed at EVEN. Data bits are fixed at 8 and Stop bits are fixed at 1. The serial protocol is fixed at Dual Slave.

Edit Allowed Master List

The SERI may receive commands from up to four Modbus/TCP masters. This table must be set to allow writes from those masters. Any master not configured in this table will be allowed to read the registers in the SERI, but will not be allowed to write the Outputs. Also in this table is the Watchdog timeout for writing the Outputs. Failure to write the Outputs within the specified time will result in the SERI setting the Outputs to the default value. The final configuration in this option is of the rack in which the SERI will reside. Valid options are HRK100, HRK150, HRK200, RRK100, RRK200, or RRK300. The allowed masters list is shown in Figure 5-3.
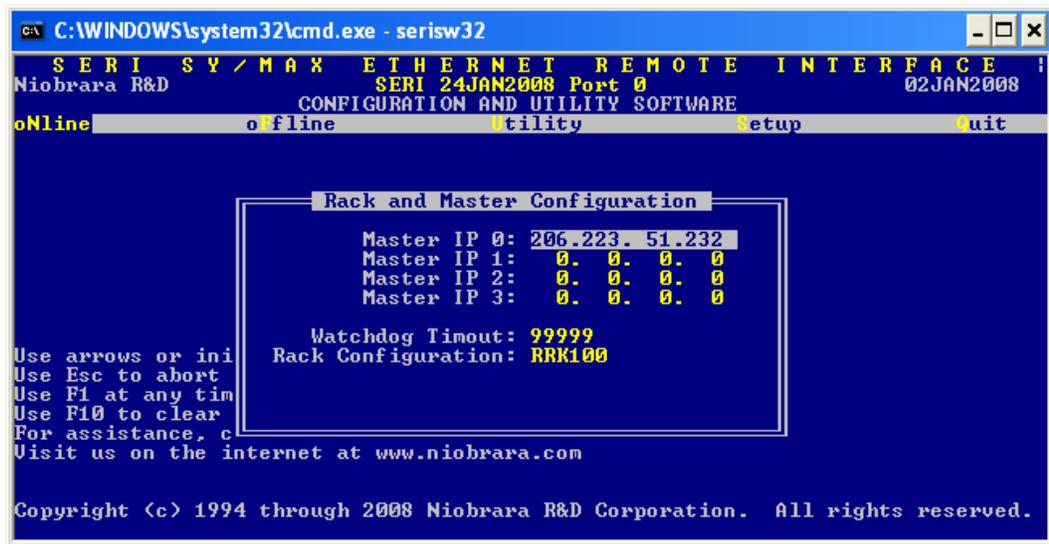
Figure 5-3   oNline Allowed Masters

Edit Mapper Configuration

This option determines how the I/O will be mapped within the SERI. In the first column, the user chooses the first register (1-10000) into which the data for the chosen module will reside. The second column references the slot in the SY/MAX rack (D1-16 or R1-16). The third column dictates the first register in the chosen module that will be referenced. For most discrete modules, this number must always be 1. In the case of a Niobrara module (SPE4, EPE5, MEB), this number may be as high as 2048. The fourth column references the number of consecutive registers to be used in the module. The fifth column decides whether these registers are to be Inputs or Outputs. The last column displays the default values (displayed in HEX) of any Output registers.
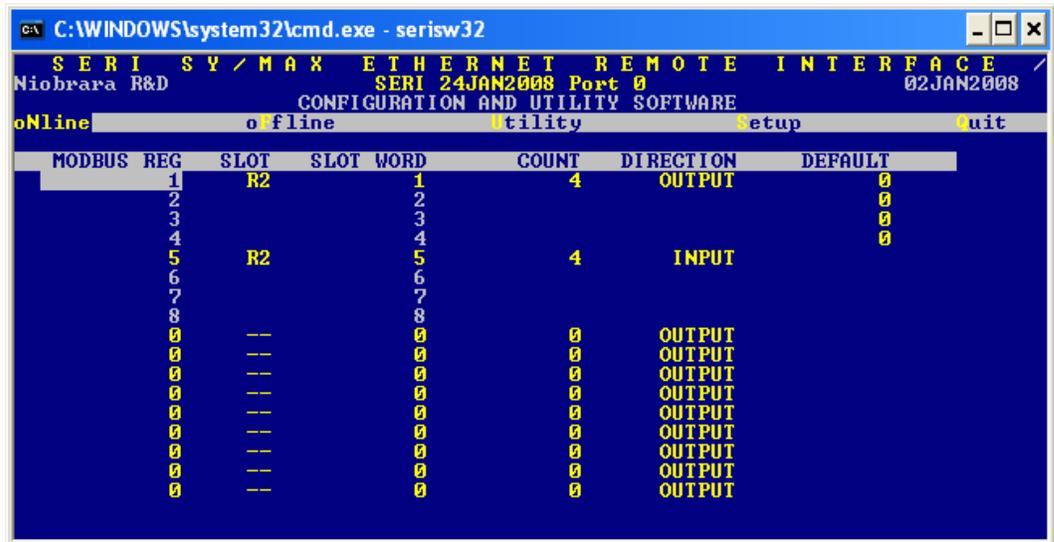
Figure 5-4   SERI Mapper Editor

oFfline

The oFfline menu offers several choices for maintenance, storage, and retrieval of SERI configurations. The oFfline menu is shown in Figure 5-5. The oFfline menu items perform their operations using a copy of SERI setup parameters in the personal computer's memory. This copy may not be related to the actual configuration in an SERI that may be connected oNline. Any changes made in the oFfline Editing that are needed to be transferred to a connected SERI must be done with the Send memory to module menu item.
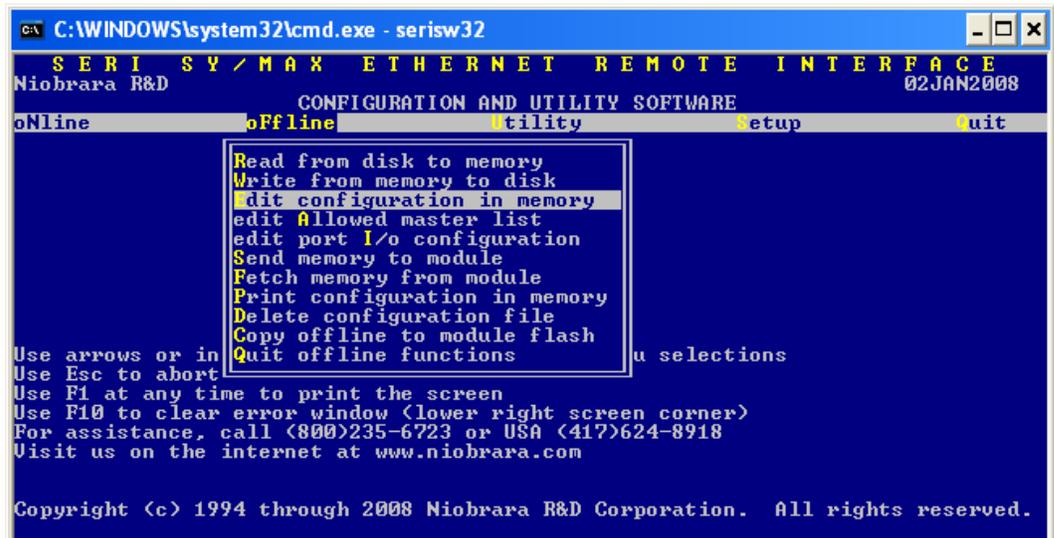
Figure 5-5   oFfline menu

Read from disk to memory

This function reads an SERI configuration from disk into the computer's memory. The file to be read should have been created by the "Write from memory to disk" function described below and must have a .SRM extension. When "Read from disk to memory" is selected, a window will open and ask for the name of the file to read. The bottom part of the screen will show a list of all files with the extension .SRM in the current directory. Any subdirectories, or drives, will be shown in square brackets. The parent directory (of which the current directory is a subdirectory) is shown by the word "parent" in square brackets. You may either type the name of the file to read or you may use the arrow keys to move the highlight to the desired filename. Pressing **ENTER** with the highlight on a filename will select that file for reading. Pressing **ENTER** with the highlight positioned on a directory name (either a subdirectory or [parent]) will change the current directory to that directory and will show the .SRM files in the new directory. If there are more files than will fit on the screen, pressing the right arrow with the highlight at the right edge of the screen will scroll the display sideways to show more files. Typing the **ESC** key will return to the offline function menu without loading a file.

Write from memory to disk

This function saves a copy of the memory file to a disk file. "Write from memory to disk" uses the same point and shoot file selection described for "Read from disk to memory" above. To create a new file you must type the name. The name should be a valid MS/DOS filename but should not include any path name or extension. The program will append an extension of .SRM to the name and the file will be placed in the directory which is shown in the bottom half of the screen. To create a file in a directory other than the current one, use the arrow and **ENTER** keys to traverse the directory tree until a listing of the desired directory is shown in the bottom half of the screen. Then type in the file name and press **ENTER**. If you specify (either by typing or by pointing) a file that already exists, you will be prompted for approval before that file is overwritten.

Edit configuration in memory

The Edit selection brings up a screen similar to the oNline Edit screen. Use the editor in the normal fashion to make changes to the memory file. Upon completion of the editing, it is advised that the work be saved using the "Write from memory to disk" routine. Upon exiting the editor, the main SERISW menu will appear.

It is important to remember to save the file before exiting or the changes will not be made.

edit Allowed master list

The Allowed master list is similar to the oNline version of the same screen. Use the editor in the normal fashion to make changes to the memory file. Upon completion of the editing, it is advised that the work be saved using the "Write from memory to disk" routine. Upon exiting the editor, the main SERISW menu will appear.

It is important to remember to save the file before exiting or the changes will not be made.

Edit Mapper configuration

The I/O configuration screen is similar to the oNline version. Use the editor in the normal fashion to make changes to the memory file. Upon completion of the editing, it is advised that the work be saved using the "Write from memory to disk" routine. Upon exiting the editor, the main SERISW menu will appear.

It is important to remember to save the file before exiting or the changes will not be made.

Send memory to module

This function requires a physical connection from the computer to an SERI. The Serial setup must be properly configured to allow oNline communication to the SERI. When the "Send memory to module" selection is made, the configuration in the computer's memory is immediately transferred to the SERI.

Fetch memory from module

This function requires a physical connection from the computer to an SERI. The Serial setup must be properly configured to allow oNline communication to the SERI. When the "Fetch memory from module" selection is made, the configuration in the SERI is immediately transferred to the oFfline memory.

Print configuration in memory

This function will produce a report showing the current oFfline configuration parameters in the computer's memory. When this function is selected, the user will be prompted for an output filename with the default value of PRN shown. To send the report to the PRN device (normally the parallel printer port), simply press **ENTER**. To send the report to a different port or to a file, type the name and then press **ENTER**. Online configurations may be printed with the **F1** print screen key.

Delete configuration file

This function removes the selected SERI source file from the disk. "Delete configuration file" uses the same point and shoot file selection described for "Read from disk to memory" above. The name should be a valid MS/DOS filename but should not include any path name or extension. The program removes the file from the disk as well as removing it from the bottom of the screen. To remove a file in a directory other than the current one, use the arrow and **ENTER** keys to traverse the directory tree until a listing of the desired directory is shown in the bottom half of the screen. Then type in the file name and press **ENTER**.

Quit offline functions

Selecting this menu item will return the user to the main menu. Pressing the Escape key will perform the same function.

Utility

The Utility menu provides access to useful maintenance and testing functions of the SERISW software.

View registers

Selecting the View registers menu item will invoke a SY/MAX register data viewer/modifier. This viewer continuously performs a block read of 20 registers and displays the contents of those registers in hex, unsigned integer, signed integer, and binary. The status register associated with the data register is also displayed in hex. The register viewer is dependent on the values located in the SETUP Serial communications menu. Mode, Baud rate, Parity, Route, etc. must be properly set for proper communication.

The Up and Down arrow keys are used to move from register to register.

The Page Up and Page Down keys move in increments of 10 registers.

The Left and Right arrows move from column to column on the same register.

This register viewer is highly useful in that it allows easy editing of the data in the register being viewed. By pressing 0..9 in the decimal fields or 0..9, or A..F in the hex field, an editing mode is entered. New data may be entered at this time. Pressing the Enter key or moving to a new field with the arrow keys will cause the new data to be written to the edited register. If the curser is located in the REGISTER column the block of registers being viewed may be adjusted by entering a new register number. To edit the binary values, press HOME when on the binary field. Move the cursor to the desired bit and enter a '0' or a '1' and press enter to accept.

Pressing the F9 key will invoke the Setup serial window for immediate access to the personal computer's communication parameters.

Pressing the F8 key will invoke the Register Viewer Setup screen. Useful options that can be changed include the starting register to be viewed, the number of registers to view at once, and whether or not to read the firmware date from the SERI.

Pressing Esc will exit from the Register viewer and return to the main menu. Pressing Esc while editing a data field will result in canceling the edit and the modified data will not be written to the register.

The STAT field displays the status register associated with the data register. The STATUS field is a read only display and can not be modified by the Register Viewer. Two common values are E000 and A000. A000 is the hex representation that the PLC recognizes as a PLC OUTPUT register. E000 is for a PLC INPUT register. This allows easy recognition of registers used by the SERI as inputs and used by the PLC as outputs.
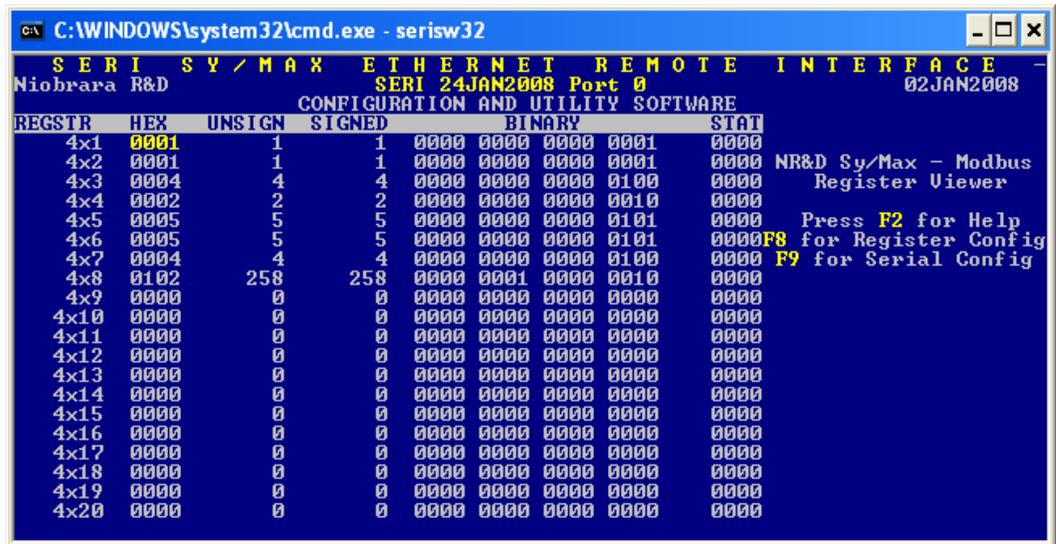
Figure 5-6   View Registers

Terminal Emulator

Selecting the Terminal emulator from the Utilities menu will invoke a terminal emulator according to the setup selected in the Setup menu. The terminal emulator opens as shown in Figure 5-7.

The terminal sends the ASCII code for the alpha-numeric characters out the selected COM port. Functions keys F1 through F4 and the keypad arrows send ANSI (i.e. VT100) codes. F7 is reserved for starting a file capture. F8 will close the capture file. The backspace key sends ASCII BS (08 hex). The Delete key sends and ASCII DEL (7F hex). The Insert key allows the transmission of ASCII hexadecimal characters directly from the hex numbers separated by spaces.

The F9 key will invoke the Terminal Emulator Setup Screen for immediate modification of the personal computer's communication setup parameters.
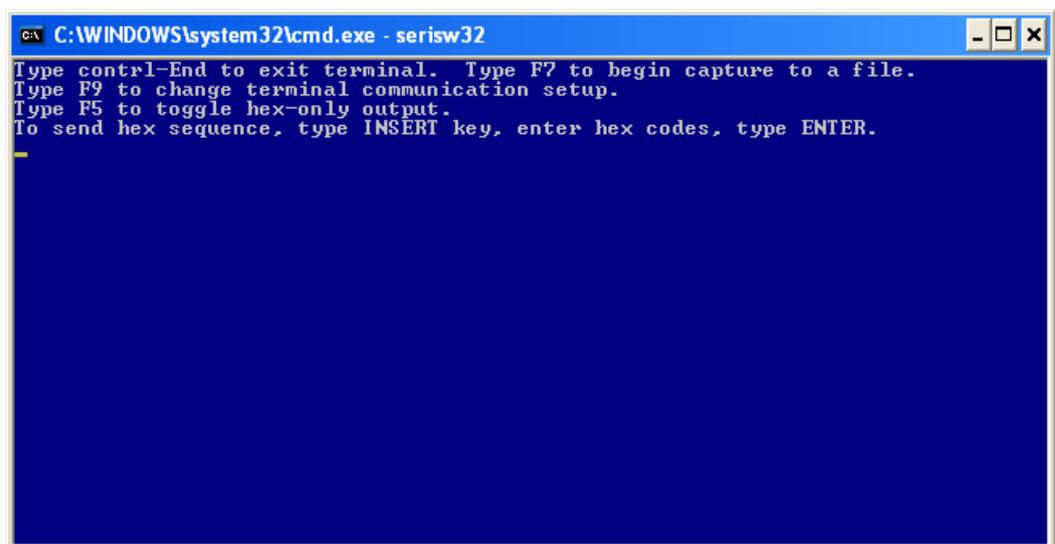
Figure 5-7   Terminal Emulator

SETUP

The setup menu accesses the setup parameters for the personal computer to enable it to communicate with the SERI and the terminal emulator. The parameters chosen will depend on the exact equipment involved in making the connections. The Setup menu should appear as in Figure 5-8.
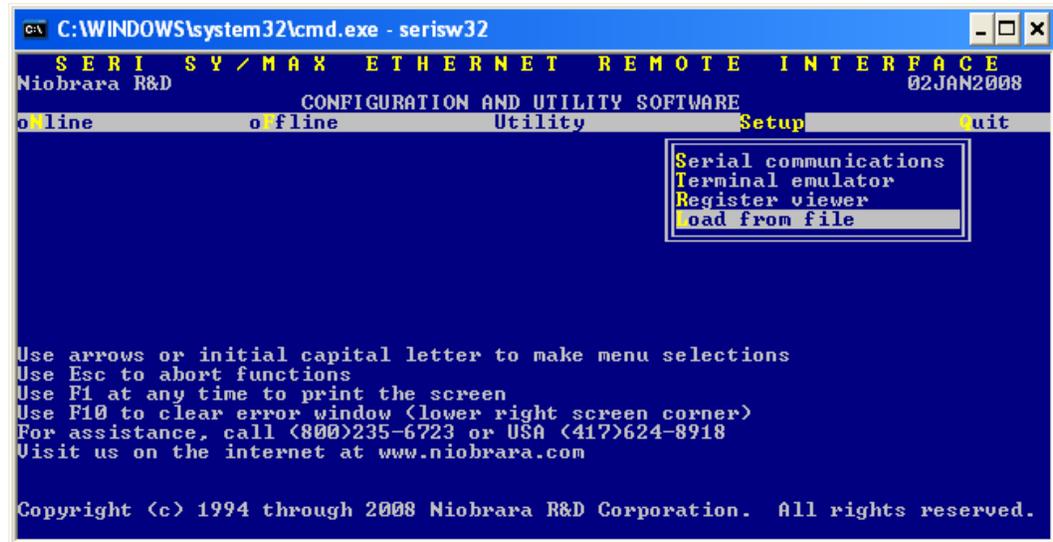
Figure 5-8   Setup Menu Screen

Serial SETUP

The connection type is mainly determined by the method of connection to the outside world and may be broken into two groups: the personal computer's COM: port and the Modbus/TCP Ethernet.

Personal Computer COM: port

If the connection from the personal computer is made through one of its serial ports then the Connection type should be one of the following:

- Modbus RTU COM:
- SY/MAX COM:

Modbus RTU COM: is the default and most likely will be the one used. In this mode the personal computer will communicate through one of its COM: ports as a Modbus master. The drop number selected must be 255 to configure the SERI. This mode is to be used when a direct connection from the personal computer COM: port is made to the SERI. In most cases an RS-232<>RS-422 conversion is required and the Niobrara SC902 cable makes this conversion very convenient.

Modbus/TCP is used when connecting over Ethernet to the SERI. The Host must be the IP Address of the SERI. Index 255 must be used to configure the SERI.

In these examples a RRK-100 rack is populated with various input and output modules see Figure 6-1. Slot one contains the SERI. Slot two contains a RIM-101 which is a 16 function optically isolated input module. Slot three contains a ROM-271 which is a 16 function isolated relay output module. Slot four contains a RIM-331 which is a 24VDC, 32 function input module. Slot five contains ROM-441 which is a 24VDC, 32 function output module.

Slot 1	Slot 2	Slot 3	Slot 4	Slot 5
SERI	**RIM-101**	**ROM-271**	**RIM-331**	**ROM-441**
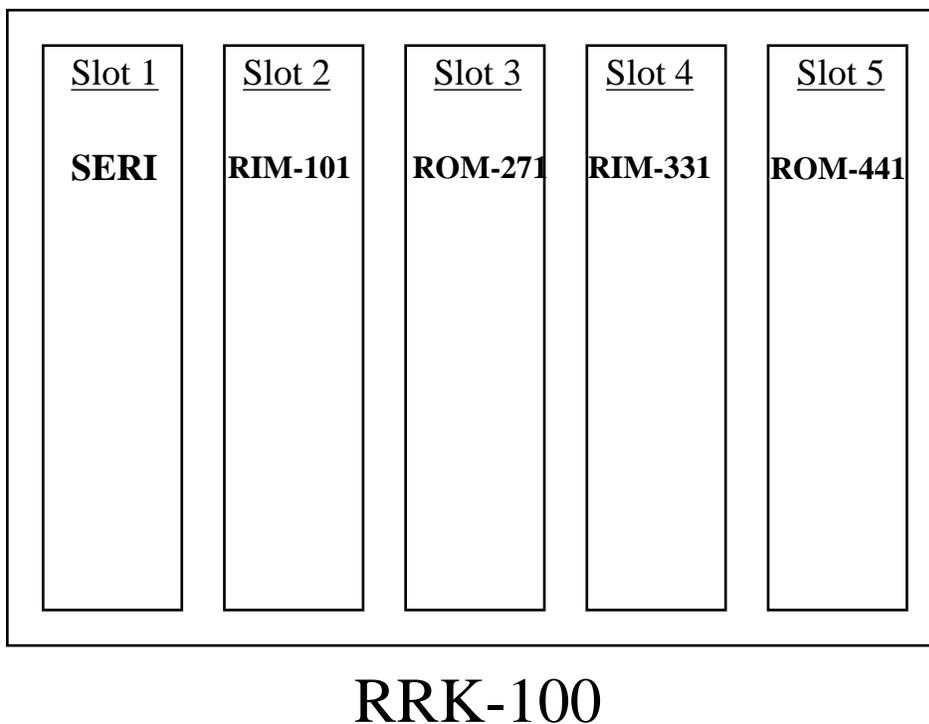
RRK-100

Figure 6-1   Example RRK-100 Rack populated with Input and Output Modules

Table 6-1 shows the information needed to setup each device. The first column in the table "Device" is the name of the device and is only used to help identify the modules in the table. Modbus Register is the Mobus Register assigned to the device in the SERI. Slot is the physical slot the device occupies in the rack. Slot Word is the starting register in the device which is one for many devices. Word Count is the number of words needed to contain the data. The Direction is whether the device is an input or an output. The Default Value is the value that will be sent to the device if the SERI has not received a message for the device within the timeout period.

Table 6-1   Example one SERI Device Table

Device	Modbus Register	Slot	Slot Word	Word Count	Direction	Default Value
RIM-101	1	2	1	1	input	N/A
ROM-271	2	3	1	1	output	2=X0000
ROM-331	3-4	4	1	2	input	N/A
ROM-441	5-6	5	1	2	output	5=x0000 6=x0000

In Example one the entries in the SERI are arranged in the slot order. This method of mapping the devices will work, however the first register is an input, register two is an output, registers 3-4 are inputs, and registers 5-6 are outputs. Grouping the inputs and outputs into consecutive registers can make reading the inputs and outputs more intuitive and the number of Modbus messages can be reduced see Table 6-2 . Four Modbus messages have to be processed to get all inputs and outputs in example one, whereas only two messages are required in example two. The physical slots the devices occupies have not been changed just the Modbus registers in the SERI. The Modbus registers do not have to start at one for instance the inputs could start at register 100 and the outputs start at register 200 and status start at register 300.

Table 6-2   Example two SERI Device Table

Device	Modbus Register	Slot	Slot Word	Word Count	Direction	Default Value
RIM-101	1	2	1	1	input	N/A
ROM-271	4	3	1	1	output	2=X0000
ROM-331	2-3	4	1	2	input	N/A
ROM-441	5-6	5	1	2	output	5=x0000 6=x0000

The SERI can also reverse the bit order of the data in the registers. This is useful when working with Concept devices as the Modbus master. To accomplish this rack address the devices into unused Modbus registers. Then Add a Mapper Entry for each card in the rack and place in a register the Modbus master can reach and reverse these registers see Table 6-3.   In this example Modbus registers starting at 100 represent the reversed input data, Modbus registers starting at 200 represent reversed output data. In the Mapper Entry Table the Modbus Register is the register the reversed data will be placed into. The Source is either R1(0) which represents the cards in the rack or R1(255) which represents the internal registers of the SERI including setup, status, and error registers. The Source Address is the address of the source data. The Word

Count is the number of words to be read. The Direction represents the direction the data of the data. Table 6-4 shows the example.

Table 6-3   SERI Add Mapper Entry Table

Modbus Register	Source	Source Address	Word Count	Direction
100	R1(0)	1	3	input (reversed)
200	R1(0)	4	3	output (reversed)

Table 6-4 shows the resulting device table with the mapper entries added. The Device column shows the name of the device in the rack. This column does not appear on the SERI web page nor in the SERISW32 software because it is only to help with the explanation of how the device works and is not needed by the SERI. The Modbus Register column shows the registers were the data will be held. Slot is the physical slot the device occupies. In the case of the two mapper entries Slot is R1(0) which points to registers inside the SERI not to a slot. Slot Word is the starting location in the device to start reading data. The Slot Word in the two Mapper Entries shows the starting Modbus register inside the SERI which in the first entry starts at register 1 and in the second entry starts at register 4. Word Count is the number of registers to be read. It is the same for the rack or the mapper entries. Direction indicates inputs or outputs and in the case of the mapper entries whether the data is to be reversed. Default Value is the value written to the device from the SERI if no messages are received by the SERI from the Modbus master within the timeout period. The Default Values in the Mapper Entries that are mapped to internal registers will override the default values set in the Rack Entries.

Table 6-4   Example three SERI Device Table

Device	Modbus Register	Slot	Slot Word	Word Count	Direction	Default Value
RIM-101	1	2	1	1	input	N/A
ROM-271	4	3	1	1	output	2=x0000
ROM-331	2-3	4	1	2	input	N/A
ROM-441	5-6	5	1	2	output	5=x0000 6=x0000
Mapper Entry	100-102	R1(0)	1	3	input (reversed)	N/A
Mapper Entry	200-202	R1(0)	4	3	output (reversed)	200=x0000 201=x0000 202=x0000

In the example above there are only two Mapper Entries needed to collect all the data from the cards and reverse the data. All the inputs are read from the first mapper entry and all the outputs are read from the second mapper entry.

7
Connector Pinouts

COMM RS-422 port on SERI (DE9S with slide lock posts)

1   TX- transmit data (inverted) from SERI to output device

2   TX+ transmit data (noninverted) from SERI to output device

3   RX- receive data (inverted) from data source to SERI

4   RX+ receive data (noninverted) from data source to SERI

5   +5VDC for smart cable power

6   +5VDC for smart cable power

7   GND

8   GND

9   Shield ground. AC coupled to the chassis.
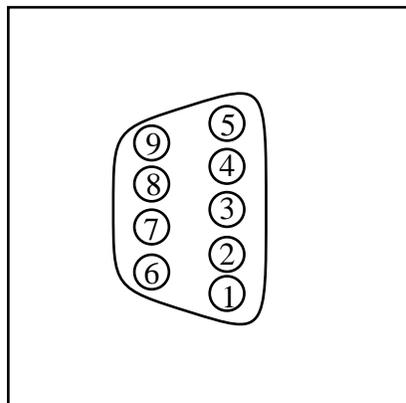
Figure 7-1   SY/MAX RS-422 Connector Pinout

8

Recommended Cabling

SY/MAX Cabling required to configure an SERI

The factory default configuration for the RS-422 serial port module in Dual Slave mode is 9600 baud, 8 data bits, EVEN parity, 1 stop bit. Dual Slave mode is a combination of SY/MAX slave and Modbus RTU slave. Modbus Slave address 255 provides access to the configuration of the SERI. Modbus Slave address 0 or 1 provides access to the rack data.

SERI to personal computer cabling

Connecting the RS-422 SERI is very easy using Niobrara's **SC902** RS-232 to RS-422 converter cable.

Note: The included power supply with the **SC902** is not required when connecting to the SERI. Pins 5 and 6 of the SERI's RS-422 port provide the +5VDC to power the smart cable. Pins 7 and 8 provide the GND return for the cable.

Sy/Max Module Hardware Description

This set of tables are intended to help with the setup of various Sy/Max modules.

Input Modules

8030 RIM 101

The RIM-101 in a discrete Input Module with 16 optically isolated 120VAC/DC inputs. Input 1 corresponds with the least significant bit. (See Square D Bulletin: 30598-282-01C1)

Table 9-1   RIM-101 Register Map

Slot Word	Description	Direction
1	Inputs 1-16	input

8030 RIM 121

The RIM-121 is a Standard Analog Module with four analog inputs. Each input is placed in its own 16-bit word. (See Square D Bulletin: 30598-203-02)

Table 9-2   RIM-121 Register Map

Slot Word	Description	Direction
1	Analog Input #1	input
2	Analog Input #2	input
3	Analog Input #3	input
4	Analog Input #4	input

Table 9-3   RIM-121 Status Bits

Hex Value	Status Bits								Description
	32	31	30	29	28	27	26	25	
C1	1	1	0	0	0	0	0	1	Normal Operation
62	0	1	1	0	0	0	1	0	EPROM Failure
60	0	1	1	0	0	0	0	0	DC-DC Failure
69	0	1	1	0	1	0	0	1	Diagnostics in progress

RIM 123

The RIM-123 is a High-Speed Analog Input Module with eight channels. (See Square D Bulletin: 30598-703-001A1)

Table 9-4   RIM-123 Register Map

Slot Word	Description	Direction
1	Analog Input #1	input
2	Analog Input #2	input
3	Analog Input #3	input
4	Analog Input #4	input
5	Analog Input #5	input
6	Analog Input #6	input
7	Analog Input #7	input
8	Analog Input #8	input

Table 9-5   RIM-123 Status Bits

Hex Value	Status Bits								Description
	32	31	30	29	28	27	26	25	
C3	1	1	0	0	0	0	1	1	Normal Operation
62	0	1	1	0	0	0	1	0	EPROM Failure
61	0	1	1	0	0	0	0	1	Invalid Range Selection
60	0	1	1	0	0	0	0	0	DC-DC Failure
53	0	1	0	1	0	0	1	1	Watchdog Failure
69	0	1	1	0	1	0	0	1	Diagnostics in progress

RIM 125

The RIM-125 is a 16 Channel Analog Input Module. (See Square D Bulletin: 30598-209-01B1)

Table 9-6   RIM-123 Register Map

Slot Word	Description	Direction
1	Analog Input #1	input
2	Analog Input #2	input
3	Analog Input #3	input
4	Analog Input #4	input
5	Analog Input #5	input
6	Analog Input #6	input
7	Analog Input #7	input
8	Analog Input #8	input
9	Analog Input #9	input
10	Analog Input #10	input
11	Analog Input #11	input
12	Analog Input #12	input
13	Analog Input #13	input
14	Analog Input #14	input
15	Analog Input #15	input
16	Analog Input #16	input

Table 9-7   RIM-123 Status Bits

Hex Value	Status Bits								Description
	32	31	30	29	28	27	26	25	
C1	1	1	0	0	0	0	0	1	Normal Operation
62	0	1	1	0	0	0	1	0	EPROM Failure
60	0	1	1	0	0	0	0	0	DC-DC Failure
53	0	1	0	1	0	0	1	1	Watchdog Failure
69	0	1	1	0	1	0	0	1	Diagnostics in progress

RIM 126

The RIM-126 is a 8 Channel Isolated Analog Input Module that supports high level analog and low level thermocouple signals. (See Square D Bulletin: 30598-208-01D2)

Table 9-8   RIM-126 Register Map

Slot Word	Description	Direction
1	Analog Input #1	input
2	Analog Input #2	input
3	Analog Input #3	input
4	Analog Input #4	input
5	Analog Input #5	input
6	Analog Input #6	input
7	Analog Input #7	input
8	Analog Input #8	input
9	Bits 1-8 indicate Open Input Detections Bits 10-16 Not used	input
10	Bits 1-8 indicate Under-range Detection Bits 10-16 indicate Over-range Detection	input
11	DIP Switch settings for switch SW9 (LSB), SW10 (MSB)	input
12	DIP Switch settings for switch SW11 (LSB)	input

Table 9-9   RIM-126 Status Bits

Hex Value	Status Bits								Description
	32	31	30	29	28	27	26	25	
C7	1	1	0	0	0	1	1	1	Normal Operation (Registers 1-10)
81	1	0	0	0	0	0	0	1	Normal Operation (Registers 11&12)
62	0	1	1	0	0	0	1	0	EPROM Failure
60	0	1	1	0	0	0	0	0	DC-DC Failure
53	0	1	0	1	0	0	1	1	Watchdog Failure
69	0	1	1	0	1	0	0	1	Diagnostics in progress

RIM 127

The RIM-127 is a 12 Channel RTD/Direct Resistance Input Module. (See Square D Bulletin: 30598-731-01B2) This module does not use DIP switches for configuration and relies on the values written to registers 14 and 15. These two words are good candidates for the SERI to store default values.

Table 9-10   RIM-127 Register Map

Slot Word	Description	Direction
1	Analog Input #1	input
2	Analog Input #2	input
3	Analog Input #3	input
4	Analog Input #4	input
5	Analog Input #5	input
6	Analog Input #6	input
7	Analog Input #7	input
8	Analog Input #8	input
9	Analog Input #9	input
10	Analog Input #10	input
11	Analog Input #11	input
12	Analog Input #12	input
14	Configruation Registers (See Square D Bulletin)	output
13	Configuration Registers (See Square D Bulletin)	output
15	Bits 1-12 indicate Current Source Error Bits 13,14 indicate Valid Range Selected Bit 15 indicates EEPROM Status Bit 16 indicates Over Current	input
16	Bits 1-12 indicate Over/Under Range Detection Bits 13-16 not used	input

Table 9-11   RIM-127 Status Bits

Hex Value	Status Bits								Description
	32	31	30	29	28	27	26	25	
CD	1	1	0	0	1	1	0	1	Normal Operation (Registers 1-12, 15, 16)
8D	1	0	0	0	1	1	0	1	Normal Operation (Registers 13&14)
60	0	1	1	0	0	0	0	0	DC-DC Failure
53	0	1	0	1	0	0	1	1	Watchdog Failure
69	0	1	1	0	1	0	0	1	Diagnostics in progress

RIM 131

The RIM-131 is a High Speed Counter Module.(See Square D Bulletin: 30598-210-01)

Table 9-12   RIM-131 Register Map

Slot Word	Description	Direction
1	HSCM Status	Input
2	HSCM Control	Output
3	Least Significatn 4 digits decode 1 set point	Output
4	Most Significatn 3 digits decode 1 set point	Output
5	Least Significatn 4 digits decode 2 set point	Output
6	Most Significatn 3 digits decode 2 set point	Output
7	Least Significatn 4 digits preset count value	Output
8	Most Significatn 3 digits preset count value	Output
9	HSCM Control	Output
10	Least significant 4 digits of count value	Input
11	Most significant 3 digits of count value	Input
12	Count pulses per second	Input
13	Reserved	Output
14	Reserved	Output
15	Reserved	Output
16	Reserved	Output

RIM 144

The RIM-144 is a Multiplexed and Single Channel Fast Response BCD Input Module. (See Square D Bulletin: 30598-213-02)

Table 9-13 RIM-144 Register Map

Slot Word	Description	Direction
1	Thumbwheel Input #1	input
2	Thumbwheel Input #2	input
3	Thumbwheel Input #3	input
4	Thumbwheel Input #4	input
5	Thumbwheel Input #5	input
6	Thumbwheel Input #6	input
7	Thumbwheel Input #7	input
8	Thumbwheel Input #8	input
9	Thumbwheel Input #9	input
10	Thumbwheel Input #10	input
11	Thumbwheel Input #11	input
12	Thumbwheel Input #12	input
13	Thumbwheel Input #13	input
14	Thumbwheel Input #14	input
15	Thumbwheel Input #15	input
16	Thumbwheel Input #16	input

Table 9-14 RIM-144 Status Bits

Hex Value	Status Bits								Description
	32	31	30	29	28	27	26	25	
50	0	1	0	1	0	0	0	0	EPROM Failure
60	0	1	1	0	0	0	0	0	Improper input data or format
40	0	1	0	0	0	0	0	0	Watchdog Failure
62	0	1	1	0	0	0	1	0	Self Test Failure
41	0	1	0	0	0	0	0	1	RAM Failure if red LED is ON otherwise normal operation
69	0	1	1	0	1	0	0	1	Diagnostics in progress

RIM 331

The RIM-331 is a 24V DC 32 Function Input Module. (See Square D Bulletin: 30598-284-01B2)

Table 9-15 RIM-331 Register Map

Slot Word	Description	Direction
1	Discrete inputs 1-16 (Input 1 is lsb)	input
2	Discrete Inputs 17-32 (Input 17 is lsb)	input

RIM 361

The RIM-361 is a 16 Function 240 VAC/DC Input Module. (See Square D Bulletin: 30598-287-01B1)

Table 9-16   RIM-361 Register Map

Slot Word	Description	Direction
1	Discrete inputs 1-16 (Input 1 is lsb)	input

RIM 731

The RIM-731 64 Function, 24 VAC/DC Input Module. (See Square D Bulletin: 30598-812-01B2)

Table 9-17   RIM-731 Register Map

Slot Word	Description	Direction
1	Discrete inputs 1-16 (Input 1 is lsb)	input
2	Discrete Inputs 17-32 (Input 17 is lsb)	input
3	Discrete inputs 33-48 (Input 33 is lsb)	input
4	Discrete Inputs 49-64 (Input 49 is lsb)	input

Table 9-18   RIM-731 Status Bits

Hex Value	Status Bits								Description
	32	31	30	29	28	27	26	25	
E	1	1	1	0	1	1	0	1	Normal Operation
50	0	1	0	1	0	0	0	0	EEPROM Failure
53	0	1	0	1	0	0	1	1	Watchdog Failure
69	0	1	1	0	1	0	0	1	Diagnostics in progress

Output Modules

RAO 208

The Spectrum Controls RAO-208 is a 8 Channel Isolated Analog Output Module. (See Spectrum Controls 8000 RAO-208 Operation Manual)

Table 9-19   RAO-208 Register Map

Slot Word	Description	Direction
1	Analog Output #1	Output
2	Analog Output #2	Output
3	Analog Output #3	Output
4	Analog Output #4	Output
5	Analog Output #5	Output
6	Analog Output #6	Output
7	Analog Output #7	Output
8	Analog Output #8	Output
9	Channel Configuration 1-4	Output
10	Channel Configuration 5-8	Output
11	Channel response to "Halt"	Output
12	Status/Alarm	Intput
13	Preset Output #1	Output
14	Preset Output #2	Output
15	Preset Output #3	Output
16	Preset Output #4	Output
17	Preset Output #5	Output
18	Preset Output #6	Output
19	Preset Output #7	Output
20	Preset Output #8	Output

Table 9-20   RAO-208 Status Bits

Hex Value	Status Bits								Description
	32	31	30	29	28	27	26	25	
84	1	0	0	0	0	1	0	0	Registers 1-11 and 13-20
C3	1	1	0	0	0	0	1	1	Register 12
50	0	1	0	1	0	0	0	0	EEPROM Failure
53	0	1	0	1	0	0	1	1	Watchdog Failure
60	0	1	1	0	0	0	0	0	Group Error

ROM 121

The ROM-121 is an Analog Output Module with four channels. (See Square D Bulletin: 30598-204-01B1)

Table 9-21   ROM-121 Register Map

Slot Word	Description	Direction
1	Analog Output #1	Output
2	Analog Output #2	Output
3	Analog Output #3	Output
4	Analog Output #4	Output

Table 9-22   ROM-121 Status Bits

Hex Value	Status Bits								Description
	32	31	30	29	28	27	26	25	
82	1	0	0	0	0	0	1	0	Normal Operation
50	0	1	0	1	0	0	0	0	EPROM Failure
60	0	1	1	0	0	0	0	0	DC-DC Failure
69	0	1	1	0	1	0	0	1	Diagnostics in progress
51	0	1	0	1	0	0	0	1	External RAM failure

ROM 122

The ROM-122 is a 4 Channel Isolated Analog Output Module. (See Square D Bulletin: 30598-735-01A1)

Table 9-23   ROM-122 Register Map

Slot Word	Description	Direction
1	Analog Output #1	Output
2	Analog Output #2	Output
3	Analog Output #3	Output
4	Analog Output #4	Output
5	Preset Value #1	Output
6	Preset Value #2	Output
7	Preset Value #3	Output
8	Preset Value #4	Output

Table 9-24 ROM-122 Status Bits

Hex Value	Status Bits								Description
	32	31	30	29	28	27	26	25	
82	1	0	0	0	0	1	0	0	Normal Operation
50	0	1	0	1	0	0	0	0	EPROM Failure
60	0	1	1	0	0	0	0	0	DC-DC Failure
69	0	1	1	0	1	0	0	1	Diagnostics in progress
51	0	1	0	1	0	0	0	1	External RAM failure

ROM 141

The ROM-141 is a Multiplexed and Single Channel Fast Response BCD Output Module.(See Square D Bulletin: 30598-213-02)

Table 9-25 ROM-144 Register Map

Slot Word	Description	Direction
1	BCD Output #1	Output
2	BCD Output #2	Output
3	BCD Output #3	Output
4	BCD Output #4	Output
5	BCD Output #5	Output
6	BCD Output #6	Output
7	BCD Output #7	Output
8	BCD Output #8	Output
9	BCD Output #9	Output
10	BCD Output #10	Output
11	BCD Output #11	Output
12	BCD Output #12	Output
13	BCD Output #13	Output
14	BCD Output #14	Output
15	BCD Output #15	Output
16	BCD Output #16	Output

Table 9-26 ROM-144 Status Bits

Hex Value	Status Bits								Description
	32	31	30	29	28	27	26	25	
40	0	1	0	0	0	0	0	0	Watchdog Failure
41	0	1	0	0	0	0	0	1	RAM Failure if red LED is ON otherwise normal operation
50	0	1	0	1	0	0	0	0	EPROM Failure
69	0	1	1	0	1	0	0	1	Diagnostics in progress

ROM 221

The ROM-221 is a 16 Function 120VAC Output Module. (See Square D Bulletin: 30598-283-01D1)

Table 9-27   ROM-221 Register Map

Slot Word	Description	Direction
1	Discrete Outputs 1-16 (Output 1 is lsb)	Output

ROM 431

The ROM-431 is a 16 Function 220/240VAC Output Module. (See Square D Bulletin: 30598-288-01E1)

Table 9-28   ROM-431 Register Map

Slot Word	Description	Direction
1	Discrete Outputs 1-16 (Output 1 is lsb)	Output

ROM 441

The ROM-441 is a 24VDC 32 Function Output Module. (See Square D Bulletin: 30598-285-01B2)

Table 9-29   ROM-441 Register Map

Slot Word	Description	Direction
1	Discrete Outputs 1-16 (Output 1 is lsb)	Output
2	Discrete Outputs 17-32 (Output 17 is lsb)	Output

ROM 271

The ROM-271 is a 16 Function Isolated Relay Output Module. (See Square D Bulletin: 30598-732-01C1)

Table 9-30   ROM-271 Register Map

Slot Word	Description	Direction
1	Discrete Outputs 1-16 (Output 1 is lsb)	Output

ROM 871

The ROM-871 is a 64 Function Reed Relay Output Module. (See Square D Bulletin: 30598-811-01B1)

Table 9-31 RIM-871 Register Map

Slot Word	Description	Direction
1	Discrete Outputs 1-16 (Output 1 is lsb)	Output
2	Discrete Outputs 17-32 (Output 17 is lsb)	Output
3	Discrete Outputs 33-48 (Output 33 is lsb)	Output
4	Discrete Outputs 49-64 (Output 49 is lsb)	Output

Table 9-32 RIM-871 Status Bits

Hex Value	Status Bits								Description
	32	31	30	29	28	27	26	25	
AD	1	0	1	0	1	1	0	1	Normal Operation
50	0	1	0	1	0	0	0	0	EEPROM Failure
53	0	1	0	1	0	0	1	1	Watchdog Failure
69	0	1	1	0	1	0	0	1	Diagnostics in progress