SERM
Installation and Programming Manual

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

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The Niobrara SERM is a SY/MAX® compatible Ethernet communications module that acts as a rack master to allow another PLC or SCADA to remotely control SY/MAX I/O via Modbus/TCP. The SERM 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 SERM’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 SERM requires that 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 SERM is accomplished through a built-in web server or the included SERMSW32 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-333, 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

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 D-connector, RS-422/485 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 SERM 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.

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Figure 1-1  SERM Front Panel
Module Installation

1. Remove power from the rack.
2. Mount the SERM 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 SERM 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

**Warning**
Do NOT install or remove the SERM 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.
SERMSW Software Installation

This CD that is included with the SERM includes the SERMSW32 software. Insert the CD into the CD ROM drive of the PC and select the SERM from the install programs and manuals feature.

**NOTE:** The absolute latest version of SERMSW and the SERM firmware may be downloaded from www.niobrara.com.

Default IP Address for the SERM

The SERM 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 SERM via Ethernet, set the IP Address of the PC to a similar IP Address of the SERM (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 SERM

A physical connection from the personal computer to the SERM may be used with the SERMSW32 program to configure the SERM. 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 SERM provides 5VDC power for the SC902 cable so the external power supply is not required.

Firmware Upgrade

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

1. Remove power from the register rack.
2. Remove the SERM from the register rack.
3. Locate the Load/Normal toggle switch on the top of the SERM. (See Figure 2-1) Move this switch to the LOAD position. Install the SERM back into the register rack.
4. Apply power to the rack. The SERM should perform its startup sequence and display the program and memory LEDs.
5. Connect the personal computer to the COMM port of the SERM. An SC902 cable provides a convenient method for the RS-232<>RS-422 conversion.
6 From the start menu of the computer select "Start, Programs, Niobrara, SERM, Download SERM Firmware". Fwload will start with the File to load c:\Niobrara\Firmware\serm.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 SERM from the rack.

11 Change the LOAD/NORMAL switch back to NORMAL.

12 Install the SERM back into the register rack.

13 Connect power back to the register rack.
Backplane CPLD Upgrade

The backplane interface of the SERM 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\serm.fwl, as shown in Figure 2-3.
Note: SERM is installed in Slot 1 in each type of RRK Rack.

Note: Slots 17 and 18 cannot be rack addressed.

Figure 2-4  RRK Register Racks
Figure 2-5  HRK Racks

Note: SERM is installed in slot R1 in all HRK racks.
Mapper Overview

The SERM 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 SERM 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  SERM Modbus Registers for Index 0 and 1

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

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 SERM 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 SERM 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 SERM 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 SERM is halted.

**Mapper Configuration**

The SERM’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**

<table>
<thead>
<tr>
<th>SERM Register</th>
<th>Description</th>
<th>Example Data</th>
<th>Example Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Modbus Image Reg Number</td>
<td>101</td>
<td>Modbus reg 101</td>
</tr>
<tr>
<td>2</td>
<td>Module Register Number</td>
<td>1</td>
<td>Module reg 1</td>
</tr>
<tr>
<td>3</td>
<td>Register Count</td>
<td>11</td>
<td>11 words</td>
</tr>
<tr>
<td>4</td>
<td>Direction/Slot number</td>
<td>0003 (hex)</td>
<td>Output in slot 3</td>
</tr>
<tr>
<td>5</td>
<td>Modbus Image Reg Number</td>
<td>112</td>
<td>Modbus reg 112</td>
</tr>
<tr>
<td>6</td>
<td>Module Register Number</td>
<td>13</td>
<td>Module reg 13</td>
</tr>
<tr>
<td>7</td>
<td>Register Count</td>
<td>8</td>
<td>8 words</td>
</tr>
<tr>
<td>8</td>
<td>Direction/Slot number</td>
<td>0003 (hex)</td>
<td>Output in slot 3</td>
</tr>
<tr>
<td>9</td>
<td>Modbus Image Reg Number</td>
<td>120</td>
<td>Modbus reg 120</td>
</tr>
<tr>
<td>10</td>
<td>Module Register Number</td>
<td>12</td>
<td>Module reg 12</td>
</tr>
<tr>
<td>11</td>
<td>Register Count</td>
<td>1</td>
<td>1 word</td>
</tr>
<tr>
<td>12</td>
<td>Direction/Slot number</td>
<td>0103 (hex)</td>
<td>Read in Slot 3</td>
</tr>
</tbody>
</table>
### Table 3-3  SERM Configuration Register List (Index 255)

<table>
<thead>
<tr>
<th>Register Range</th>
<th>Read/Write</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1..200</td>
<td>R/W</td>
<td>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 -&gt; Direction - value of 0 indicates write - value of 1 indicates read LSB -&gt; Slot Number (1-32)</td>
</tr>
<tr>
<td>1001</td>
<td>R/W</td>
<td>Control Register bit 1 = Halt bit 2 = Disable Outputs</td>
</tr>
<tr>
<td>1011</td>
<td>R</td>
<td>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</td>
</tr>
<tr>
<td>1012</td>
<td>R</td>
<td>Scan time in ms</td>
</tr>
<tr>
<td>1013-1014</td>
<td>R</td>
<td>IP Address of current master. Packed MSW, LSW.</td>
</tr>
<tr>
<td>1015</td>
<td>R</td>
<td>“Checksum” of status of first words in rack (changes if modules change)</td>
</tr>
<tr>
<td>1021-1036</td>
<td>R</td>
<td>First status word of register slots 1-16</td>
</tr>
<tr>
<td>1053-1054</td>
<td>R</td>
<td>Checksum of configuration</td>
</tr>
<tr>
<td>1055</td>
<td>R</td>
<td>Configuration mismatches FLASH 1=mismatch</td>
</tr>
<tr>
<td>2049-2092</td>
<td>R/W</td>
<td>Statistics for Ethernet and port 1</td>
</tr>
<tr>
<td>2900-2901</td>
<td>R/W</td>
<td>IP Address of SERM</td>
</tr>
<tr>
<td>2902-2903</td>
<td>R/W</td>
<td>Default Gateway</td>
</tr>
<tr>
<td>2904-2905</td>
<td>R/W</td>
<td>Subnet Mask</td>
</tr>
<tr>
<td>2997</td>
<td>R/W</td>
<td>TCP Backstep</td>
</tr>
<tr>
<td>2998</td>
<td>R/W</td>
<td>TCP Downstream Timeout</td>
</tr>
<tr>
<td>2999</td>
<td>R/Q</td>
<td>TCP Quiet Timeout</td>
</tr>
<tr>
<td>3000-3001</td>
<td>R/W</td>
<td>IPAddress of Allowed Master 0 (Packed MSW, LSW)</td>
</tr>
<tr>
<td>3002-3003</td>
<td>R/W</td>
<td>IPAddress of Allowed Master 1</td>
</tr>
<tr>
<td>3004-3005</td>
<td>R/W</td>
<td>IPAddress of Allowed Master 2</td>
</tr>
<tr>
<td>3006-3007</td>
<td>R/W</td>
<td>IPAddress of Allowed Master 3</td>
</tr>
<tr>
<td>3008-3009</td>
<td>R/W</td>
<td>Watchdog timeout in ms (unsigned integer MSW, LSW)</td>
</tr>
<tr>
<td>3010</td>
<td>R/W</td>
<td>Rack Type 0=None, 1=HRK100, 4=RRK100, 2=HRK150, 5=RRK200, 3=HRK200, 6=RRK300</td>
</tr>
<tr>
<td>3011-3021</td>
<td>R/W</td>
<td>Password for web server null-terminated string</td>
</tr>
<tr>
<td>10001-20000</td>
<td>R</td>
<td>Copy of same registers in index 0 and 1 (SY/MAX Status words)</td>
</tr>
<tr>
<td>20001-30000</td>
<td>R</td>
<td>Copy of same registers in index 0 and 1 (Slot number/Error)</td>
</tr>
<tr>
<td>30001-40000</td>
<td>R/W</td>
<td>Copy of same registers in index 0 and 1 (Default Outputs)</td>
</tr>
</tbody>
</table>

**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 SERM.
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 SERM.

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

The Main page shows the firmware revision of the SERM, 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 are presented in a menu on the left side of the page.

Selecting the Configuration pages will prompt for a user name and password. The username does not matter and may be left blank. The default password is "master" and is case sensitive.
Figure 4-1  SERM Web Server Main Page
The SERMSW software program is provided free of charge to SERM users. This software is used to help configure the operation of the SERM.

**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 SERMSW 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](image)

**oNline**

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

**Edit Configuration**

Upon selection of Edit, SERMSW attempts to connect to the SERM 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 21.

Once SERMSW has been able to connect to an SERM, 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, SERMSW is continuously polling the SERM 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 SERM.
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 21. 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 SERMSW. 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 SERM. Near the top of the center of the screen, the firmware revision of the SERM is displayed. The date displayed in the upper right hand corner of the screen is the revision of the SERMSW32 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 SERM. 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 SERM. 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 SERM 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 SERM, 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 SERM setting the Outputs to the default value. The final configuration in this option is of the rack in which the SERM 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](image)

**edit port I/O configuration**

This option determines how the I/O will be mapped within the SERM. 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.
The offline menu offers several choices for maintenance, storage, and retrieval of SERM configurations. The offline menu is shown in Figure 5-5. The offline menu items perform their operations using a copy of SERM setup parameters in the personal computer’s memory. This copy may not be related to the actual configuration in an SERM that may be connected online. Any changes made in the offline Editing that are needed to be transferred to a connected SERM must be done with the Send memory to module menu item.

**Figure 5-4  SERM Mapper Editor**

**offline**

**Figure 5-5  offline menu**

**Read from disk to memory**

This function reads an SERM 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 .IBS 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 .IBS 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 SERMSW 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 SERMSW menu will appear.

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

**edit port I/O 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 SERMSW 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 SERM. The Serial setup must be properly configured to allow online communication to the SERM. When the "Send memory to module" selection is made, the configuration in the computer’s memory is immediately transferred to the SERM.

**Fetch memory from module**

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

**Copy offline to module flash**

A serial connection must be made to the SERM to use this function. The SERM must have its "RUN/LOAD" switch switched to the "LOAD" position. The program will copy the offline configuration directly to the parameter flash of the SERM. This will allow the user to combine the steps of offline, "Send memory to module" and Utility, "Write setup to EEPROM." When finished, the program will prompt the user to move the "RUN/LOAD" switch back to the "RUN" position.

**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 SERMSW 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 cursor 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 SY/MAX Setup 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 SERM.

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 SERM as inputs and used by the PLC as outputs.
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.

The BBS terminal displays printable ANSI ASCII characters which are received on the port.
SETUP

The setup menu accesses the setup parameters for the personal computer to enable it to communicate with the SERM 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.

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 SERM. This mode is to be used when a direct connection from the personal computer COM: port is made to the SERM. 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 SERM. The Host must be the IP Address of the SERM. Index 255 must be used to configure the SERM.
COMM RS-422 port on SERM (DE9S with slide lock posts)

1. TX- transmit data (inverted) from SERM to output device
2. TX+ transmit data (noninverted) from SERM to output device
3. RX- receive data (inverted) from data source to SERM
4. RX+ receive data (noninverted) from data source to SERM
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 6-1  SY/MAX RS-422 Connector Pinout
Recommended Cabling

SY/MAX Cabling required to configure an SERM

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 SERM. Modbus Slave address 0 or 1 provides access to the rack data.

SERM to personal computer cabling

Connecting the RS-422 SERM 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 SERM. Pins 5 and 6 of the SERM’s RS-422 port provide the +5VDC to power the smart cable. Pins 7 and 8 provide the GND return for the cable.

Cabling required to connect a SERM port to an external device

SERM RS-422 to SY/MAX RS-422 port

<table>
<thead>
<tr>
<th>DE-9P</th>
<th>DE-9P</th>
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<tbody>
<tr>
<td>1</td>
<td>pair 1</td>
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<tr>
<td>2</td>
<td>pair 1</td>
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<tr>
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<td>pair 2</td>
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<td>8</td>
<td></td>
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<tr>
<td>9</td>
<td>shield</td>
</tr>
</tbody>
</table>

This is a Niobrara DC1 cable.