3000-SS32
SoftScreen®/Modicon Modbus Plus Driver

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Table of Contents

SoftScreen/Modicon Modbus Plus Driver

This *SoftScreen* driver allows the Focal Point™ family of 3000 engines to communicate with Modicon Modbus compatible programmable controllers (984 and Quantum series) through a Modbus Plus port.

The driver is installed separately from *SoftScreen*. However, once it is installed, it becomes a part of *SoftScreen* and is downloaded, along with an application, to the run-time engine.

Supported Devices

This driver supports the following devices:

- 984
- 984-785E
- Quantum

Installing the Driver

> **Technical Note**
>
> You *must* install *SoftScreen* before you install the driver.

Because *SoftScreen* is a Windows® 95 program, you must install the Modicon Modbus Plus driver in the Microsoft® Windows 95 Operating System. If you have already installed this driver on your system, this installation will overwrite the current files.

To install the Modicon Modbus Plus driver...

1. Start Windows 95.

Technical Note

SoftScreen must be closed when you install this driver. We also recommend you close all other Windows applications before you install this driver.

2. Insert the Modbus Plus Driver Install disk in your local drive (usually drive A).
3. Click the Start button, and then select the Run command.
4. Type A:setup (or B:setup, depending on which local drive you use) in the Open text box, and then click OK or press ENTER to begin the installation.
5. Press the Next button to proceed to the next setup screen.
6. Follow the on-screen prompts to complete the installation.

   As files are being copied to your hard drive, three icons display on the left side of your workstation screen to indicate your progress.

   The far left icon indicates how much of an individual file has been transferred. The middle icon indicates how much of a floppy has been transferred. The far right icon represents the amount of space occupied on the system's hard drive before you install the driver.

Technical Note

To end the installation process at any time, select the Cancel button in the setup dialog boxes. A prompt will inform you that setup is not complete. Select the Exit Setup button if you still want to exit the installation program. If you wish to continue the installation, select the Resume button.

Uninstalling the Driver

To uninstall the Modbus Plus driver...

1. From Windows 95, click the Start button. Select the Settings command, then Control Panel.
2. From the Control Panel, double-click on Add/Remove Programs.

3. Double-click on the Modbus Plus Driver entry in the list of removable programs on the Install/Uninstall page.
4. Select Yes in the Confirm File Deletion dialog box.

You will be notified once the driver has been successfully uninstalled.

Configuring the SA85 Network Adapter Board

To connect to a Modbus Plus programming port, you must have the SA85 Network Adapter board installed in your system. Figure 1 illustrates the layout of the SA85 board.

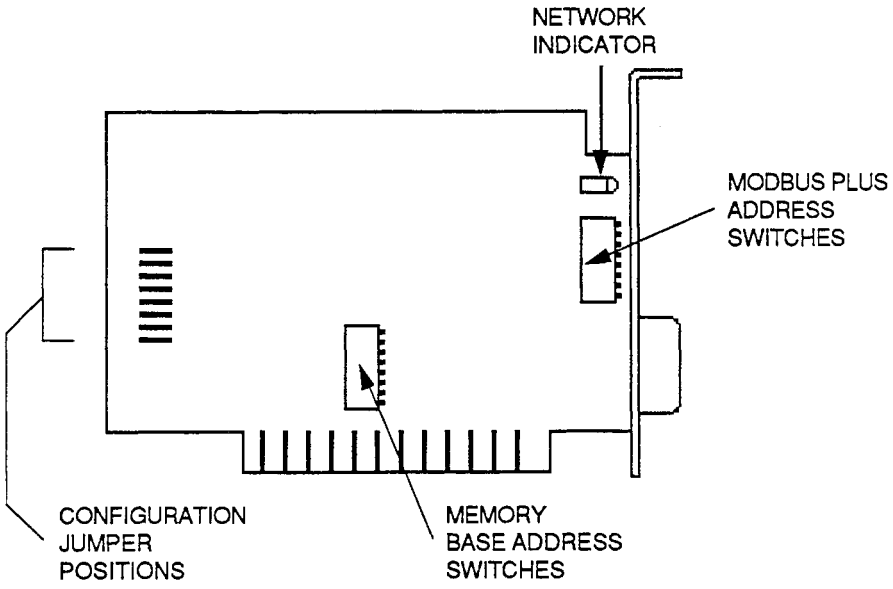

Figure 1. SA85 Network Adapter Board Layout

Setting the Modbus Plus Address

A unique network address is required for each device on the Modbus Plus network. Refer to Table 1 to determine the SA85 address you will use in your application. The address will be one higher than the binary value you set in switches 1 through 6 (switches 7 and 8 are not used).

Use this address in the SA85 Network Address field in the Modbus Plus Configuration dialog box (refer to the *Development System Configuration* section later in this manual).

Table 1. Modbus Plus Network Address Switch Settings

Address	Switch Position						Address	Switch Position					
	1	2	3	4	5	6		1	2	3	4	5	6
1	0	0	0	0	0	0	33	0	0	0	0	0	1
2	1	0	0	0	0	0	34	1	0	0	0	0	1
3	0	1	0	0	0	0	35	0	1	0	0	0	1
4	1	1	0	0	0	0	36	1	1	0	0	0	1
5	0	0	1	0	0	0	37	0	0	1	0	0	1
6	1	0	1	0	0	0	38	1	0	1	0	0	1
7	0	1	1	0	0	0	39	0	1	1	0	0	1
8	1	1	1	0	0	0	40	1	1	1	0	0	1
9	0	0	0	1	0	0	41	0	0	0	1	0	1
10	1	0	0	1	0	0	42	1	0	0	1	0	1
11	0	1	0	1	0	0	43	0	1	0	1	0	1
12	1	1	0	1	0	0	44	1	1	0	1	0	1
13	0	0	1	1	0	0	45	0	0	1	1	0	1
14	1	0	1	1	0	0	46	1	0	1	1	0	1
15	0	1	1	1	0	0	47	0	1	1	1	0	1
16	1	1	1	1	0	0	48	1	1	1	1	0	1
17	0	0	0	0	1	0	49	0	0	0	0	1	1
18	1	0	0	0	1	0	50	1	0	0	0	1	1
19	0	1	0	0	1	0	51	0	1	0	0	1	1
20	1	1	0	0	1	0	52	1	1	0	0	1	1
21	0	0	1	0	1	0	53	0	0	1	0	1	1
22	1	0	1	0	1	0	54	1	0	1	0	1	1
23	0	1	1	0	1	0	55	0	1	1	0	1	1
24	1	1	1	0	1	0	56	1	1	1	0	1	1
25	0	0	0	1	1	0	57	0	0	0	1	1	1
26	1	0	0	1	1	0	58	1	0	0	1	1	1
27	0	1	0	1	1	0	59	0	1	0	1	1	1
28	1	1	0	1	1	0	60	1	1	0	1	1	1
29	0	0	1	1	1	0	61	0	0	1	1	1	1
30	1	0	1	1	1	0	62	1	0	1	1	1	1
31	0	1	1	1	1	0	63	0	1	1	1	1	1
32	1	1	1	1	1	0	64	1	1	1	1	1	1

Setting the Memory Base Address

The SA85 board uses a memory area in your computer as a buffer for the board's status and message transactions. You must define a base address for this memory area that prevents conflict with other boards in your system. Valid base address settings are C8000h to DF800h in 2 Kbyte increments. The default setting in the development system is D0000. Valid settings are listed in Table 2.

Table 2. Memory Base Address Switch Settings

Address	Switch Position							Address	Switch Position						
	1	2	3	4	5	6	7		1	2	3	4	5	6	7
C8000	0	0	1	0	0	0	0	D4000	0	1	0	1	0	0	0
C8800	0	0	1	0	0	0	1	D4800	0	1	0	1	0	0	1
C9000	0	0	1	0	0	1	0	D5000	0	1	0	1	0	1	0
C9800	0	0	1	0	0	1	1	D5800	0	1	0	1	0	1	1
CA000	0	0	1	0	1	0	0	D6000	0	1	0	1	1	0	0
CA800	0	0	1	0	1	0	1	D6800	0	1	0	1	1	0	1
CB000	0	0	1	0	1	1	0	D7000	0	1	0	1	1	1	0
CB800	0	0	1	0	1	1	1	D7800	0	1	0	1	1	1	1
CC000	0	0	1	1	0	0	0	D8000	0	1	1	0	0	0	0
CC800	0	0	1	1	0	0	1	D8800	0	1	1	0	0	0	1
CD000	0	0	1	1	0	1	0	D9000	0	1	1	0	0	1	0
CD800	0	0	1	1	0	1	1	D9800	0	1	1	0	0	1	1
CE000	0	0	1	1	1	0	0	DA000	0	1	1	0	1	0	0
CE800	0	0	1	1	1	0	1	DA800	0	1	1	0	1	0	1
CF000	0	0	1	1	1	1	0	DB000	0	1	1	0	1	1	0
CF800	0	0	1	1	1	1	1	DB800	0	1	1	0	1	1	1
D0000	0	1	0	0	0	0	0	DC000	0	1	1	1	0	0	0
D0800	0	1	0	0	0	0	1	DC800	0	1	1	1	0	0	1
D1000	0	1	0	0	0	1	0	DD000	0	1	1	1	0	1	0
D1800	0	1	0	0	0	1	1	DD800	0	1	1	1	0	1	1
D2000	0	1	0	0	1	0	0	DE000	0	1	1	1	1	0	0
D2800	0	1	0	0	1	0	1	DE800	0	1	1	1	1	0	1
D3000	0	1	0	0	1	1	0	DF000	0	1	1	1	1	1	0
D3800	0	1	0	0	1	1	1	DF800	0	1	1	1	1	1	1

The area used in memory is a 2 Kbyte (800 hex) portion starting at the base address. Select an area that will not be overwritten by other adapters that may be installed.

Setting Jumpers

The SA85 board contains a jumper which enables a hardware interrupt. Verify that the jumper is installed in the polled mode position, as shown in Figure 2.

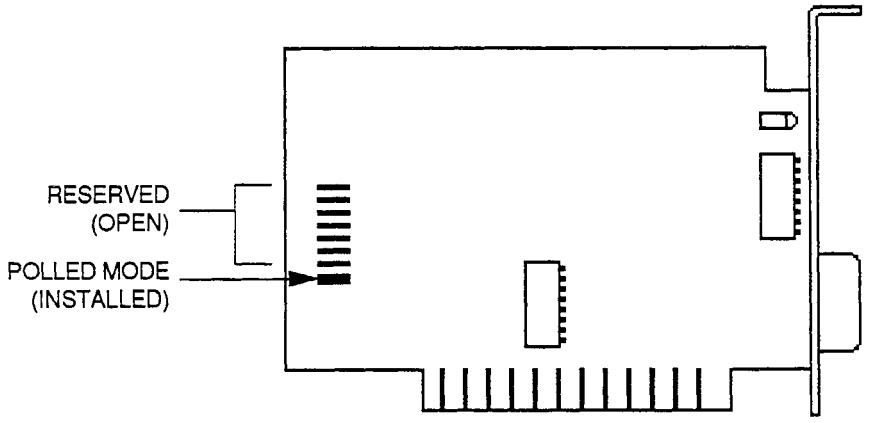

Figure 2. SA85 Jumper Setting

Understanding the Network Indicator

The network indicator (see Figure 1) on the SA85 board reflects the Modbus Plus port's communication status. Table 3 describes the signals the network indicator may produce.

Table 3. Network Indicator Signals

Signal	Description
Six flashes per second	Indicates the mode's normal operating state. The node is receiving and passing the token. All network nodes should be flashing this signal.
One flash per second	Indicates the node is offline after power up or after exiting the four flashes per second mode. When this signal occurs, the node is monitoring the network and is building a table of active nodes and token holding nodes. It remains in this state for five seconds before attempting to go to its normal operating state.
Two flashes, then off for two seconds	Indicates the node hears the token being passed among other nodes, but it never receives the token. Check the network for an open circuit or defective termination.
Three flashes, then off for 1.7 seconds	Indicates the node does not hear any other nodes. It is periodically claiming the token, but it is not finding another node to which to pass it. Check the network for an open circuit or defective termination.
Four flashes, then off for 1.4 seconds	Indicates the node hears a valid message from another node that is using the same address. The node remains in this state as long as it hears the duplicate address. If the node does not hear the duplicate address for five seconds, it changes to one flash per second mode.

Connecting to the PLC

This section describes the serial port configuration and the cabling pin-outs for connecting a 3000 engine to a Modbus Plus PLC.

Configuring the Port

The 3000 workstation connects to a Modbus Plus programming port through the SA85 port via a network cable.

Cabling to the Modbus Plus Network

The network connection (Belden 9841) consists of a twisted pair shielded cable in a continuous run between the device connectors at two locations.

> **Technical Note**
>
> Do not use splices, taps, splitters, or star or tree configurations. The only components you should use are the network cable and network device connectors.

Figure 3 depicts an example of a Modbus Plus network.

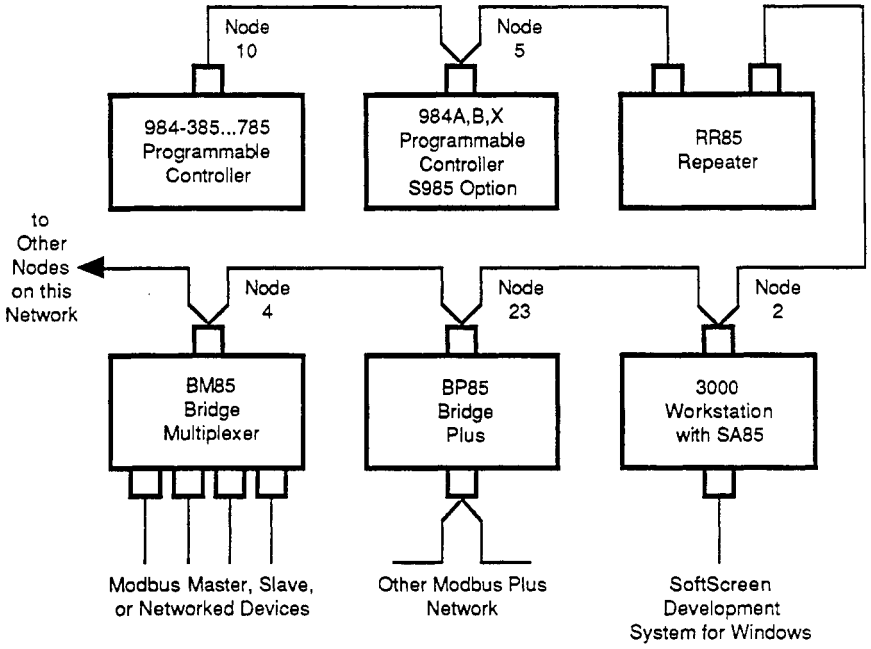

Figure 3. Modbus Plus Network Configuration Example

Figure 4 illustrates the pinout between the 3000 workstation's SA85 port and a Modbus Plus port.

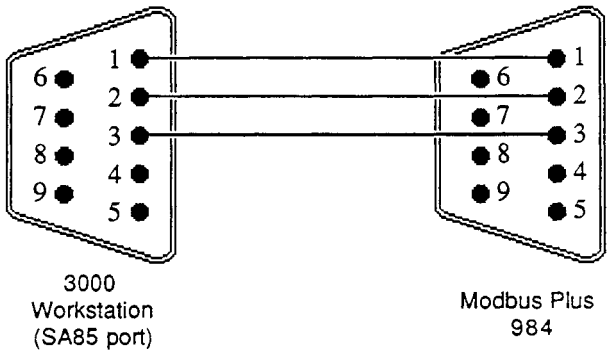

Figure 4. Modbus Plus Pinout

Before building the cable, refer to the *Modicon Modbus Plus Network Planning and Installation Guide* for more information on Modbus Plus cabling and cable termination.

Development System Configuration

Once you have installed the driver (refer to the *Installing the Driver* section at the beginning of this manual), you must configure it in the *SoftScreen* Development System.

To configure the Modbus Plus driver...

1. Open an application in *SoftScreen*. Refer to the *SoftScreen Development System for Windows User's Guide* for information on creating an application.
2. Select the Drivers command on the Configure menu in the Application Navigator. The Configure Physical Drivers dialog box opens, as shown in Figure 5.

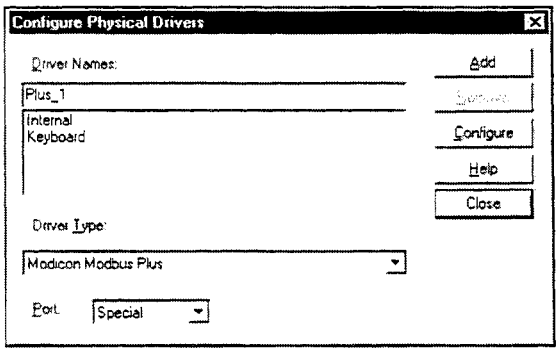

Figure 5. Configure Physical Drivers Dialog Box

3. Select Modicon Modbus Plus from the Driver Type drop-down list box. This is the driver type.
4. Type a unique name in the Driver Names text box, using up to 32 characters. This name can begin with a character or a colon, and can contain alphanumeric characters, underscores, and colons. Tag names cannot begin with or contain a space.
5. Select Special as the Port, since the Modbus Plus driver does not communicate to the PLC through a COM port.

6. Click the Add button. The driver name is added to the Driver Names list box.
7. Highlight the name in the Driver Names list box, and then click on the Configure button.

   The Modicon Modbus Plus Configuration dialog box opens, as shown in Figure 6.

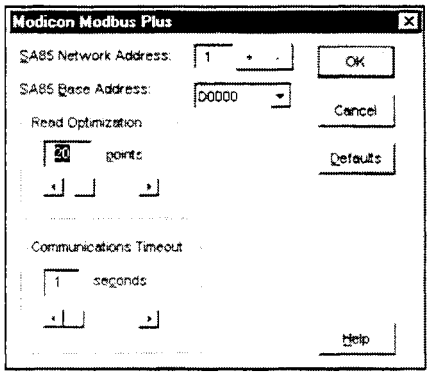

Figure 6. Modicon Modbus Plus Configuration dialog box

This dialog box reflects the default settings. Table 4 defines the fields in this dialog box.

Table 4. Fields in the Modicon Modbus Plus Driver Configuration Dialog Box

Field	Definition
SA85 Network Address	Sets the address of the 3000 workstation on the Modbus Plus network. The range is from 1-64. The default is 1. This must match the switch settings on the SA85 board.
SA85 Base Address	Sets the base address of the SA85 board. This address ranges from C8000h to DF800h in 2 Kbyte increments. The default is D0000. This setting must match the switch settings on the SA85 board.
Read Optimization	Optimizes the number of data points read in a single command, from 1 to 100. The default is 20. This number can be changed to affect driver performance.
Communications Timeout	Sets the time period the engine will wait for a response from the PLC before timing out, from 1 to 99 seconds. The default is 1.

8. Click OK to accept the changes you have made to these settings. If you want to revert to the default settings, click Defaults. Click Cancel to cancel any changes you have made during the current use of the dialog box.

To change settings once you have configured the driver, double-click on the driver name in the Drivers configured list box on the Application Navigator form.

Technical Note

You cannot change the port setting from the Application Navigator form. You must use the Drivers command on the Configure menu in the Application Navigator to change this setting.

Once the driver is configured, you can create tag names that address Modbus Plus data points.

Addressing the PLC

SoftScreen uses tag names to address PLC data points. Tag names can be up to 32 alphanumeric characters. Do not start tag names with a number, a space, or an underscore.

This section describes how to assign these tag names to Modbus Plus PLC data points, and defines valid Modbus Plus expressions.

Assigning Tag Names

To assign a tag name to a Modbus Plus data point...

1. Select Drivers from the Data drop-down list box on the Application Navigator form.
2. Double-click on the driver name for which you want to configure tag names. The Modbus Plus data point configuration form opens, as shown in Figure 7.

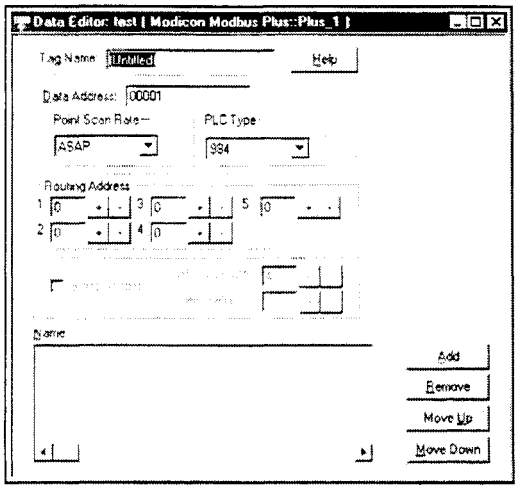

Figure 7. Modicon Modbus Plus Data Point Configuration Form

Table 5 defines the fields in this form.

Table 5. Fields in the Modicon Modbus Plus Data Point Configuration Form

Field	Definition
Tag Name	Defines a unique tag name.
Data Address	Links the tag to a valid data point. The default is 00001. Refer to the *Creating Valid Addresses* section for more information.
Point Scan Rate	Sets how often the run-time engine will read from the data point, from ASAP (as soon as possible) to once every eight hours. The default is ASAP.
PLC Type	Sets the type of Modbus Plus PLC to which you will communicate. The default is 984. (Choose 984 if you will be communicating with a Quantum.)
Routing Address	Sets the node path for the Modbus PLC. There can be up to five nodes per path. The range for each node is 0-64. Zero indicates that there is no further routing.

Field	Definition
String Access	When checked, indicates the data address you entered in the Data address field accesses strings. If this field is checked, you must select a string length, from 1 to 128 characters (the default is 4), and a string terminator character (in hexadecimal), from 0 to FF (the default is 0). When a string is read from the PLC, the driver will search for the specified terminator, replace it with a null and then store it in the run-time engine. When a string is written to the PLC, the driver will append the specified terminator at the end of the string, and then send it to the PLC. *Note: Refer to tables 6 and 7 for information on data types that access strings.*

3. Click Add to add the tag to the Name list box. Click Remove to delete the tag. Click Move Up or Move Down if you want to change the order in which the tags are arranged in the list box, which will change the order in which they are written to or read from.

Creating Valid Addresses

Tables 6 and 7 define the valid data types and address ranges for Modicon Modbus Plus PLCs. All Modbus Plus PLC data types are configured decimally.

Table 6. Modbus Plus 984 Valid Data Types and Addressing Ranges

Data Type	Valid File Range	Size	Bit Access	String Support	R/W
Coil Status	00001-09999	Bit	N/A	No	R/W
Input Status	10001-19999	Bit	N/A	No	R
Input Register	30001-39999	Word	0-15	No	R
Holding Register	40001-49999	Word	0-15	Yes	R/W

Table 7. Modbus Plus 984E Valid Data Types and Addressing Ranges

Data Type	Valid File Range	Size	Bit Access	String Support	R/W
Coil Status	000001-065536	Bit	N/A	No	R/W
Input Status	100001-165536	Bit	N/A	No	R
Input Register	300001-365536	Word	0-15	No	R
Holding Register	400001-465536	Word	0-15	Yes	R/W

Following are examples of tags that address Modicon Modbus Plus data points.

Example_1 addresses output holding register data point 40001, bit 1 at routing address 5, 0, 0, 0, 0 every two hours.

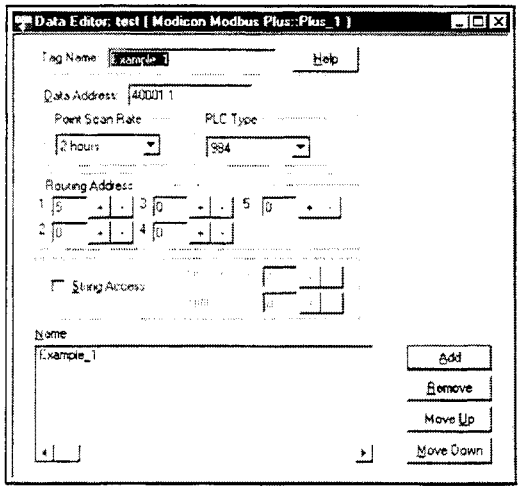

Figure 8. Modicon Modbus Plus Addressing, Example 1

Example_2 addresses input register data point 100001 at routing address 1, 53, 0, 0, 0 ASAP.

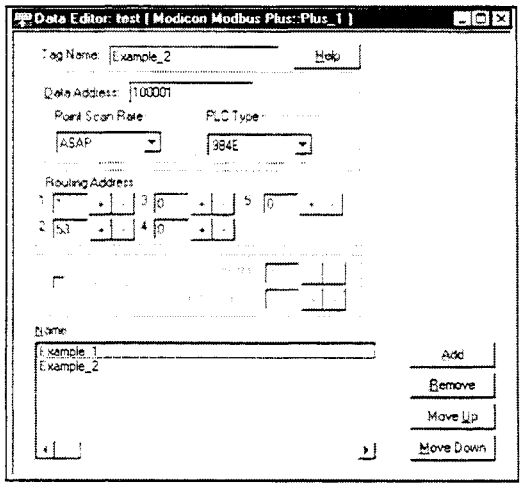

Figure 9. Modicon Modbus Plus Addressing, Example 2

Retrieving Status Information

Use the strings described in this section to retrieve driver status information.

Technical Note

These strings are not case sensitive.

Driver ID

MBPDriverId returns the following null-terminated string identifying the driver running on the 3000 engine: "Modicon Modbus Plus Driver."

Driver Revision

MBPDriverRev returns a string identifying the driver revision level, such as "1.2."

Error Handling

MBPCommStatus returns a number describing the current communication status of the driver. Table 8 defines these status bits.

Technical Note

If the entire number is 0, there are no communication errors.

Table 8. Modbus Plus Communication Status Errors

Error	Description
1	Initialization error
2	Not used
3	Routing error/communications lost
4	Interface command error
5	No SA85 board
6	Not used
7	First diagnostic test failed

Error	Description
8	Second diagnostic test failed
9	Configured node address does not match SA85's
60	Node not running
64	Address error–Station address sent does not match the one received
113	2.5 second interface timeout
114	Bad interface opcode
115	Interface data error
116	Interface test error
117	Interface transfer-done error
118	Bad interface path
119	Bad transfer state
120	Bad transfer length
128	Timeout–It took too long to get a response
129	Illegal Modbus function for the slave
130	Illegal data address for the slave
131	Illegal data value for the slave
132	Device failure–The slave's PC has failed to respond
133	Acknowledge–A delay is occurring because the slave's PC is processing the message
134	Busy–The PC is processing another message

Each of the data points assigned to the driver can have a different update rate, so on any given scan, some points will be scanned and some will not. When the driver detects an error (either read or write), it will post an alarm if it has not previously posted an alarm. The alarm will be posted at the bottom of the screen for three seconds. During any given scan, only the first error condition in the scan will be posted.

The alarm message that is posted will indicate the data point that caused the error, as shown below:

```
"Modbus Plus Addr:(R) 30001"
```

This error occurred while reading address 30001.

The number that indicates the type of error that occurred does not appear on screen. However, the number will be logged in the alarm summary

along with the date and time of the alarm (refer to the *SoftScreen Development System for Windows User's Guide* for information on the alarm summary).

If the driver is optimizing points, it will read data points in optimized blocks, instead of one at a time. If an error occurs while the driver is reading the block, the alarm message will describe the data point that was at the beginning of the block.

For example, if the driver reads an optimized block of data points (a, b, and c), and an error occurs because data point "c" does not exist in the target device, an alarm message is posted. This message will indicate that there was an error reading data point "a," not data point "c."

Once the driver completes a scan without any errors (after an error has occurred in a previous scan), then the driver will post the following message:

```
"Modbus Plus: Communication Restored"
```

Communication Status

MBPCommString returns a null-terminated string describing the current communication status of the driver. For example, if there are no errors, it would return the following string:

```
"Modbus Plus: NO Errors"
```

Scan Time

MBPScanTime returns a number (in msecs) describing the amount of time it takes the driver to read the current data points. For example, if all data points are set to ASAP, the system would track the time between the starting point of the scan and the ending point, and then would display the scan time based on these two numbers. However, if one data point is set to an ASAP scan rate and another is set to an eight hour scan rate, the system would continue to read the ASAP point until eight hours had passed, then it would read the ASAP point and the eight-hour point, and then provide you with the time period it took for this scan to read both the points.

Index

N

P

R

S

T

U