3100/3101-SYS
Revision 1.5
3150/3151-SYS
Revision 1.5

February 1996

Systronics Communication Module

USER MANUAL

TABLE OF CONTENTS

APPENDICES

Appendix A
     PLC-5 Example Ladder Logic
     SLC Example Ladder Logic

Appendix B
     Definitions of RS-232C Handshaking Signals
     RS-232C Cable Configuration
     RS-422/RS-485 Cable Configuration

Appendix C
     3100/3101 Jumper diagrams
     3150/3151 Jumper diagrams

Appendix D
     Product Revision History

Appendix E
     Systronics Protocol Specification
        (Provided by Conoco)

I.   Card Overview

The ProSoft Technology, Inc. Systronics VSAT Slave firmware upgrade gives Allen-Bradley 1771 and 1746 I/O compatible processors the ability to interface to a Systronics VSAT Master device on up to two ports per module. The product includes the following capabilities:

- Foxboro / Systronics Minimote RTU Protocol

- Two fully configurable serial ports, each capable of supporting the full implementation of the protocol

- Binary Data Stream with CRC-16 Error Checking

- Supported File Numbers:
14h	Analog Data
19h	Status Data
37h	Accumulator Data - 32 bit
1Dh	Momentary Control Select
21h	Setpoint Select
23h	Execute Selected Control File
2Ch	Pulse Train Control File
30h	Multi-file Streaming Data Setup
3Fh	Multi-file Streaming Data
3Ch	VSAT Timer Setup
3Eh	20 msec Timer
41h	Analog Deviation Limits
44h	Accumulator Reset Commands
47h	32 bit Accumulator Current End of Batch
4Bh	Tank Levels

- Master Broadcast Addressing to Slaves (#127)

- Software configuration (From PLC)
Address	:	1 to 126
Parity	:	None, odd, or even,
Stop Bit	:	1 or 2
Baud Rate	:	300 TO 38,400

- Hardware RS-232C handshaking for modem and radio applications

- RS-422/RS-485 compatible for multi-drop applications

(This page intentionally left blank)

II. Systronics VSAT Programming Considerations

2.1 Systronics VSAT Communications

The ProSoft Systronics VSAT Slave module runs the Systronics Minimote protocol. This capability allows the module to communicate data from a PLC/SLC to a Systronics Master and vice-versa. The module supports both point-to-point as well as multi-drop implementations.

The following discusses the functional capabilities of the Prosoft card.

2.1.1 Command/Reply Cycle

Successful communications between a Systronics Slave and a Master will always consist of the following two transactions:

Command: Message from master giving instruction to slave.

Reply: Response to command.

A slave station will respond to a master issued command in several ways.

Data Message: If the command was executed by the slave, the response message will include the data requested, or an acknowledgement that the command was executed.

Error Message: If the command could not be executed by the slave, for whatever reason, an error response message is transmitted to the master.

No Reply: If the master does not detect a reply within its timeout period, the master should re-transmit the command, before a time out error is issued. If the Slave could not decode the message or an error occurred preventing the Slave from recognizing the message, no response will be issued.

2.1.2 Report by Exception

The Systronics Slave may also report by exception. Any change noted in the Status bits (19h) or Analog values exceeding deviation limits (14h) will generate a message from the slave to the master. This message will transmit the current Status or current Analog data to the master.

Timing for the transmission of these messages is configured using file 3Ch. File 3Fh is multiple file report command which will return all data on a periodic basis, as determined by the user configuration in file 3Ch.

2.1.3 Command Types in the Systronics Slave

The Systronics Slave can respond to two types of commands from the master; read data and write data. These are discussed collectively in Section V since some command types are both read and write types.

2.1.4 Command Error Checking

When the Systronics Slave cannot execute a command, an error code is generated and returned to the master. Error codes generated at the slave will usually be indicative of an illegal function, an illegal address, bad data, or the inability to complete a transaction because of a network problem.

2.1.5 Data Integrity

As in all good protocols, there must exist a level of data integrity checking to verify, with some degree of assurance, the quality of the transmitted data. The Systronics protocol supports two types of error checking:

- 16 bit cyclic redundancy check (CRC-16)
- One bit parity check

A key criteria to keep in mind when implementing a network is to make sure that the master and all the slaves are configured with the same error checking method.

CRC-16: When the master generates a message, a 16 bit CRC value is added to the end of the transmitted packet. The CRC value is generated using a series of bit shifts and manipulations. The receiving station executes the same calculation on the data and verifies the transmitted CRC. Any discrepancy will cause the message to be disregarded.

Parity: Parity checking can be added as an additional level of data security. If parity checking is selected, even or odd parity can be implemented.

2.2 Module Memory Layout

This section explains the different segments of the memory which are utilized in the PLC and in the Systronics Slave module.

2.2.1 Data Memory

Data is transferred from the PLC/SLC to the module asynchronously from the Master's data read requests. This allows the application ladder logic to manipulate and position the data as needed before transfer to the module. Since the module stores the data from the ladder logic in local memory, read requests from the Master are serviced immediately.

The data registers are moved over the backplane between the module and the processor using the standard Block Transfer read and write functions, in the case of a PLC, and M0/M1 file transfers in the case of an SLC.

The module controls the data which is transferred from the module to the PLC/SLC during a read (BTR or M1 instruction) from the module. Being a slave module, the only time valid 'data' is transferred to the ladder logic is when a write command is issued from the Master.

When writing data from the ladder logic to the module (BTW or M0 instruction), the ladder logic controls the data written to the module. Appendix A contains a PLC5 and a SLC program showing an example of the logic to transfer data registers to and from the module. *Section III* discusses the transfer mechanism in detail, as well as several important relationships between PLC / SLC addressing, module addressing, and protocol addressing.

The relationship between the Systronics addressing and the processor's addressing is shown in the figure below. The processor programs in Appendix A are designed to support this data table configuration. In order to modify the flow and / or directions of the data, the example ladder logic needs to be modified.

Filetype	File #'s	Valid Addresses	PLC / SLC Addresses
16 bit registers	14h	0 - 61	N12:0 - N12:49
16 bit binary	19h	0 - 123	N12:50 - N12:99
32 bit acc EOBatch	47h	0 - 15	N12:100 - N12:149
32 bit accumulator	37h	0 - 31	N12:150 - N12:199
Tank Levels	4Bh	0 - 31	N12:200 - N12:249
Momentary Control	1Dh	Bit:0 - 255	B13:0 - B13:15
		Card 0 - 15	
Setpoint Select	21h	Reg:0 - 4095	N11:0 - N11:32
Accumulator Reset	44h	1 -2	B13:16 - B13:17

Relationship between Systronics addressing & PLC / SLC Data Tables

2.2.2 Communications Configuration Parameters

The communications configuration parameter data block contains the information necessary for the module to set up the module's communications ports. *On power up, the module will not proceed without receiving this configuration block*.

2.2.3 File 30h and 3Ch Configuration Values

The configuration values for File 30h (Multi-File Streaming Data Setup) and File 3Ch (VSAT Timer Setup) are stored in the processor data image. This image may be edited manually as well as being updated by downloads from a host.

(This page intentionally left blank)

III.   SYS Module Theoretical Operation

Data transfers between the processor and the ProSoft Technology module occur using the Block Transfer commands, in the case of the PLC, and M0/M1 data transfer commands, in the case of the SLC. These commands transfer up to 64 physical registers per transfer.   The logical data length changes depending on the data transfer function.

The following discussion details the data structures used to transfer the different types of data between the ProSoft Technology module and the processor. The term 'Block Transfer' is used generically in the following discussion to depict the transfer of data blocks between the processor and the ProSoft Technology module. Although a true Block Transfer function does not exist in the SLC, we have implemented a pseudo-block transfer command in order to assure data integrity at the block level.   Examples of the PLC and SLC ladder logic are included in Appendix A.

> In order for the ProSoft Technology module to function, the PLC must be in the RUN mode, or in the REM RUN mode. If in any other mode (Fault/PGM), the block transfers between the PLC and the module will stop, and communications will halt until block transfers resume. [***Note***: PLC Version ONLY]

3.1   Moving Data to the Module

This section discusses how to transfer Data, Status and Analog data to the ProSoft module.

Data transfer to the module from the processor is executed through the Block Transfer Write function.   The different types of data which are transferred require slightly different data block structures, but the basic data structure is:

WORD	DESCRIPTION
0	Block ID code
1-63	Data

> In a PLC, the BTW length must be configured for 64 words. In an SLC, the M0 file should be configured for 64 words. Otherwise module operation will be unpredictable.

where:

BLOCK ID CODE: A block identifier code between 0-6 and 255 in value. This code is used by the ProSoft module to determine what to do with the data block. Valid codes are:

CODE	DESCRIPTION
0-6	File and Data Identifier
255	Communication Configuration Parameters

DATA: The data to be written to the module. The structure of the data is dependent on the block ID code. Sections 3.1.1 and 3.1.2 provide details on the different structures.

3.1.1 Communications Configuration Parameters

The ProSoft Technology firmware communication parameters must be configured at least once when the card is first powered up, and any time thereafter when the parameters must be changed.

On power up, the module enters into a logical loop waiting to receive configuration data from the processor. While waiting, the module sets the first word of the BTR buffer to 255, telling the processor that the module must be configured before anything else will be done. The module will continuously perform block transfers until the communications configuration parameters block is received. Upon receipt, the module will begin execution.

> Transferring the Communications Configuration Parameters to the module will force a reset of the communication port, as well as dropping DTR to reset any attached hardware.

The configuration data block structure which must be transferred from the processor to the module is as follows:

Data Word		Description
		Block ID Header = 255
Port 1		
0	N[]:0	Port Configuration Word
1	N[]:1	Address (if configured as a Slave)
2	N[]:2	Baud Rate
3	N[]:3	RTS to TxD Delay
4	N[]:4	RTS off Delay
5	N[]:5	Message Response Timeout
6	N[]:6	Inter-character timing
7	N[]:7	Momentary Select Count
8	N[]:8	Setpoint Select Count
9	N[]:9	Setpoint Table Initialize
Port 2		
10	N[]:10	Port Configuration Word
11	N[]:11	Address (if configured as a Slave)
12	N[]:12	Baud Rate
13	N[]:13	RTS to TxD Delay

<pre>
14   N[]:14   RTS off Delay
15   N[]:15   Message Response Timeout
16   N[]:16   Inter-character timing
17   N[]:17   Momentary Select Count
18   N[]:18   Setpoint Select Count
19   N[]:19   Setpoint Table Initialize
</pre>

System Configuration
<pre>
20   N[]:20   Not Used
21   N[]:21   Not Used
22   N[]:22   Not Used
23   N[]:23   Not Used
24   N[]:24   Not Used
25   N[]:25   Block Transfer Delay Counter
</pre>

Where:

For Port 1 and Port 2

Port Configuration Word: This register contains several communication configuration parameters encoded into the word. These are as follows:

> **Type:** The operating mode of the port is selected by these bits:
>
> > **Bits**
> > **3210**
> > 0001   Systronics Slave
> > (Other modes not valid at this time)
>
> **Stop Bits:** The number of stop bits to be used is defined as follows:
>
> > **Bits**
> > **13 12**
> > 0   0   One stop bit
> > 0   1   Two stop bits
> > 1   x   Invalid Port Configuration
>
> **Parity:** The parity mode to be used by the module is defined by this word as follows:
>
> > **Bits**
> > **15 14**
> > 0   0   No parity
> > 0   1   Odd parity
> > 1   0   Even parity
> > 1   1   Invalid Port Configuration

Baud Rate: The baud rate at which the module is to operate. The baud rate is configured as follows:

Value	Baud Rate
0	300 Baud
1	600 Baud
2	1200 Baud
3	2400 Baud
4	4800 Baud
5	9600 Baud
6	19200 Baud
7	38400 Baud

> The module's two ports are limited to an upper baud rate of either 19200 or 38400 baud. The module cannot be configured with one port at 19200 and the other at 38400. If an attempt is made to configure the module in this fashion, a Port Configuration Error will be returned.

RTS To TXD Delay: This value represents the time in 1 ms increments to be inserted between asserting RTS, and the actual transmission of data. The delay, if greater in duration than the hardware time delay associated with CTS, will override the CTS line until the time-out is complete.

This configurable parameter is useful when interfacing with modem based devices, or anytime line noise must be allowed to subside before data is transmitted.

RTS Off Delay: The value in this word represents the number of 1 ms time delay increments inserted after the last character is transmitted and before RTS is dropped. The module automatically inserts a one character width Off Delay, assuring that RTS does not drop until after the last character has been completely sent. Unless working under unusual conditions, this value will normally be configured with a value of 0. The maximum value to be used is 65535 (0xffff).

Message Response Timout: This register represents the message response timeout period in 1 ms increments. This is the time which a port configured as a Master will wait before re-transmitting a command if no response is received from the addressed slave. The value is set depending on the expected slave response times.

The allowable range of values is 0 to 65535(0xffff). If a zero value is entered, the module will default to a one second timeout value (1000 ms).

Inter-character Timing: This register is used in situations where the end of message character timeout delay must be extended beyond the normal 3.5 character widths. The value entered

10

represents the number of 1 ms intervals of 'no transmission' which will be counted prior to accepting a message. This parameter will be useful in satallite or packet radio installation where a data transmission may be split between two packets. Increasing this value beyond the system's packet handling time will eliminate timeout errors.

Momentary Select Count: Valid values are from 0 - 32. This parameter informs the Systronics host how many 8 point cards of I/O this station contains.

Setpoint Select Count: Valid values range from 0 -32. This parameter informs the Systronics host of how many setpoints this station will accept.

Setpoint Table Initialization: If equal to 1 (or LSB = 1), initializes setpoint write table to 0's.

<u>**System Configuration**</u>

Block Transfer Delay Counter: This value is used by the module to slow down the block transfer loading between the module and the processor. Excessive Block Transfers can slow down the response time of the SYS's communication ports. This parameter has been provided to allow the Block Transfer timing to be determined on an application basis. A value of 0 is normally used at the factory and is recommended as a starting point.

3.1.2 Moving Register Data (Block ID Codes 0-4)

The movement of data to the module is executed through a block transfer write with the following structure:

Word 0	:	Block ID
Word 1	:	Entity Count
Word 2-63	:	Data

where:

Block ID: The Block ID is used by the module to decode which file the data is intended for. The relationship between block ID number and file type is as follows:

<u>Block ID</u>	<u>File Type</u>
0	14h - Analog Data
1	19h - Status Data
2	47h - 32 bit Accum Current End of Batch
3	37h - 32 bit Accumulator
4	4Bh - Tank Level - BCD

Entity Count: This value represents the size of the file data block that is available to the master. The master uses this value to determine how many registers values to request. Valid values are as follows:

Block ID	Entity Count
0	0 to 62
1	0 to 124
2	0 to 31
3	0 to 31
4	0 to 31

Data: This field contains the data that is to be transmitted to the master if a request is received. The data structures are as follows:

Block ID 0:	*Analog Data*
Word 2:	16 bit integer data
Word 3:	16 bit integer data
Word 63:	16 bit integer data

Block ID 1:   *Status Data*

The status data is arranged as follows within a word, starting at word 2:

Word X :	High byte	: Entry #1	**Hold for**
	Low byte	: Entry #2	**verification**

Block ID 2:	*32 bit Accumulator Current End of Batch*
Word 2:	Rollover Flags (1-16)
Word 3:	Shift Flags (1-16)
Word 3:	Accum # 1 (Value / 10000)
Word 4:	Accum # 1 (Value MOD 10000)
Word 5:	Accum # 2 (Value / 10000)
Word 6:	Accum # 2 (Value MOD 10000)
Word 34:	Accum # 16(Value / 10000)
Word 35:	Accum # 16(Value MOD 10000)

Block ID 3:	*32 Bit Accumulator*
Word 2:	Accum # 1 (Value / 10000)
Word 3:	Accum # 1 (Value MOD 10000)
Word 4:	Accum # 2 (Value / 10000)
Word 5:	Accum # 2 (Value MOD 10000)
Word 62:	Accum # 31(Value / 10000)
Word 63:	Accum # 31(Value MOD 10000)

Block ID 4:	*Tank Level*
Word 2:	Level #1 - 16ths of inches
Word 3:	Level #2 - 16ths of inches
Word 4:	Level #3 - 16ths of inches
Word 5:	Level #4 - 16ths of inches
Word 31:	Level #31 - 16ths of inches
Word 32:	Level #32 - 16ths of inches

3.1.3 File 30h and 3Ch Setup Data (Block ID Codes 5&6)
The movement of data to the module is executed through a block transfer write with the following structure:

Word 0	:	Block ID 5 & 6
Word 1-51	:	Data Block

where:

Block ID: The Block ID is used by the module to decode which file the data is intended for.   The relationship between block ID number and file type is as follows:

<u>Block ID</u>	<u>File Type</u>	
5	30h -	Multi-File Streaming Data Setup
6	3Ch-	VSAT Timer Setup

Data: This field contains the data that is to be transmitted to the master if a request is received.   The data structures are as follows:

Block ID 5:	*Setup Data for Port 1 and 2*
Word 1	File Number to read - Entry 0, Port 1
Word 2	Starting Entry to read - Entry 0, Port 1
Word 3	Number of Entries - Entry 0, Port 1
-	-
Word 22	File Number to read - Entry 7, Port 1
Word 23	Starting Entry to read - Entry 7, Port 1
Word 24	Number of Entries - Entry 7, Port 1
Word 25	File Number to read - Entry 0, Port 2
Word 26	Starting Entry to read - Entry 0, Port 2
Word 27	Number of Entries - Entry 0, Port 2
-	-
Word 46	File Number to read - Entry 7, Port 2
Word 47	Starting Entry to read - Entry 7, Port 2
Word 48	Number of Entries - Entry 7, Port 2

Block ID 6:	*VSAT Timer Setup - Port 1 and 2*
Word 1	File Number to send - Entry 0, Port 1
Word 2	Preset Timer Value - Entry 0, Port 1
-	-
Word 15	File Number to send - Entry 7, Port 1
Word 16	Preset Timer Value - Entry 7, Port 1
Word 17	File Number to send - Entry 0, Port 2
Word 18	Preset Timer Value - Entry 0, Port 2
-	-
Word 31	File Number to send - Entry 7, Port 2
Word 32	Preset Timer Value - Entry 7, Port 2

3.2 Receiving Write Data from a Host

This section discusses how to get data written to the ProSoft module by a Master into the processor.

The transfer of data from the ProSoft Technology module to the processor is executed through the Block Transfer Read function. Three different types of data are moved from the module into the processor.

The data structure for the block transfer depends on the type of block data. Note that the module supports the direct control and select modes of writes.

> In a PLC, the BTR length must be configured for 64 words. In a SLC, the M1 file must be configured for 64 words. Otherwise module operation will be unpredictable.

3.2.1 Setpoint Select Command (File # 21h)

In order to allow the transfer of variable length data fields into any part of the Processor's data table (i.e.: to support variable length register writes) the Read data block from the module is structured as follows:

WORD	DESCRIPTION
0	Setpoint Write (bit 0) = 1
1	Register address
2 - 33	Setpoint Data Values

where:

Register Write: This word (bit) is used to tell the Processor that a new register write command has been issued by a Master and to transfer the data that follows into the Processor's data table. When the write command is received by the slave module, bit 0 of the word 0 is set. Once the transfer is complete, the Systronics module resets the bit.

Bit 0 can then be used by the Processor logic to condition the transfer of data from the BTR buffer into the Processor's data table. Note that the Processor application program need not reset the bit.

Register Address: This register represents the offset address into which the write data block will start to be written. This register can be used to point directly into the Processor's data table, as in the Appendix A example. The register address is calculated as follows:

Address: (I/O card x 2) + (point - 1)

Data: A table of up to 32 values containing the results of the write commands from the Systronics master. Write commands from a host are received into this table at the addressed position. The entire table is moved with each write. This table may be initialized to 0 by setting the Setpoint Table Initialization Bit and issuing a module configuration.

3.2.2 Momentary Control Command (File # 1Dh)
In order to set a bit within the Processor's data table, the Read Data Block has been structured as follows:

WORD	DESCRIPTION
0	Bit Set (bit 1) = 2
1 - 16	Binary image (16 words)

where:

BIT SET: Word 0, bit 1 of the data block is used to tell the Processor that a new bit set/reset command has been received from the master. When the "Bit Set/Reset" bit is set, (bit 1 = 1), the ladder logic is enabled to act on the Processor's data table. The exact action that the Processor will take is dependent on the next two words. Note that the Systronics slave module will reset this bit after the transfer, and therefore the application need not reset the bit.

BINARY IMAGE: The bit wrtie command is received by the module and is used to set the appropriate bit in the 16 word image. The active 16 words are moved to the ladder logic. Once the block has been moved, the bit is immediately reset in the module's image so that on the next write command the last written bit will no longer be set.

3.2.3 Accumulator Reset Command (File # 44h)
In order to reset the 16 and 32 bit Accumulators, the Read Data Block is structrured as follows:

WORD	DESCRIPTION
0	Bit Set (bit 2) = 4
1-2	Reset Accumulator Bit Image

where:

BIT SET: Word 0, bit 2 of the data block is used to tell the Processor that an Accumulator Reset command has been received from the Systronics master.

RESET ACCUMULATOR BIT IMAGE: When an Accumulator Reset command is received by the module, a bit in the 'Reset Bit Accumulator Image' is set, corresponding to the addressed

accumulator. The ladder logic should use the bit, with a 'ONS' (One Shot) to trigger the reset logic. Once the block has been moved, the bit is immediately reset in the module's image so that on the next write command the last written bit will no longer be set.

3.2.4 Multi-Streaming File Data Setup (File #30h)

When a File 30h write is received from the host, whether a partial file write or a complete file write, the File 30h image that is maintained in the module is moved down to the processor. The ladder logic can selectively store this data to assure that under power up conditions, the slave still maintains reporting capabilities. (Note that the data for both ports is moved to the processor no matter which port the write comes in on).

WORD	DESCRIPTION
0	File 30h write = 5
1-48	Per structure detailed in Section 3.1.3

3.2.5 VSAT Timer File Setup (File #3Ch)

When a File 3Ch write is received from the host, whether a partial file write or a complete file write, the File 3Ch image that is maintained in the module is moved down to the processor. The ladder logic can selectively store this data to assure that under power up conditions, the slave still maintains reporting capabilities. (Note that the data for both ports is moved to the processor no matter which port the write comes in on).

WORD	DESCRIPTION
0	File 3Ch write = 6
1-32	Per structure detailed in Section 3.1.3

3.2.6 Write Real Time Clock (File #05h)

When a File 05h write is received from the host, whether a partial file write or a complete file write, the File 05h image that is maintained in the module is moved down to the processor. The ladder logic can selectively store this data to assure that under power up conditions, the slave still maintains reporting capabilities. (Note that the data for both ports is moved to the processor no matter which port the write comes in on).

WORD	DESCRIPTION
0	File 05h write = 7
1-32	Per structure detailed in Section 3.1.3

3.2.7 Pulse Train Control Select File (File #2Ch)

When a File 2Ch write is received from the host, the data received from the host is moved to the ladder logic. (Note that the

data for both ports is moved to the processor no matter which port the write comes in on).

WORD	DESCRIPTION
0	File 2Ch write = 8
1	Point Address
2	Pulse Train Count
3	Pulse train period

> Note that the SYS module is limited to receiving one Pulse command per transmission.

Point Address: This register represents the point address which is being commanded to pulse by the host. This register can be used to point directly into the Processor's data table. The register address is calculated as follows:

Address: (I/O card x 2) + (point - 1)

Pulse Train Count: Number of pulse cycles as commanded by the host

Pulse Train Period: The pulse period, in milliseconds, as commanded by the host

3.3 Module Status
This section discusses how to get module status data from the module into the processor.

3.3.1 Slave Error Code Table
The SYS Module monitors the status of all Slave port commands. This status is communicated to the processor in the form of a Slave Error Code Table.

> The Slave Error Code Table is initialized to zero on power up, and every time the module receives the 255 configuration data block.

The Slave Error Table is a 20 word block. The Table is returned to the ladder logic anytime the BTR Block ID is equal to 0.

The structure of the data block is as follows:

WORD	DESCRIPTION
Port 1	
0	Current port status
1	Last transmitted error condition
2	Total Messages to this slave
3	Total Msg responses from this slave
4	Total Msgs seen by this slave

<u>Port 2</u>
5	Current port status
6	Last transmitted error condition
7	Total Messages to this slave
8	Total Msg responses from this slave
9	Total Msgs seen by this slave

<u>System Information</u>
10-11	Product Name (ASCII)
12-13	Revision (ASCII)
14	(blank)
15	Production Run Number
16-19	Spare

Where:

Current Port Error Status: This value represents the current value of the error code for the port. This value will only be valid if the port is configured as a Slave. The possible values are detailed in the following section.

Last Transmitted Error Code: This value is the last error code transmitted to the master by this slave port. Error codes which can be expected in this field are 0, 1, 2, 3, and 6. The field will only be cleared by re configuring the module (Block ID 255).

Total Messages to This Slave: This value represents the total number of messages that have matched this slaves address on this port, whether the slave actually determined them to be good (worthy of response) or not.

Total Message Responses From This Slave: This value represents the number of good (non-error) responses that the slave has sent to the master on this port. The presumption is that if the slave is responding, the message was good.

Total Messages Seen By This Slave: This value represents the total number of commands seen by the slave on this port, regardless of the slave address.

> All counters in the Slave Error Table will rollover to 0 after reaching 65535

Product Name: These two words represent the product name of the module in an ASCII representation. In the case of the SYS product, the letters ' SYS ' should be displayed when placing the programming software in the ASCII data representation mode.

Revision : These two words represent the product revision level of the firmware in an ASCII representation. An example of the data displayed would be '1.20' when placing the programming software in the ASCII data representation mode.

Blank: Not used at this time

Production Run Number: This number represents the 'batch' number that your particular chip belongs to. This number should appear as a number equal or greater than 1. This should help the factory determine when the User's chip was created.

3.3.2   Error Status Codes

The Error Codes returned in the Slave Error Code Table reflect the outcome of the commands and responses executed by the module. Note that in all cases, if a zero is returned, there was not an error. Valid Error Status Codes are as follows:

Code	Description
0	All OK The module is operating as desired.
1	Illegal Function An illegal function code request has been received from the master
253	Port 1 DCD not Active Port 1 of the module has been designated the VSAT port and requires the DCD signal to operate correctly
254	Checksum Error The slave determined that the message checksum was in error, and therefore discarded the message
255	TX Hardware Time-out A time-out has occurred in the transmission of the command from the master, and the command has been aborted. This error is usually an indication that the CTS signal is not being received by the module.

(This page intentionally left blank)

IV   *Configuring the Module*

4.1   Hardware Overview
When purchasing the MCM product, there are two available choices for each platform. These choices are as follows:

Description	ProSoft Cat Num	
	PLC	**SLC**
Module provided by ProSoft	3100-SYS	3150-SYS
Firmware only	3101-SYS	3151-SYS

When purchasing the module from ProSoft Technology, many of the jumper configurations will have been factory set. When purchasing the firmware from ProSoft Technology and the Allen-Bradley module from another source, particular attention must be paid to hardware configuration.

4.2   Module Jumper Configurations
The following section details the available jumper configurations for the 1771 and 1746 platform solutions. As needed, differences between the module based solutions and the firmware based solutions are highlighted.

4.2.1   3100/3101 for the 1771 Platform
Following are the jumper positions for the 1771-DB Rev B module and the ProSoft Technology 3100-SYS module (See Appendix D for details on jumper locations):

Jumper	**3100-SYS**	**3101-SYS**
JW1	N/A	Enabled
JW2	N/A	32K PROM
JW3	N/A	Turbo
JW4	Not Used	ASCII/ASCII
JW5	16 Pt	16 Pt
JW6	Not Used	Not Used
JW7	Enabled	Enabled
JW8	As Needed	As Needed
JW9	As Needed	As Needed

JW1   Watchdog Enable / Disable   Enable
The position of this jumper does not affect the operation of the unit under normal operations. In order to enable the watchdog function, simply place the jumper in the Enabled position.

JW2   PROM select   32K PROM
The position of this jumper is very important to the successful operation of the module. In order to operate with our MCM EPROM, the jumper <u>must</u> be in the 32K PROM position.

JW3   Speed select (Normal / Turbo)   Turbo

The position of this jumper does not affect the operation of the unit under normal operations. Unless there are reasons not to operate in the Turbo mode, we recommend operating in the Turbo mode.

JW4   Port 1 and 2 configuration   Position A
The position of this jumper set must be changed from the shipped default position (D) to the A position. Operation of the module will be unpredictable if the jumper set is not in the A position.

A	PRT 1 = ASCII	PRT 2 = ASCII	DH485 = PGM
B	PRT 1 = PGM	PRT 2 = ASCII	DH485 = RUN
C	PRT 1 = PGM	PRT 2 = DF1	DH485 = DISABLED
D	PRT 1 = PGM DEFAULT	PRT 2 = ASCII	DH485 = RUN

JW5   Backplane 8/16 point   16 Point
The module has only been tested in the 8 and 16 point modes and has successfully operated in both positions. The 8 point mode should be used when installing the module into old PLC-2 installations.

JW6   Port 2 Baud Rate   Not Used
This jumper is not used by the MCM firmware. All baud rate configuration is performed through the ladder logic data table.

JW7   Battery Enable / Disable   Enabled
This jumper should be placed in the Enabled position when the module is powered up. Although not critical to the operation of the module, this will back up some data registers in the module during a power failure or reset.

JW8/9   RS Configuration for Port 1 and 2   See options on module
The default from factory is RS-232, but all options are supported by the MCM firmware

4.2.2 3150/3151 for the 1746 Platform

Following are the jumper positions for the 1746-BAS module and the ProSoft Technology 3150-SYS module (See Appendix D for details on jumper locations):

Jumper	3150-SYS	3151-SYS
JW1	As Needed	As Needed
JW2	As Needed	As Needed
JW3	N/A	3-5, 4-6
JW4	N/A	1-3, 2-4

JW1/2   RS configuration for port 1 and 2   See Appendix D
The default from factory is RS-232, but all options are supported by the MCM firmware

JW3   Memory Selection   3-5, 4-6
When using the 3151 firmware solution with a 1746-BAS module, the EPROM is plugged into the User Socket. When in this configuration, it is <u>essential</u> that the jumper be in the correct position.

With the 3150 module, this jumper will not affect operation of the product.

| JW4 | **Mode Configuration** | **1-3, 2-4** |

When using the 3151 firmware solution with a 1746-BAS module, it is <u>essential</u> that the jumper be in the correct position.

With the 3150 module, this jumper will not affect operation of the product.

4.3 Firmware Installation Procedure (3101 & 3151)

The following section details the available jumper configurations for the 1771 and 1746 platform solutions. As needed, differences between the module based solutions and the firmware based solutions are highlighted.

4.3.1 1771-DB Revision B Module

The firmware installation steps are as follows:

1. Remove the card cover from the module

2. Plug the ProSoft Technology EPROM into the module's User Socket. Align the notches on the EPROM plastic carrier with the notches in the User socket.   Make sure the EPROM is well seated

3. Replace the card cover

4. Turn the module over and locate the identi- fication sticker in the unused indent.   This sticker will be important should the module ever require service.

4.3.2 1746-BAS Module

The firmware installation steps are as follows:

1. Plug the ProSoft Technology EPROM into the module's User Socket. Align the notches on the EPROM plastic carrier with the notches in the User socket.   Make sure the EPROM is well seated

2. Remove the plastic lens cover from the 1746- BAS module and slip on the new cover provided with the firmware. Make sure the cover is firmly affixed to the module

Once the firmware has been installed and the module's jumpers have been verified, the hardware is ready to be inserted into the I/O rack.

(This page intentionally left blank)

V. Systronics Slave Commands

The ProSoft Technology Systronics Slave module supports several data read and write commands. The decision on which command to use is made depending on the type of data being addressed, and the level of Systronics support in the slave and master equipment. The following sections detail the different commands supported by the module.

5.1   Systronics Command Structure

The Systronics Slave module supports the following commands. As stated in earlier sections, the data for responding to read commands is taken directly out of module memory, while write data from the Master is sent directly to the processor ladder logic, bypassing the module memory table.

5.1.1   File # 14h - Read Analog Data

The Systronics Slave module supports the transfer of up to 62 words in this file. In the normal protocol, this data would be limited to 12 bit signal analog values. The module will transfer 16 bit values unaltered from the PLC to the host.

5.1.2   File # 19h - Read Status Data

The Systronics Slave module supports the transfer of up to 62 words (124 bytes) of status data. The data values may be transferred in from a binary file or from an integer file.

5.1.3   File # 47h - Read Current End of Batch Data - 32 bit

The Systronics Slave module transfers up to 16 32-bit accumulator values. The accumulator data is organized such that the ladder logic can operate with two stacked counters. The low word counter is a 0 to 9999 counter, while the high counter increments each 10000th count. The data is organized in the form of 2 integers, where the first integer is the high word (Value / 10000) and the second integer is the low word (Value MOD 10000).

5.1.4   File # 37h - Read Accumulator Data - 32 bit

The module transfers 31 32-bit numbers to the master. The accumulator data is organized such that the ladder logic can operate with two stacked counters. The low word counter is a 0 to 9999 counter, while the high counter increments each 10000th count. The data is organized in the form of 2 integers, where the first integer is the high word (Value / 10000) and the second integer is the low word (Value MOD 10000).

5.1.5   File # 1Dh - Momentary Control Select

This function is used to set a bit in the processor. The processor ladder logic must provide the timing control to operate the output

for the required duration. This command is most often used with the "Execute Selected File" command (File # 23h), although the module does support the Direct Control feature. In the protocol, the card# - 1 is used to point into a 32 byte array, where the select point value is OR'd.

$$Address = (card\# - 1)$$

5.1.6 File # 21h - Setpoint Select
This function is used to write a value into a word in the processor. The module develops a word address using the following equation:

$$Address = (card\# - 1) \times 2 + (point - 1)$$

This address is used to point into a word array where the setpoint value is placed.

5.1.7 File # 23h - Execute Selected Control File
The module supports the single data register write command. The data value and destination address written from the master will be transferred directly to the processor. Use of the data is dependent on the ladder logic to actually move the data from the BTR buffer to the correct data location.

5.1.8 File # 30h - Multi-file Streaming Data Setup
This function is used by Action routine to create a multiple file stream for transmission to a master, unused entries must be set to 00h. Up to 8 blocks of data can be defined in any order.

5.1.9 File # 3Fh - Multi-file Streaming Data
This file contains the actual data defined by the multi-file 30h.

5.1.10 File # 3Ch - VSAT Timer Setup
Used by Action routine to create up to 8 separate timers used to send data to the master without being polled. Odd entries 1 through 15 are used to specify a preset timer value in seconds. When this value is non-zero, a transmission will be scheduled when the timer's counter decrements to zero. Upon reaching zero, the file number specified will be sent back to the master and the timer will be reset to the preset value.

Entries 2 through 5 are special cases which will transmit only when a change of status or analogs has taken place.

5.1.11 File # 3Eh - 20 msec Timer
This file contains a 20 msec timer which will rollover at 65535.

5.1.12 File # 41h - Analog Deviation Limits

Used by analog report by exception. The deviation limits are defaulted to 4 on powerup.

5.1.13 File # 44h - Accumulator Reset Commands
This file contains the command to reset both the 16-bit and 32-bit accumulators.

5.1.14 File # 4Bh - Tank Levels
The module transfers 31 tank level values to the master. The ladder logic places a value in each of the word registers representing the tank level in 1/16th inch increments. The module automatically translates this value into the BCD format required to support the protocol.

5.1.15 File # 2Ch - Pulse Train Control Select File
The module accepts the pulse train control command from the host and transfers the control information to the ladder logic for execution.

(This page left intentionally blank)

VI   *Hardware Diagnostics*

Several hardware diagnostics capabilities have been implemented using the LED indicator lights on the front of the module. The following sections explain the meaning of the individual LEDs for both the PLC and the SLC platforms.

6.1   3100/3101 PLC Platform

The PLC platform SYS product is available in two forms:

- ProSoft Technology Module (3100-CIM)
- Allen-Bradley 1771-DB Revision B card

Operation of the two modules is nearly identical, but labeling on the status LEDs is different. The following table documents the differences between LEDs on the two hardware platforms and explains the operation of the LEDs.

```
┌──────────────────────────────────────────────────────────┐
│        ProSoft CIM                    A-B 1771-DB          │
│           Card                         Rev B Card          │
│                                                            │
│      ACTIVE ○ ○  FLT               ACTIVE ○ ○  FLT         │
│         CFG ○ ○  BPLN                DH485 ○ ○  BTLO       │
│        ERR1 ○ ○  ERR2                 LED1 ○ ○  LED2       │
│        TXD1 ○ ○  TXD2                 PT1X ○ ○  PT2X       │
│        RXD2 ○ ○  RXD2                 PT1R ○ ○  PT2R       │
└──────────────────────────────────────────────────────────┘
```

Table 6.1 : PLC Platform LED Indication

ProSoft CIM	A-B DB/B	Color	Status	Indication
ACT	ACT	Green	Blink (Fast)	Normal state : The module is operating normally and successfully Block Transferring with the PLC
			On	The module is receiving power from the backplane, but there may be some other problem
			Blink (1/Sec)	Indicates the module has somehow entered the Basic Programming Mode. Verify jumper JW4 (DB/B only) configuration. If all are correct, then contact the factory
			Off	The module is attempting to Block Transfer with the PLC and has failed. The PLC may be in the PGM mode or may be faulted
FLT	FLT	Red	Off	Normal State : No system problems are detected during background diagnostics
			On	A system problem was detected during background diagnostics. Please contact factory for technical support

Table 6.1 : PLC Platform LED Indication (Cont'd)

ProSoft Name	DB Name	Color	Status	Indication
CFG	DH485	Green	Off	<u>Normal state</u> : No configuration related activity is occurring at this time
			Blink	This light blinks every time a Module Configuration block (ID = 255) is received from the processor ladder logic
			On	The light is on continuously whenever a configuration error is detected. The error could be in the Port Configuration data or in the System Configuration data. See Section 4 for details
BPLN	BTLO	Red	Off	<u>Normal State</u> : When this light is off and the ACT light is blinking quickly, the module is actively Block Transferring data with the PLC
			On	Indicates that Block Transfers between the PLC and the module have failed.(Not activated in the initial release of the product)
ERR1 ERR2	LED1 LED2	Amber	Off	<u>Normal State</u> : When the error LED is off and the related port is actively transferring data, there are no communication errors
			Blink	Periodic communication errors are occurring during data communications. See Section 4 to determine the error condition
			On	This LED will stay on under several conditions: • CTS input is not being satisfied • Port Configuration Error • System Configuration Error • Unsuccessful comm on MCM slave • Recurring error condition on MCM master
Tx1 Tx2	PT1X PT2X	Green	Blink	The port is transmitting data.
Rx1 Rx2	PT1R PT2R	Green	Blink	The port is receiving data

6.2   3150/3151 SLC Platform

The PLC platform SYS product is available in two forms:

- ProSoft Technology Module (3150-CIM)
- Allen-Bradley 1746-BAS card

Operation of the two modules is nearly identical and labeling on the status LEDs is the same. The following table documents the differences

between LEDs on the two hardware platforms and explains the operation of the LEDs.

3150-SYS

COMMUNICATIONS

ACT   FAULT

CFG   BPLN

PRT1   ERR1

PRT2   ERR2

Table 6.2 : SLC Platform LED Indication

LED Name	Color	Status	Indication
ACT	Green	Blink (Fast)	Normal state : The module is operating normally and successfully Block Transferring with the SLC
		On	The module is receiving power from the backplane, but there may be some other problem
		Blink (1/Sec)	Indicates the module has somehow entered the Basic Programming Mode. Verify jumper JW3 (BAS only) configuration. If all are correct, then contact the factory
		Off	The module is attempting to Block Transfer with the SLC and has failed. The SLC may be in the PGM mode or may be faulted (*Not in initial release)*
FLT	Red	Off	Normal State : No system problems are detected during background diagnostics
		On	A system problem was detected during background diagnostics. Please contact factory for technical support
CFG	Green	Off	Normal state : No configuration related activity is occurring at this time
		Blink	This light blinks every time a Module Configuration block (ID = 255) is received from the processor ladder logic
		On	The light is on continuously whenever a configuration error is detected. The error could be in the Port Configuration data or in the System Configuration data. See Section 4 for details
BPLN	Red	Off	Normal State : When this light is off and the ACT light is blinking quickly, the module is actively Block Transferring data with the SLC
		On	Indicates that Block Transfers between the SLC and the module have failed

Table 6.2 : SLC Platform LED Indication (Cont'd)

LED Name	Color	Status	Indication
ERR1 ERR2	Amber	Off	Normal State : When the error LED is off and the related port is actively transferring data, there are no communication errors
		Blink	Periodic communication errors are occurring during data communications. See Section 4 to determine the error condition
		On	This LED will stay on under several conditions: • CTS input is not being satisfied • Port Configuration Error • System Configuration Error • Unsuccessful comm on MCM slave • Recurring error condition on MCM master
TxRx1 TxRx2	Green	Blink	The port is communicating, either transmitting or receiving data

VII   Support, Service and Warranty

7.1   Technical Support

ProSoft Technology survives on its ability to provide meaningful support to its customers. Should any questions or problems arise, please feel free to contact us at:

>ProSoft Technology, Inc.
>9801 Camino Media
>Suite 105
>Bakersfield, CA 93311
>(805) 664-7208
>(800) 326-7066
>(805) 664-7233 (fax)
>E-Mail : prosoft@prosoft-technology.com

Before calling for support, please prepare yourself for the call. In order to provide the best and quickest support possible, we will most likely ask for the following information (you may wish to fax it to us prior to calling):

1. Product Serial and Version Number
2. Configuration Information
    - Communication Configuration
    - Master Command List
    - Jumper positions
3. System hierachy
4. Physical connection information
    - RS-232, 422 or 485
    - Cable configuration
5. Module Operation
    - Block Transfers operation
    - LED patterns

An after-hours answering service (on the Bakersfield number) can patch you to one our qualified technical and/or application support engineers at any time to answer the questions that are important to you.

7.2   Service and Repair

The ProSoft card is an electronic product, designed and manufactured to function under somewhat adverse conditions. As with any product, through age, misapplication, or any one of many possible problems, the card may require repair.

The ProSoft product has a one year parts and labor warranty according to the limits specified in the warranty. Replacement and/or returns

should be directed to the distributor from whom the product was purchased. If you need to return the card for repair, it is first necessary to obtain an RMA number from ProSoft Technology. Please call the factory for this number and display the number prominently on the outside of the shipping carton used to return the card.

7.3   Warranty

7.3.1   General Warranty Policy

ProSoft Technology, Inc. (Hereinafter referred to as ProSoft) warrants that the Product shall conform to and perform in accordance with published technical specifications and the accompanying written materials, and shall be free of defects in materials and workmanship, for the period of time herein indicated, such warranty period commencing upon receipt of the Product.

This warranty is limited to the repair and/or replacement, at ProSoft's election, of defective or non-conforming Product, and ProSoft shall not be responsible for the failure of the Product to perform specified functions, or any other non-conformance caused by or attributable to: (a) any misapplication of misuse of the Product; (b) failure of Customer to adhere to any of ProSoft's specifications or instructions; (c) neglect of, abuse of, or accident to, the Product; or (d) any associated or complementary equipment or software not furnished by ProSoft.

Limited warranty service may be obtained by delivering the Product to ProSoft and providing proof of purchase or receipt date. Customer agrees to insure the Product or assume the risk of loss or damage in transit, to prepay shipping charges to ProSoft, and to use the original shipping container or equivalent. Contact ProSoft Customer Service for further information.

7.3.2   Limitation of Liability

EXCEPT AS EXPRESSLY PROVIDED HEREIN, PROSOFT MAKES NO WARRANT OF ANY KIND, EXPRESSED OR IMPLIED, WITH RESPECT TO ANY EQUIPMENT, PARTS OR SERVICES PROVIDED PURSUANT TO THIS AGREEMENT, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANT ABILITY AND FITNESS FOR A PARTICULAR PURPOSE. NEITHER PROSOFT OR ITS DEALER SHALL BE LIABLE FOR ANY OTHER DAMAGES, INCLUDING BUT NOT LIMITED TO DIRECT, INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES, WHETHER IN AN ACTION IN CONTRACT OR TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY), SUCH AS, BUT NOT LIMITED TO, LOSS OF ANTICIPATED PROFITS OR BENEFITS RESULTING FROM, OR ARISING OUT OF, OR IN CONNECTION WITH THE USE OR FURNISHING OF EQUIPMENT, PARTS OR SERVICES HEREUNDER OR THE PERFORMANCE, USE OR INABILITY TO USE THE SAME, EVEN IF PROSOFT OR ITS DEALER'S TOTAL LIABILITY EXCEED THE PRICE PAID FOR THE PRODUCT.

Where directed by State Law, some of the above exclusions or limitations may not be applicable in some states. This warranty provides specific legal rights; other rights that vary from state to state may also exist. This warranty shall not be applicable to the extent that any provisions of this warranty is prohibited by any Federal, State or Municipal Law that cannot be preempted.

7.3.3   Hardware Product Warranty Details

Warranty Period : ProSoft warranties hardware product for a period of one (1) year.

Warranty Procedure : Upon return of the hardware Product ProSoft will, at its option, repair or replace Product at no additional charge, freight prepaid, except

as set forth below. Repair parts and replacement Product will be furnished on an exchange basis and will be either reconditioned or new. All replaced Product and parts become the property of ProSoft. If ProSoft determines that the Product is not under warranty, it will, at the Customer's option, repair the Product using current ProSoft standard rates for parts and labor, and return the Product freight collect.

(This page intentionally left blank)

APPENDIX A-1

PLC-5 Example Ladder Logic

APPENDIX A-2

SLC-5/02 Example Ladder Logic

APPENDIX B

CABLE DIAGRAMS

RS-232
-
RS-422
-
RS-485

Definitions of RS-232C Handshaking Signals

SIGNAL	TITLE	DESCRIPTION
TXD	Transmitted Data	Carries serialized data. It is an output from the module
RXD	Received Data	RXD is serialized data input to the module. RXD is isolated from the rest of the circuitry on the modules
RTS	Request To Send	RTS is a request from the module to the modem to prepare to transmit. RTS is turned ON when the module has a message to transmit. Otherwise, RTS is OFF
CTS	Clear to Send	CTS is a signal from the modem to the module that indicates the carrier is stable and the modem is ready to transmit. The module will not transmit until CTS is on. If CTS is turned off during transmission, the module will stop transmitting until CTS is restored
DTR	Data Terminal Ready	DTR is a signal to the modem to indicate that the module is operational and ready for communication. The module will continually assert DTR
DSR	Data Set Ready	DSR is a signal from the modem to the module to indicate that the modem is operational and ready for communication. The SYS product family does not require the DSR signal to operate correctly. This signal is disregarded by the SYS units.
DCD	Data Carrier Detect	DCD is a signal from the modem to the module to indicate that the carrier from another modem is being sensed on the link. This signal is used by Port 1 of the SYS module, but is disregarded by Port 2.

(Excerpted form Allen-Bradley Publication 1785.6.5.2)

RS-232C Cable Configuration

With Handshaking :

ProSoft Module	Modem
25-Pin 9-Pin	25-Pin

```
           ProSoft Module                    Modem

           25-Pin   9-Pin                    25-Pin
            2  TxD  3    ------------------    2 (Verify pins 2 and 3)

            3  RxD  2    ------------------    3

            4  RTS  7    ------------------    4

            5  CTS  8    ------------------    5

            8  DCD  1    ------------------    8 (for Port 1 only)

            7  GND 5     ------------------    7

           20 DTR  4     ------------------    20
```

Without Handshaking :

```
           ProSoft Module                     Device

           25-Pin   9-Pin                     25-Pin
            2  TxD  3    ------------------    2 RxD (Verify pins 2 and 3)

            3  RxD  2    ------------------    3 TxD

            4  RTS  7    -----        -----    4 RTS
                            |            |
            5  CTS  8    -----        -----    5 CTS

                                      ----    6 DSR
                                         |
                                      -----   20 DTR

            8  DCD  1    ------------------    8 (for Port 1 only)

            7  GND 5     -------------------   7 GND
```

RS-422/RS-485 Cable Configuration (Port 2 only)

Two Wire Mode :

	ProSoft Module			**Foreign Device**
25-Pin	9-Pin			
4 RTS	7	----		
		|		
5 CTS	8	----		
14 TxRxD+	9	--------------------	A(+) TxRxD+
25 TxRxD-	1	--------------------	B(-) TxRxD-
7 GND	5	--------------------	GND

Four Wire Mode :

	ProSoft Module			**Foreign Device**
25-Pin	9-Pin			
4 RTS	7	----		
		|		
5 CTS	8	----		
14 TxD+	9	--------------------	RxD+
16 RxD+	6	--------------------	TxD+
18 RxD-	2	--------------------	TxD-
25 TxD-	1	--------------------	RxD-
7 GND	5	--------------------	GND

NOTES: If communication in RS-422/RS-485 do not work, despite all attempts, try switching termination polarities. Some manufacturers interpret (+) and (-) differently.

APPENDIX C

Jumper Configurations

1771 Platform
- **3100 Module**
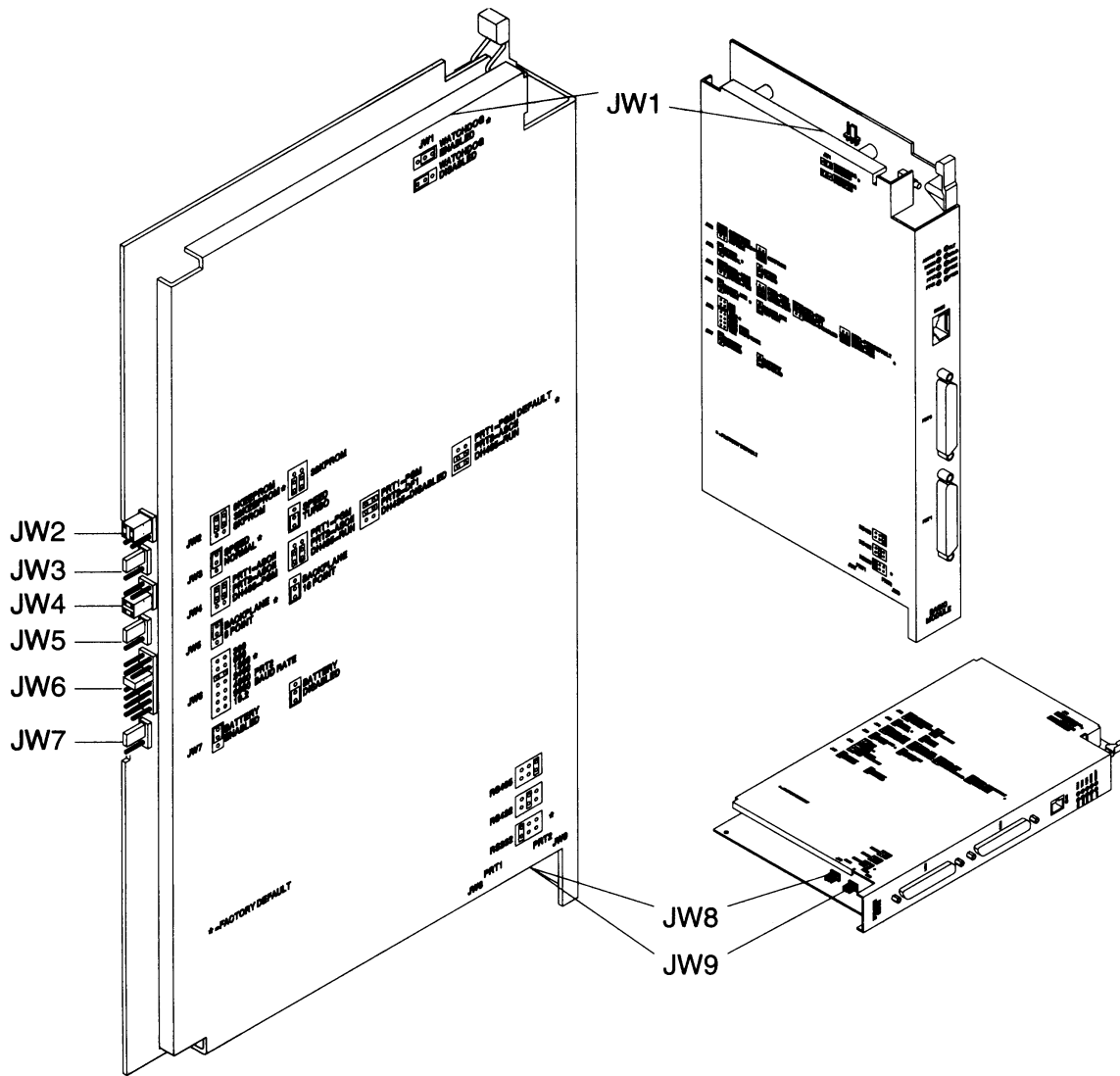- **1771-DB Revision B Module**

1746 Platform
- **3150 Module**
- **1746-BAS Module**

3100 Module from ProSoft Technology

The 3100 module from ProSoft Technology is shipped from the factory as a complete unit including any applicable firmware resident in the module.

All jumper configurations have been preset for the module to pass a functional test at the factory. Verify jumper placement with Section 2 of the manual for application specific changes.

1771-DB Revision B Module from Allen-Bradley

The 3101 firmware solution is installed into an Allen-Bradley 1771-DB Revision B module. To successfully operate the module, the firmware must be installed and the jumpers must be configured.

Section 2 of the manual details the correct positioning for the jumpers.

In addition, Section 2 also details the steps necessary to install the firmware chip. The ProSoft Technology firmware is shipped in a plastic carrier to help minimize erroneous installations.

The following diagrams help to identify the physical location of the jumpers on the module and location of the firmware socket.
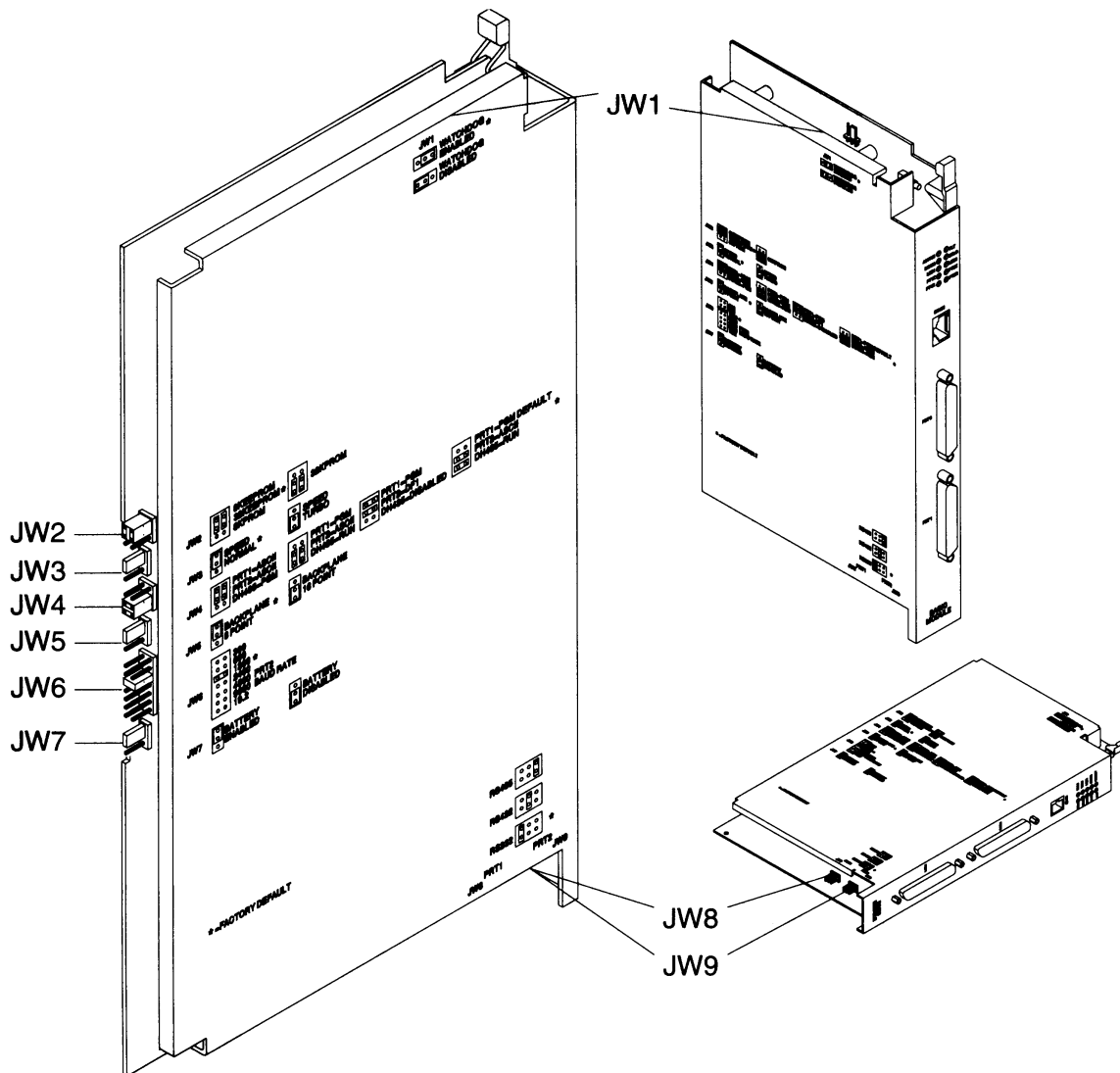
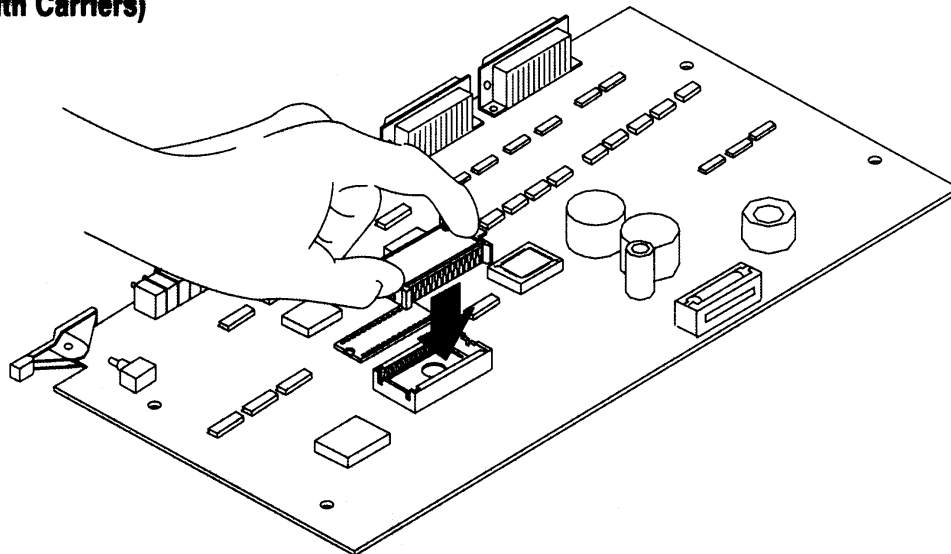## 1771-DB Revision B Module from Allen-Bradley (Cont'd)

Firmware installation diagrams:

**SKT1
(PROMs with Carriers)**

**SKT2
(PROMs without Carriers)**
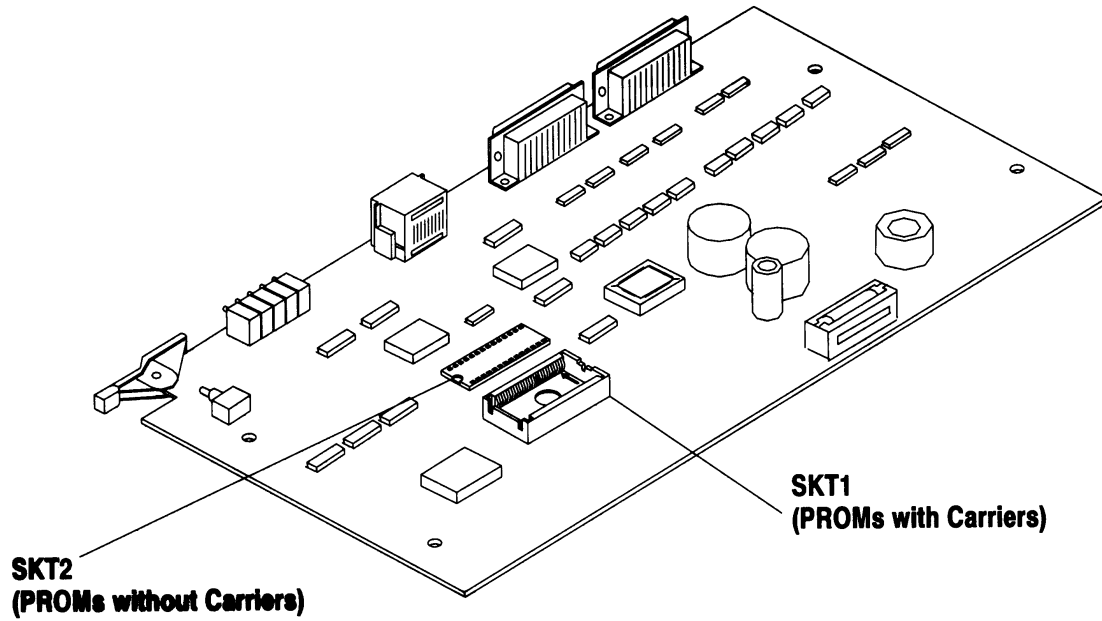
20371-M

Firmware Socket Location (SKT1)

**SKT1
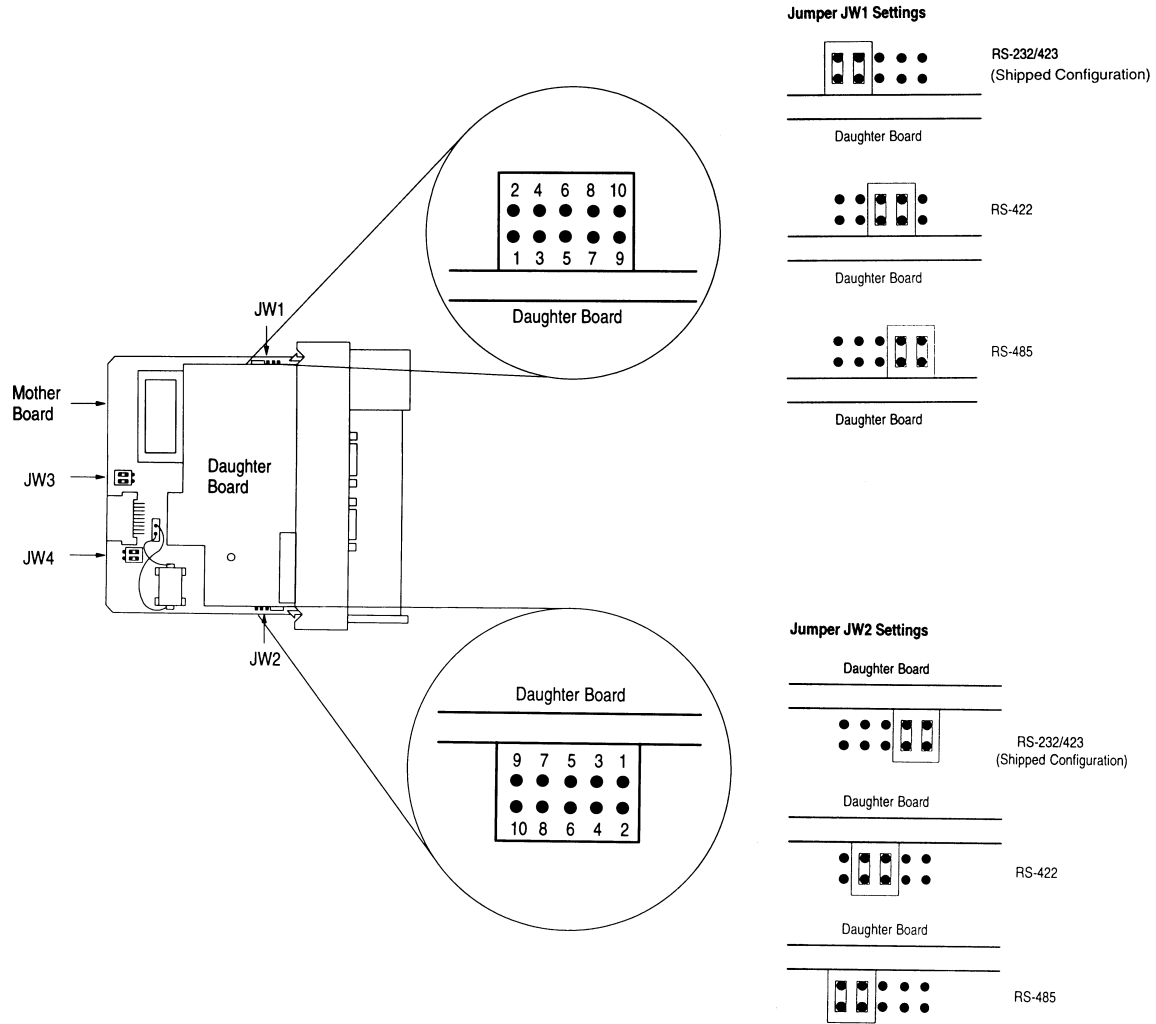(PROMs with Carriers)**

20372-M

Firmware Installation

3150 Module from ProSoft Technology

Jumpers JW 1 and JW 2: Port 1 and Port 2 Configuration

Both of these ports operate electrically in a very similar fashion. The following diagrams depict the appropriate jumper placement.
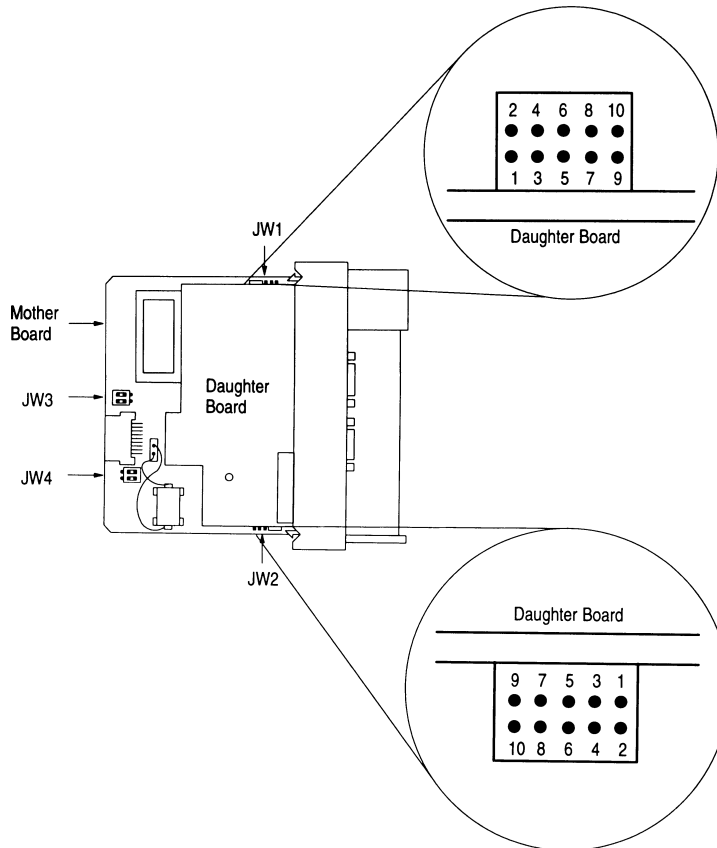
Jumper JW1 Settings

RS-232/423
(Shipped Configuration)

Daughter Board

RS-422

Daughter Board

RS-485

Daughter Board

2 4 6 8 10
1 3 5 7 9

Daughter Board

JW1

Mother Board

Daughter Board

JW3

JW4

JW2

Daughter Board

9 7 5 3 1
10 8 6 4 2

Jumper JW2 Settings

Daughter Board

RS-232/423
(Shipped Configuration)

Daughter Board

RS-422

Daughter Board

RS-485

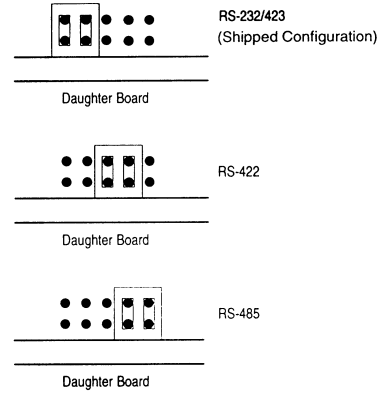Jumpers JW 3 and JW 4 are not used by 3150 module

1746-BAS Module from Allen-Bradley

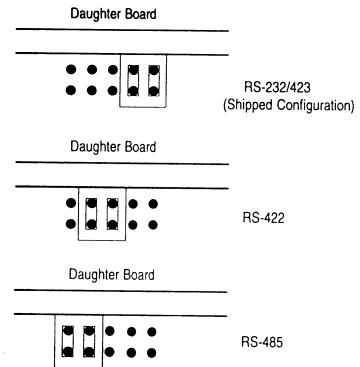### Jumpers JW 1 and JW 2: Port 1 and Port 2 Configuration

Both of these ports operate electrically in a very similar fashion. The following diagrams depict the appropriate jumper placement.

Jumper JW1 Settings

RS-232/423
(Shipped Configuration)

Daughter Board

RS-422

Daughter Board

RS-485

Daughter Board

Mother Board

JW1

```
2  4  6  8  10
●  ●  ●  ●  ●
●  ●  ●  ●  ●
1  3  5  7  9
```
Daughter Board

Daughter Board

JW3

JW4

JW2

Daughter Board
```
9  7  5  3  1
●  ●  ●  ●  ●
●  ●  ●  ●  ●
10 8  6  4  2
```

Jumper JW2 Settings

Daughter Board

RS-232/423
(Shipped Configuration)

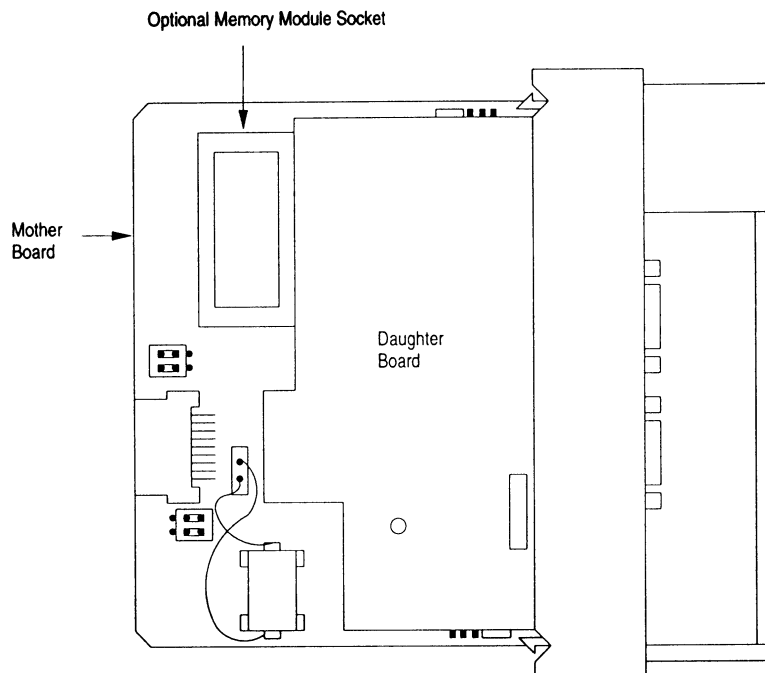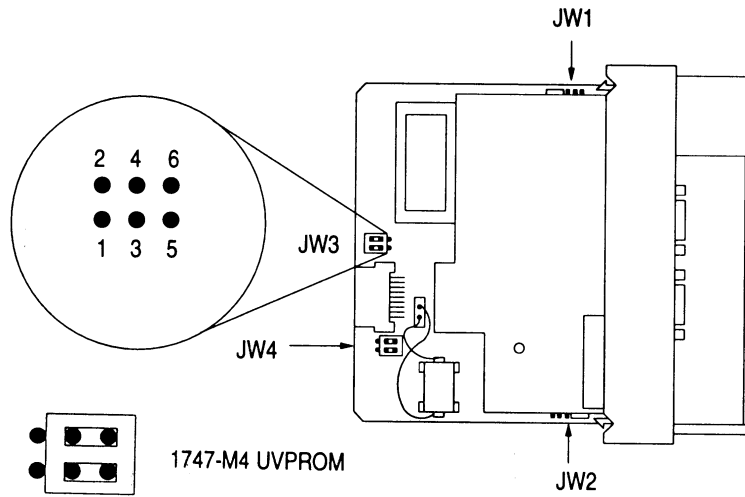Daughter Board

RS-422

Daughter Board

RS-485

1746-BAS Module from Allen-Bradley (Cont'd)

Jumpers JW 3 : Memory Selection Jumper

This jumper must be selected for the 1747-M4 UVPROM. The jumper must be as follows:

Jump 4 to 6
Jump 3 to 5
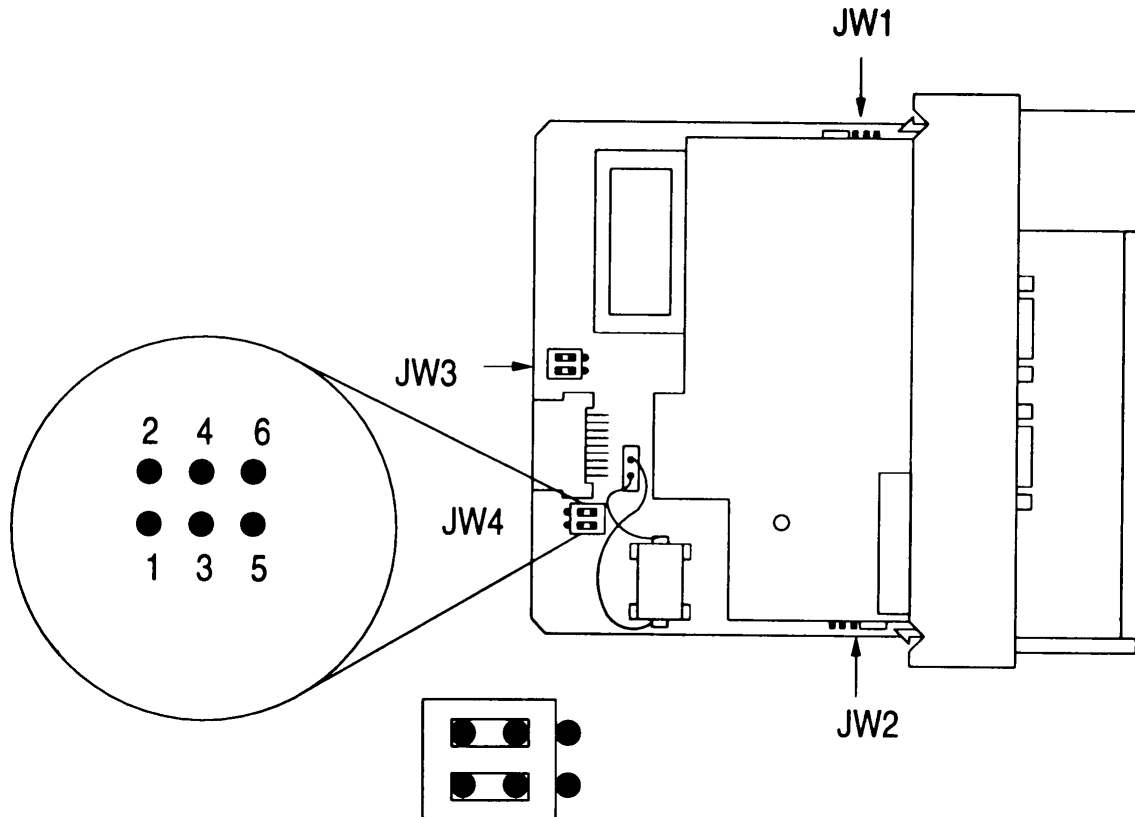
1746-BAS Module from Allen-Bradley (Cont'd)

Jumpers JW 4 : Module Port Configuration
This jumper must be selected as follows:

Jump 2 to 4
Jump 1 to 3

APPENDIX D

Product Revision History

(This page intentionally left blank)

Product Revision History

07/11/95   Revision 2.0
                Initial release of product with dual port capability
                Added 4Bh support in this release of protocol driver also

(This page intentionally left blank)

APPENDIX E

Systronics Protocol
Command Structure

Function Code   **Description**