3000-SS30
SoftScreen® /Allen-Bradley
SLC 500 Driver

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Address comments concerning this manual to:

xycom

Technical Publications Department
750 North Maple Road
Saline, Michigan 48176-1292

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SoftScreen/Allen-Bradley SLC 500 Driver

This *SoftScreen* driver allows Focal Point™ 3000 engines to communicate with the Allen-Bradley SLC 500 family of PLCs using the DH-485 protocol.

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:

- SLC 5/01
- SLC 5/02
- SLC 5/03
- SLC 5/04
- 1774-KF3 communications module
- AIC module
- PIC module

Technical Note

This driver does *not* support DH+ or SLC 500 fixed I/O controller.

Installing the Driver

Technical Note

You *must* install *SoftScreen* before you install the driver.

Because *SoftScreen* is a Microsoft Windows® 95 Operating System program, you must install the Allen-Bradley SLC 500 driver in Windows 95. If you have already installed this driver on your system, this installation will overwrite the current files.

To install the Allen-Bradley SLC 500 driver...

1. Start Windows 95.

> **Caution**
>
> *SoftScreen* must be closed when you install this driver. We also recommend you close all other Windows applications when you are installing this driver..

2. Insert the Allen-Bradley SLC 500 Driver Install disk in your floppy 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 floppy 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 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 A-B SLC 500 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.

Connecting to the PLC

This section describes the serial port configuration and the cabling pinouts for connecting a 3000 engine to a SLC 500.

Configuring the Port

You can connect a 3000 engine to a SLC 500 programming port via the RS-485 port multidrop protocol or through an Allen-Bradley 1747-PIC module card (a RS-232 to RS-485 converter) using the RS-232C port protocol. You can also connect from the 3000 engine's RS-232C port directly to the PLC's RS-232 port.

Cabling

Electromagnetic Compatibility Warning

The connection of non-shielded equipment interface cables to the Focal Point workstations will invalidate FCC EMI and European Union EMC compliance and may result in interference and/or susceptibility levels which are in violation of relevant regulations. It is the responsibility of the system integrator and/or user to obtain and use shielded interface cables and equipment. If this equipment has more than one connector, do not leave cables connected to unused interfaces. Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

All interface cables must include braid/foil type shields. Communication cable connectors must be metal, ideally zinc die-cast backsheet types, and provide 360° protection about the interface wires. The cable shield braid must be terminated directly to the metal connector shell; ground drain wires alone are not adequate.

RS-232C Connections

Figure 1 illustrates the pinouts to connect from the 3000 engine's RS-232C port to the SLC 500's RS-232C port. Figure 2 illustrates the pinouts to connect from a 3000 engine to a SLC 500 programming port through the A-B 1747-PIC module

Technical Note

When connecting via the RS-232C standard, use a Belden 9925 cable, maximum length 50 feet. Keep the cable away from high voltage and current-carrying cables. Refer to the EIA RS-232C specification for more details.

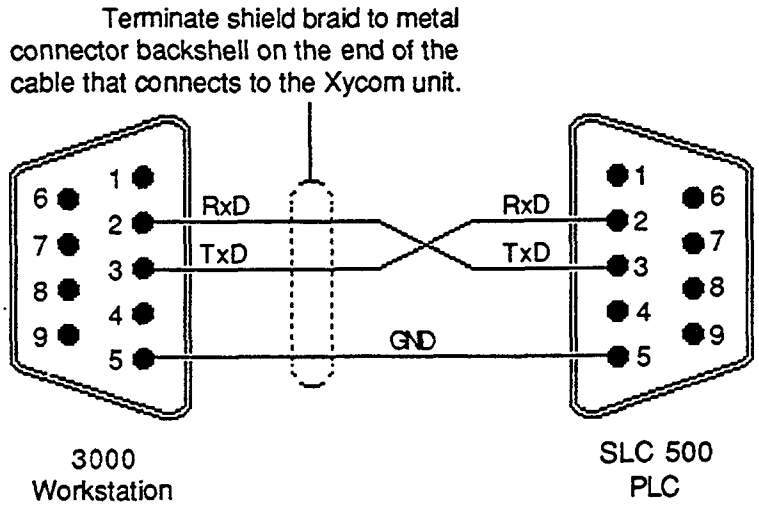


Figure 1. RS-232C Pinouts

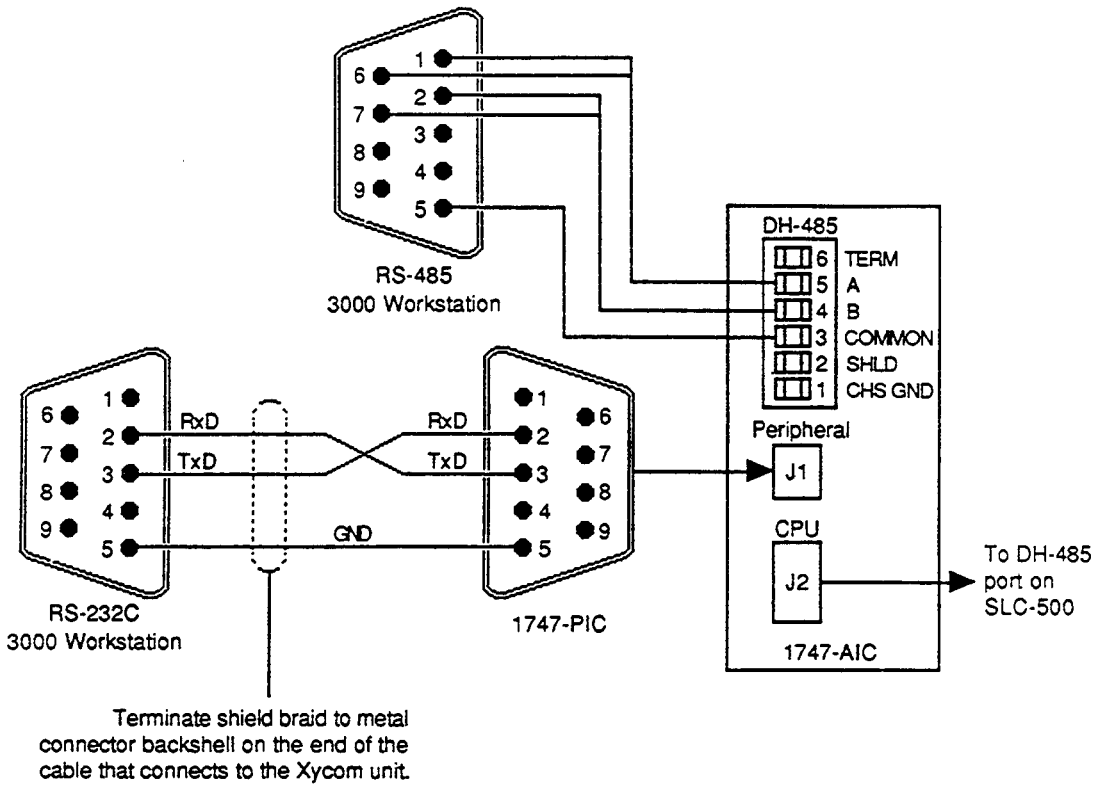


Figure 2. RS-232C Pinouts Using a 1747-AIC module

RS-485 Connections

Figure 3 shows the pinouts to connect a 3000 engine directly to a SLC 500 programming port via the DH-485 multidrop protocol.

Technical Note

When connecting via RS-485, use a Belden 8302 cable, maximum length 4000 feet. Keep the cable away from high voltage and current-carrying cables. Refer to EIA RS-485 specifications for more details.

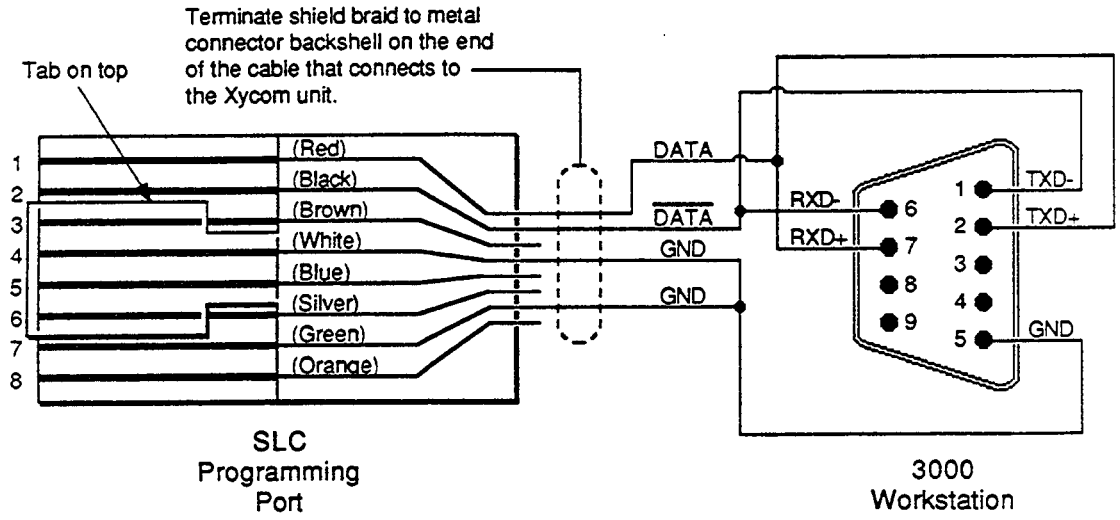


Figure 3. RS-485 Pinouts

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 development system. Once it is configured, you can create tag names that address PLC data points.

To configure the driver...

1. Open a *SoftScreen* application. See the *SoftScreen for Windows* manual 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 4.

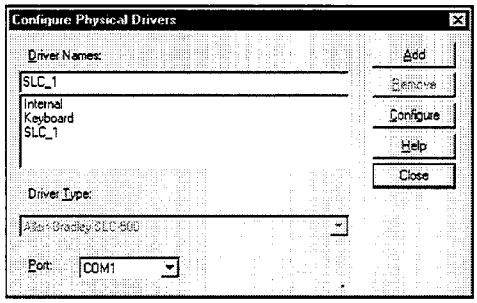


Figure 4. Configure Physical Drivers Dialog Box

3. Select Allen-Bradley SLC 500 from the Driver Type drop-down list box.
4. Type a unique name in the Driver Names text box, using up to 32 characters. Tag names can begin with a character or a colon, and can contain alphanumeric characters, underscores, and colons. Tag names cannot begin with or contain spaces.
5. Select the port to which you want to connect the PLC. Choices are None, COM1, and COM2. The default is None.
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 Allen-Bradley SLC 500 Configuration dialog box opens, as shown in Figure 5.

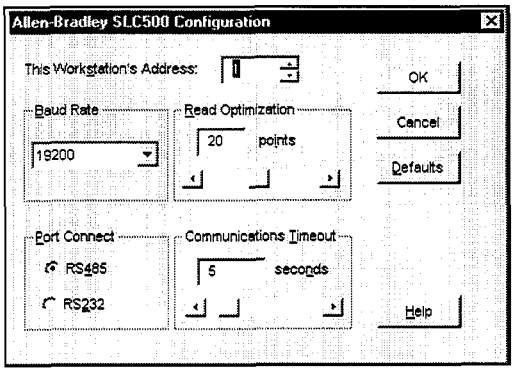


Figure 5. Allen-Bradley SLC 500 Configuration Dialog Box

You can change the settings to conform to your PLC. Table 2 defines the fields in this dialog box.

Table 1. Fields in Allen-Bradley SLC 500 Configuration Dialog Box

Field	Definition
This Workstation's Address	Sets the station address at which the 3000 engine resides on the DH-485 network, from 0 to 31 decimal. The default is 1.
Baud Rate	Sets the baud rate at which you transfer data. Choices are 1200, 2400, 9600, or 19200. The default is 19200.
Read Optimization	Optimizes the number of data points read in a single command, from 1 to 41. The default is 20. This number can be changed to affect driver performance.
Port Connect	Sets the type of port through which the 3000 engine will communicate to RS-485 or RS-232. The default is RS-485.
Communications Timeout	Sets the time period the engine will wait for a response from the PLC before timing out, from 1 to 30 seconds. The default is 5.

8. Click Defaults to revert to the original dialog box settings. Click Cancel to cancel any changes you have made during the current use of the dialog box. Click OK if you want to accept the changes you have specified.

To make changes to the 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 settings from the Application Navigator form. You must use the Drivers command on the Configure menu in the Application Navigator to change port settings.

Addressing the PLC

This section defines how to assign tag names, and identifies the allowable expressions used to address SLC 500 data points.

SoftScreen uses tag names to address PLC data points. Tag names can be up to 32 alphanumeric characters and can include underscores and colons. Do not start tag names with a number or a space.

Assigning Tag Names

To assign a tag name to a SLC 500 PLC 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 Allen-Bradley SLC 500 data point configuration form opens, as shown in Figure 6.

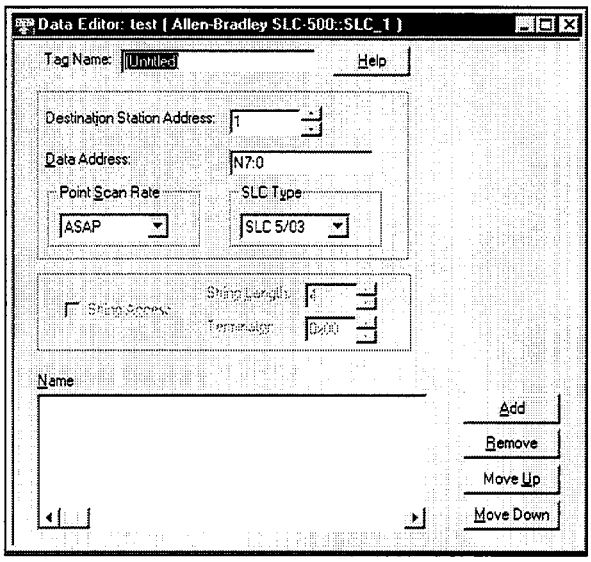


Figure 6. Allen-Bradley SLC 500 Data Point Configuration Form

Use the fields in this form to create tags that address PLC data points. Table 2 defines each of the fields.

Table 2. Fields in Allen-Bradley SLC 500 Data Point Configuration Form

Field	Definition
Tag Name	Defines a unique tag name.
Destination Station Address	Sets the station address of the PLC to which you will communicate, from 1 to 31 decimal. The default is 1.
Data Address	Links the tag name to a valid SLC 500 data point. The default is N7:0. See 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 to once every eight hours. The default is ASAP.
SLC Type	Identifies the SLC model to which you are communicating. Choices are 5/01, 5/02, 5/03, and 5/04. The default is 5/03.

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). *Note: If your data type is ST, the string length is fixed at 82 characters.* 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 3 and 4 for information on data types that access strings.*

Creating Valid Addresses

Table 3 defines the valid data types and file ranges for SLC 500 PLCs. All values are decimal unless otherwise noted.

Table 3. Valid Allen-Bradley SLC 500 Data Types and File Ranges

Data Type	Preset File #	Valid File Range	String Support	Element	Subelement	Bit Access	R/W
Output (O)	0	0	No	SLC 5/01 - /04 slot # 1-30	0-255	0-15	R/W
Input (I)	1	1	No	SLC 5/01 - /04 slot # 1-30 decimal	0-255	0-15	R
Status (S)	2	2	No	SLC 5/01: 0-15 SLC 5/02: 0-32 SLC 5/03: 0-82 SLC 5/04: 0-96	N/A	0-15	R
Binary (B)	3	9-255	No	0-255	N/A	0-15	R/W
Binary (B)	3	9-255	No	N/A	N/A	0-4095	R/W
Timer (T)	4	9-255	No	0-255	.CON (control word); .PRE (preset value); .ACC (accumulated value)	0-15	R/W
Counter (C)	5	9-255	No	0-255	.CON (control word); .PRE (preset value); .ACC (accumulated value)	0-15	R/W
Control (R)	6	9-255	No	0-255	.CON (control word); .LEN (length word); .POS (position)	0-15	R/W
Integer (N)	7	9-255	No	0-255	0-255	0-15	R/W

Data Type	Preset File #	Valid File Range	String Support	Element	Subelement	Bit Access	R/W
Floating Point (F)	8	9-255	No	SLC 503: 0-255 SLC 504: 0-255	N/A	N/A	R/W
String (ST)	N/A	9-255	Yes	SLC 503: 0-255 SLC 504: 0-255	N/A	N/A	R/W
ASCII (A)	N/A	9-255	Yes	SLC 503: 0-255 SLC 504: 0-255	N/A	N/A	R/W

There are also two data types that are unique to this driver: NETSTATUS and RUN.

NETSTATUS reads a PLC station's network status. It indicates whether the given PLC station (0-31) on the SLC 500 network is active. A 1 value indicates the station is found and active; a 0 indicates the station is either on the network and inactive, or it is not on the network.

RUN reads/writes the PLC's operating mode. A non-zero value indicates the PLC is in RUN mode; a 0 indicates it is in PROGRAM mode. If used as a write data type, a non-zero value changes the PLC's mode to RUN; a 0 changes it to PROGRAM.

In order to use the RUN data type to write to the PLC and change the operating mode, the key switch of the SLC 5/03 and SLC 5/04 PLC's must be in the REM position.

Note

Attempting to set the RUN or PROGRAM operating mode will result in a comm error.

Addressing Issues

The SLC 5/01, 5/02, 5/03, and 5/04 processors are modular controllers that can be configured with a maximum of three racks (30 total slots), with a minimum of four I/O points to a maximum of 256 I/O points. This allows many different I/O configurations. Because of this modularity, the addressing of these modules from SoftScreen needs to be explained further.

Slot 0 in a modular SLC controller is reserved for the CPU module. Slots 1 through 30 are available for I/O. Therefore, if you have an input module in slot 1 (adjacent to the CPU module), it can be addressed using the expression I:1.

The difference between a fixed and modular controller occurs when you have an input module in slot 2 and leave slot 1 empty. This is because Allen-Bradley stores the I/O data in the corresponding I/O files by taking the first module it finds in the rack, and putting it at the beginning of the input file. Therefore, in *SoftScreen*, the expression I:1 addresses the input module in slot 2 when slot 1 is open.

Think of it as sliding all of the modules in the rack toward the CPU module, and then using the physical slot number to address the desired I/O module. The Allen-Bradley APS Software knows the I/O configuration, and can appropriately adjust the I/O addressing so that you can use I:2 to address an input module located in slot 2 when slot 1 is open.

Technical Note

Xycom recommends that you do not use the *SoftScreen* input (I) or output (O) expressions if you plan on leaving open I/O slots, or if, in the future, you want to insert modules in your backplane after you have developed your *SoftScreen* application. Instead, you should move your I/O to a work file with your ladder program, and reference the I/O from that file. This way you will never have to contend with *SoftScreen* addressing changes if the physical configuration of the I/O racks changes.

Addressing Examples

Following are some examples of expressions addressing Allen-Bradley SLC 500 PLC data points using *SoftScreen*.

Example_1 addresses integer file 7, element 0 from a SLC 5/02 at station address 10, ASAP.

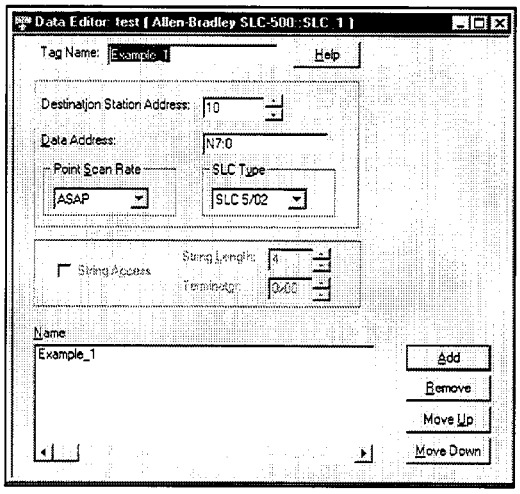


Figure 7. Allen-Bradley SLC 500 Addressing, Example 1

Example_2 addresses counter file 5, element 46 (preset value) of a SLC 5/03 at station address 10 every eight hours.

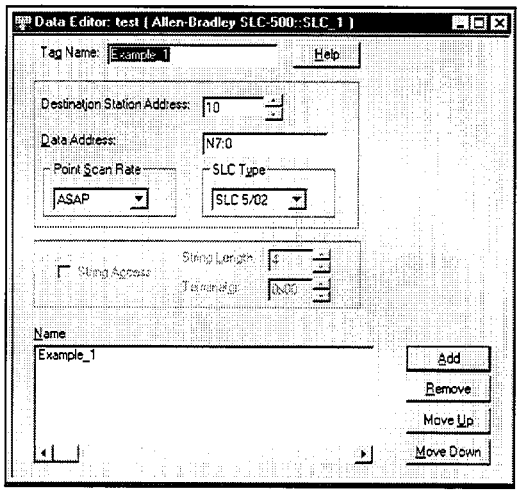


Figure 8. Allen-Bradley SLC 500 Addressing, Example 2

Example_3 addresses ASCII file 10, element 234 of a SLC 5/04 at station address 5 every 10 minutes.

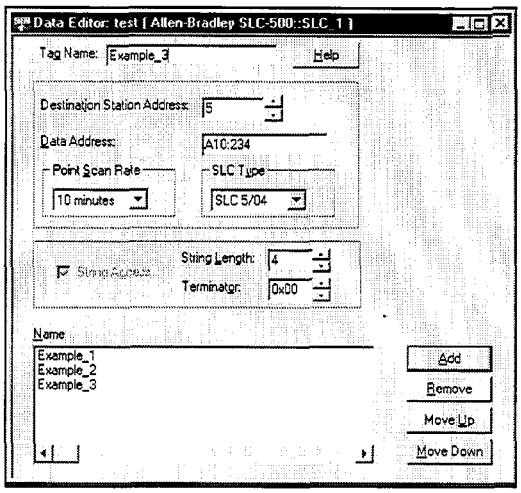


Figure 9. Allen-Bradley SLC 500 Addressing, Example 3

Retrieving Status Information

Use the strings described in this section to retrieve status information during run-time.

> **Technical Note**
>
> Status strings are *not* case sensitive.

Driver ID

SLCDriverID returns the following null-terminated string identifying the driver running on the 3000 engine:

```
"Allen-Bradley SLC 500 driver"
```

Driver Revision

SLCDriverRev returns a string identifying the driver revision level: AB Driver Revision: `1.3`

Error Handling

SLCCommStatus returns a decimal number describing the current communication status of the driver. Table 4 defines these errors.

Technical Note

If no bits are set, there were no communication errors.

Table 4. SoftScreen/Allen-Bradley SLC 500 Error Codes

Bit	Description
0	Timeout–PLC did not respond in the configured amount of time.
1	Transmit error–Unused.
2	Receive error–Unused.
3	CRC error–The CRC calculated by this driver on the message returned by the PLC did not equal zero.
4-7	Reserved.
8	Extended Status error–Bits 15-22 contain an error code returned by the PLC.
9	Message Number error–The message number of the message sent by the PLC to this station did not match the message number of the message sent by this station to the PLC.
10	Address error–Illegal PLC address.
11	Data error–It is illegal to write this data value to this location.
12-14	Unused.
15-22	Extended Status Code–If status bit 8 is true then these bits contain an error code returned by the PLC. Refer to your Allen-Bradley documentation for more information.
23-31	Reserved.

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:

```
"SLC 500 Port:1 DEST:8 Addr:(R) T4:0.ACC"
```

This error occurred while reading (R) T4:0.ACC from SLC 500, destination PLC address 8, on port 1.

The number that indicates the type of error that occurred (see Table 4) 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:

```
"SLC 500: Communication Restored"
```

Communication Status

SLCCommString returns a null-terminated string describing the current communication status of the driver.

Scan Time

SLCScanTime 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.

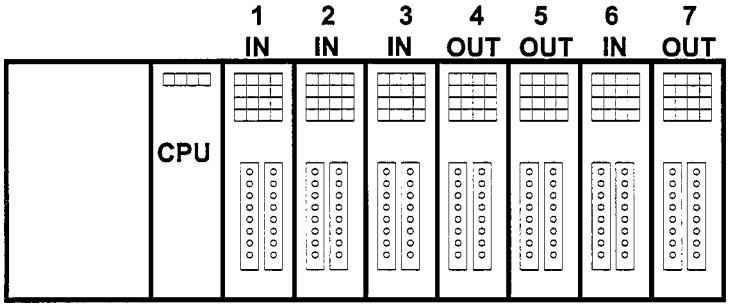
Application Notes

For various reasons, the method of defining a SLC 500 address differs in SoftScreen as compared to Allen Bradleys APS programming software. The next few sections describe to two major areas of concern.

I/O Addressing

When talking to I/O modules, AB always refers to the slot number of the rack, but SoftScreen accesses the direct memory data table and does not know which rack a module is plugged into. Addresses are determined by counting the input and output modules.

In this example, the output module in slot 5 would be O:5 to the AB but to SoftScreen it's O:2 since it's the second output module in the data table. The module in slot 7 would be O:3 to SoftScreen. To refer to discrete bits you still need to add the bit modifier: O:3/5 for bit 5. Input and Output modules have their own separate areas within the data table. Accordingly, the module in slot 6 would be I:4 to SoftScreen since it's the fourth input module in the rack. SoftScreen doesn't care about the actual physical location.



	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
A-B	I:1	I:2	I:3	O:4	O:5	I:6	O:7
SoftScreen	I:1	I:2	I:3	O:1	O:2	I:4	O:3

Note: This table is valid for this example PLC configuration only.

Internal Bit Addressing

Addressing internal bits is also different in SoftScreen than in APS. Allen-Bradley refers to each bit file as one large file and all that needs to be specified is the file number and the bit number. SoftScreen addressing must include the word number as well.

In this example of a SLC500 data file, the highlighted ONE bit would be *B3:37* to APS but in a SoftScreen application, it must be defined as *B3:2/5*. This translates to File B3, word 2, bit 5.

address	15		data	0
B3:0	0000	0000	0000	0000
B3:1	0000	0000	0000	0000
B3:2	0000	0000	0010	0000
B3:3	0000	0000	0000	0000
B3:4	0000	0000	0000	0000
B3:5	0000	0000	0000	0000
B3:6	0000	0000	0000	0000
B3:7	0000	0000	0000	0000
B3/37 = 1				

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