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## SY/MAX PROTOCOL EMULATION

### 1.1 GENERAL DESCRIPTION

This section briefly describes the Square D SYMAX® point-to-point communication protocol and the Square D multi-drop communications protocol for reference purposes only. The appropriate Square D documentation should be consulted for complete details of these protocols.

The SY/MAX point-to-point protocol and the multi-drop protocol are asynchronous byte oriented protocols that are used to communicate between Square D network interface modules and Square D processors, CRT Programmers, and many other modules. The protocol may be used to provide either peer-to-peer communication using the point-to-point protocol or in a multi-dropped configuration using the Multi-Drop Communication protocol. The Multi-Drop Communication Protocol is used to provide communications to Powerlogic Circuit Monitors and other protocol compatible devices. These devices are connected in a master/slave multi-dropped configuration. The Comm-Master uses either the point-to-point protocol or the Multi-Drop Communication protocol depending on the system application. The selection is determined by the user by setting an option byte in the configuration header (detailed in section 1.4.1 below). All communication with the remote devices use port P2 (the center port) on the Comm-Master. The Comm-Master uses Allen-Bradley DF-1 full-duplex protocol to communicate with PLC equipment connected to its "HOST" port P1 (top port). Communication between the Comm-Master and the Allen-Bradley PLC equipment operates at 9600 baud using 8 data bits, 1 stop bit and no parity. Communication security is provided by a 16-bit calculated cyclic redundancy check (CRC).

The communication parameters used for transferring information between the Comm-Master and the Square D equipment can be set by the user as required. The Comm-Master can be operated at any baud rate from 300 to 9600 baud with any combination of data, parity and stop bits. Either CRC or BCC error checking can be used. Section 1.4.1 provides the detailed information for setting the Square D communication parameters.

All communications exchanges with the Square D equipment are initiated by the Comm-Master. The Square D remotes cannot initiate any exchange with the Comm-Master.

**1.2 MESSAGE STRUCTURE**

**1.2.1 SY/MAX Point-to-Point Protocol**

The Square D SY/MAX Point-to-point protocol is used to communicate between two end devices connected to a SY/MAX network. The Comm-Master can communicate with from 1 to 254 stations on a single communication link.

| Abbreviation | Hexadecimal Code |
|--------------|------------------|
| SOH          | 01               |
| STX          | 02               |
| ETX          | 03               |
| ENQ          | 05               |
| DLE          | 10               |
| ODD          | 11               |
| EVEN         | 12               |
| NAK          | 15               |
| SYN          | 16               |

**1.2.2 Transmission Symbols**

Figure E-1 SY/MAX Control Characters

| Symbol   | Type    | Description   |
|----------|---------|---|
| DLE SOH  | Control | Master Symbol That Indicates The Start Of Header Area   |
| DLE STX  | Control | Master Symbol that Indicates The Start Of The Text Area   |
| DLE ETX  | Control | Master Symbol that Indicates the End Of The Text Area   |
| DLE ENQ  | Control | Issued By Master To Request A Retransmission Of The Last Response   |
| DLE ODD  | Control | Issued by Slave as Positive Acknowledgement   |
| DLE EVEN | Control | Issued by Slave as Positive Acknowledgement   |
| DLE NAK  | Control | Negative Acknowledge Signifying An Error In A Received Message  |
| DLE SYN  | Control | Slave Initiated Response: Informs the Master that the Slave<br>Is Temporarily unable to process the incoming data |

Figure E-2 Control Sequences

# Comm-Master™ Square D SY/MAX® Protocol

The SY/MAX protocol is a character oriented protocol. It uses the ASCII control characters shown in Figure E-1. The control characters are combined to make control and data symbols. A symbol is a sequence of one or more bytes having a specific meaning to the protocol. The characters of a symbol must be sent one after another with no other characters inserted between them. Figure E-2 defines the symbols used in the SY/MAX protocol.

## 1.2.3 Typical Message Transaction Point-to-Point

The following diagram details the messages sent between the Comm-Master and a remote to read a block of data in the remote. This typical "poll" message starts with the Comm-Master issuing a "Master Message Link Packet" which contains the id (even or odd), the route to the remote device which is to receive the message, the message itself and the BCC check field at the end of the message. The addressed slave device receives the message, checks it for errors and returns an acknowledge packet (DLE EVEN or DLE ODD). The addressed slave then sends the data requested by the Comm-Master. The Comm-Master will check the received data and return an acknowledge to the slave. The Comm-Master will transfer the data received into the local PLC's memory and proceed with the next poll message.

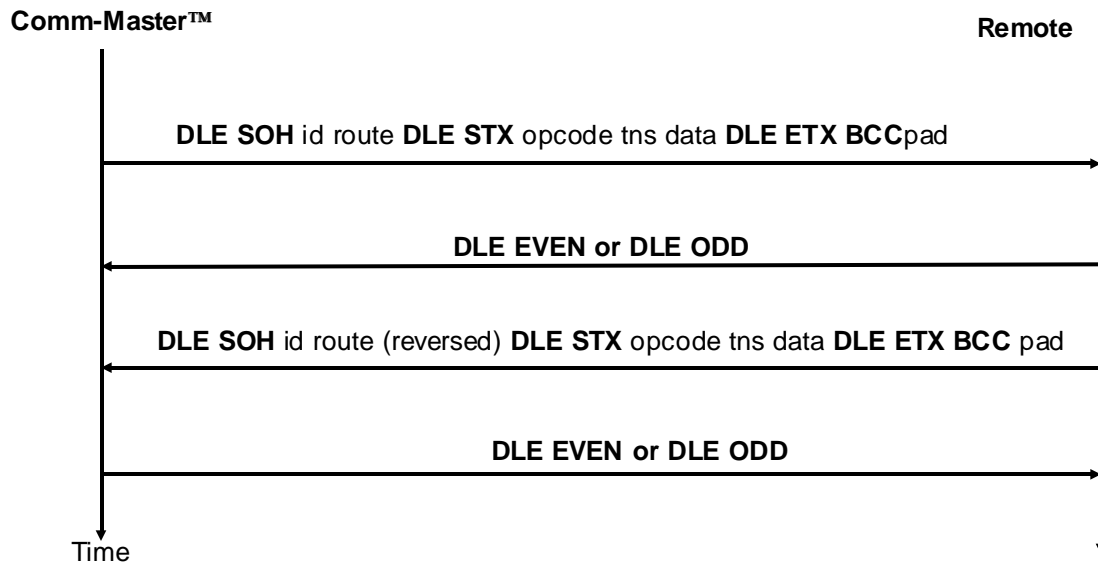


Figure E-3 Typical Message Exchange (no errors)

# Comm-Master™ Square D SY/MAX® Protocol

## 1.2.4 SY/MAX Multi-Drop Communications Protocol

The Multi-Drop Communications protocol is a protocol used for communication between one master and one or more slave devices. The Comm-Master is the master device and the slave devices are Square D Powerlogic (or compatible) modules that use the protocol.

## 1.2.5 Typical Message Transaction Multi-Drop Protocol

The following diagram details the messages sent between the Comm-Master and a remote to read a block of data in the remote. This typical "poll" message starts with the Comm-Master issuing a "Master Message Link Packet" which contains the id (message number), the route to the remote device which is to receive the message, the message itself and the CRC check field at the end of the message. The addressed slave device receives the message, checks it for errors then sends the data requested by the Comm-Master. The Comm-Master will check the received data and transfer the data received into the local PLC's memory and proceed with the next poll message.

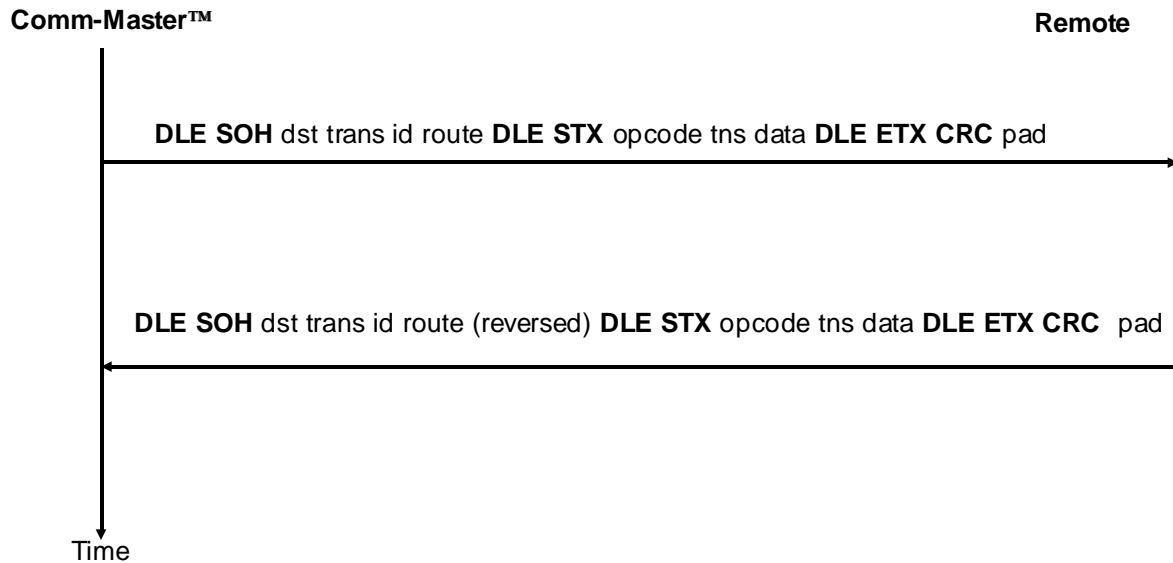


Figure E-4 Typical Message Exchange Multi-Drop Protocol

### 1.3 MESSAGE TYPES

SY/MAX protocol communication exchanges can be divided into two types: data requests (reads) and control commands (writes). In data requests (poll requests), the Comm-Master transmits a message requesting data values from the remote. The remote responds by transmitting the requested data values. These data values may be discrete (status), analog, accumulator, calculated variables, remote parameters, tRTU status, analog outputs or discrete outputs. The format of the data must be as required by the master PLC. Note that the Comm-Master does not do any processing on the data collected from the remote. The PLC ladder logic must perform any data formatting that is required prior to using the data that is transferred by the Comm-Master.

Control requests are defined as any message from the master PLC requesting the remote to change the state of a field device or the change or modify an internal condition of the remote.

### 1.4 COMM-MASTER CONFIGURATION TABLE

The following paragraphs detail the organization of the configuration table for a Comm-Master with Square D SY/MAX communication protocol installed on the RTU side.

| Word  | Byte Numbers | Function  |
|-------|--------------|---|
| 0     | 00,01        | Comm-Master Address; Number of Polling tables               |
| 1     | 02,03        | Radio turn-on Delay (x 10 msec)                             |
| 2     | 04,05        | Radio turn-off Delay (x 10 msec)                            |
| 3     | 06,07        | RTS/CTS Delay (x 10 msec- starts after Radio turn-on delay) |
| 4     | 08,09        | Remote Baud Rate; # Data Bits                               |
| 5     | 10,11        | Remote Parity; # Stop Bits                                  |
| 6     | 12,13        | Reserved-set to 0000H                                       |
| 7     | 14,15        | Reserved-set to 0000H                                       |
| 8     | 16,17        | Reserved-set to 00H; Multi-Drop Protocol Enable             |
| 9     | 18,19        | Reserved-set to 0000H                                       |
| 10    | 20,21        | Radio Key Address   |
| 11    | 22,23        | Poll Timer Multiplier Factor                                |
| 12-19 | 24-39        | Spare-set to 0000H  |

Figure E-5 Comm-Master Configuration Header

# Comm-Master™ Square D SY/MAX® Protocol

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## 1.4.1 Comm-Master SY/MAX Configuration Header

Word offset 0 is used for 2 functions: Byte # 0 is used to define the Allen-Bradley Data Highway address of the interface module that is connected to the Comm-Master. This address is typically 118 but may be assigned to other values depending on the final system configuration. The address of the data highway interface module is used as the file address when reading or writing data to a PLC-5 system. The interface module can be assigned any address from 1 thru 778.; Byte # 1 is used to define the number of RTU Polling Tables that are defined in the system. The Comm-Master will use this number to determine the number of Polling Table Entries to read.

Word offset 1 is reserved for use in other applications, Set this word to 0000H.

Word offset 2 is used for a Radio Turn-Off Delay Timer. This is the time that the Comm-Master will hold the line quiescent after transmitting the last byte of data. This delay is sometimes required when using the Comm-Master with some types of radio systems in order to insure the proper reception at the remote end. The delay time will be 10ms times the number stored in word 2.

Word Offset 3 is used for a RTS/CTS Delay timer. This is the time that the Comm-Master will delay (hold-off) sending data after raising the Request To Send line (RTS). The delay time will be 10ms times the number stored in word 3.

Word offset 4 is used for two functions. Byte # 0 is used to select the RTU port Baud Rate. Valid settings for this byte are: 06H= 1200, 08H= 2400, 09H= 4800, and 0BH= 9600. Byte 1 is used to select the RTU Port Number of data Bits option. Valid selections are: 07H and 08H, corresponding to seven and eight data bits respectively.

Word offset 5 is used for two options. Byte 0 is used to select the RTU Port Parity option and byte 1 is used to select the number of stop bits to use. Valid selections for byte 0 are 00H= no parity, 01H= odd parity and 02H= even parity. Valid selections for byte 1 are 01H and 02H, corresponding to one or 2 stop bits.

Word offsets 6 are reserved for future use. Set to 0000H

Word offset 8 is used for two functions. Byte 0 is used to enable CRC error checking; set this byte to 00H for BC checking and to 01H for CRC error checking. Byte 1 is used to select between Point-to-Point protocol and the Multi-Drop Communications protocol. Set byte 1 to 0 for Point-to-Point and to 1 for Multi-Drop Communication.

# Comm-Master™ Square D SY/MAX® Protocol

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Word offset 9 is used for two functions. Byte 0 is used to enable the "silence timing" mode of operation. Set this byte to 00H for "pad character" response timing when using the point-to-point protocol. Set this byte to non-zero to enable the silence timing mode of operation when using the Multi-Drop protocol. Byte 1 is used to specify the source ID number when using Multi-Drop protocol. The valid range of this byte is 00H to FFH. The Source ID must match the source ID value of the remotes. The default value is 00H.

Word offset 10 is used to define a "radio key address". The radio key address is an address in the master PLC which will be written to when the Comm-Master has data to send on its RTU communications port. The address is entered in decimal notation. In some applications it may be necessary to switch on or "key" a radio transmitter for subsequent transmission of data. A PLC relay output module could be used for this function. If a radio key address is defined (word is non zero) then the contents of this word are interpreted as a radio key address. The Comm-Master will set bit 0 ON whenever it wishes to transmit data. The Comm-Master will clear this bit when it has no more data to send.

Word offset 11 is used to define a "poll timer multiplier factor". Each poll table entry has a field for defining the scan update frequency (how often the poll will be issued). This time is specified in 10ms increments. In order to allow longer scan update times the 10ms basic timer value is multiplied by the value contained in word 11. For example if word 11 is set to 100 then the scan update frequency will be set in 1 second increments (10ms X 100 = 1sec.)

Word offset 12 is used to define the silence timing value. The silence timing value is the length of time that the Comm-Master will wait for a response from the remote when using the Multi-Drop protocol. The delay time will be 10ms times the number stored in word 12.

Word offsets 13 thru 19 are reserved for future use. Set to zero.

## 1.4.2 Polling Table Entry for SY/MAX Protocol

The Polling tables start immediately following the end of the configuration table header section. The polling tables are contiguous, one immediately following the other. Each Polling table is 20 words long. There is a polling table for each poll message that the Comm-Master is required to send. The number of polling tables to read is specified in the Configuration header word 0 byte 1 entry as described above.

Comm-Master™ Square D SY/MAX® Protocol

Word offset 0 is used for two functions. Byte 0 (high byte) is used to define the Command Opcode to be used to collect data from the remote. Valid selections are 00H (read register), and 20H (priority read register). Byte 1 is used to define the number of registers to read. Enter a Hex number equal to the number of registers to read. Valid entries are 1 thru 80H (1 thru 128 decimal registers).

Word offset 1 is used to store the starting register number. All 16 bits can be used to specify the register address. Byte 0 is the high order byte; byte 1 is the low order byte. The number entered is the HEX equivalent of the DECIMAL address to be read.

Word offset 2 thru 5 are used to store the route information that will be included in the message. Byte 0 of word 2 is the first route field, byte 1 the second. Byte 0 of word 3 is the third route field and so on. The first FFH (255)entry terminates the route field list.

Word offsets 6 thru 9 are used to specify the data destination PLC type, Data Highway Address, Logical Processor, File Type, File Number and Element. The Destination PLC is the location that the Comm-Master will use to store the data returned from an RTU poll.

| WORD | PLC2           | PLC5          | PLC5/250        |
|------|----------------|---------------|-----------------|
| N+ 0 | 02; Address    | 05; Address   | FA; Address     |
| N+ 1 | 00; 00         | 00; File Type | L.P.; File Type |
| N+ 2 | 0000           | File Number   | File NUmber     |
| N+ 3 | Memory Address | Element       | Element         |

Figure E-6 PLC Address Fields

Word 6 of the address field is used to define the PLC type and data highway address. Enter the HEX equivalent of the OCTAL address of the PLC.

Word 7 is used to define the Logical Processor (PLC5-250 only) in byte 0 and the file type in byte 1. The hexadecimal equivalent of the ASCII logical processor and the file type fields is entered in this word. For example if the file which contains the data to be read is an integer file (file type N) then enter a 4EH in byte 1. If the data source PLC is a PLC-2 then these fields are not used for addressing. Set this word to 0000H.

Word 8 is used to specify the file number. Enter the hexadecimal equivalent of the destination file number. If the data is in file N10 then enter 0AH in this word. The file number word is not used for PLC-2 addressing.

# Comm-Master™ Square D SY/MAX® Protocol

Word 10 is used to specify the file element that marks the start of the data to be returned. Enter the hexadecimal equivalent of the starting word address.

Word offset 10 is used to specify the interval between polls. Polls will be issued by the Comm-Master at the rate specified by the contents of this word. The polling interval can be specified in 10 ms increments. That is an entry of 200 (decimal) would result in the Comm-Master polling for the data specified in this table entry once every 2 seconds (200 X 10ms per count = 2000 ms = 2 sec). Note that the timer increment is multiplied by the number stored in word 1 of the header.

Word offset 11 is used to specify the message time-out time. The message time out will be set to the number stored in this word times 10ms.

Word offsets 12, 13, 14 and 15 are reserved for future use. Set to 0000H.

| Word  | Byte Numbers | Function                              |
|-------|--------------|---------------------------------------|
| 0     | 00,01        | Command Opcode; Data Point Count      |
| 1     | 02,03        | Starting Register Address             |
| 2     | 04,05        | Route 1; Route 2                      |
| 3     | 06,07        | Route 3; Route 4                      |
| 4     | 08,09        | Route 5; Route 6                      |
| 5     | 10,11        | Route 7; Route 8                      |
| 6     | 12,13        | Destination PLC Type; Highway Address |
| 7     | 14,15        | Destination PLC L.P.; File Type       |
| 8     | 16,17        | Destination PLC File Number           |
| 9     | 18,19        | Destination PLC Starting File Element |
| 10    | 20,21        | Scan Update Frequency (x 10 msec)     |
| 11    | 22,23        | Scan Error Timeout (x 10 msec)        |
| 12-15 | 24-31        | Reserved                              |
| 16    | 32,33        | Error PLC Type; Highway Address       |
| 17    | 34,35        | Error PLC L.P.; File Type             |
| 18    | 36,37        | Error PLC File Number                 |
| 19    | 38,39        | Error PLC File Element                |

Figure E-7 Comm-Master Polling Table Entry

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Word offsets 16 thru 19 are used to specify a PLC Poll Message Error Address. This address will be updated by the Comm-Master at the conclusion of the poll request when an error occurs. The poll request is ended whenever either the remote device responds with the requested data or an error occurs. The contents of the error location should be examined to determine the success or failure of the poll operation. The error location will be updated with either the error code (for non-priority reads) or the Status Register Data (for priority reads) if it is non-zero. The user must reset the error location after reading.

## 1.4.3 Command Message Instruction

Control commands are sent from the Comm-Master to a remote device using standard ladder logic MSG instructions. The MSG instruction must be a WRITE command addressed to the Comm-Master (the data highway address of the RS-232 interface module that is connected to the Comm-Master). The processor type must be set to PLC-2 and the Local/Remote mode set to LOCAL. The destination data table address is not used and can be set to any value. The MSG instruction references a data table address and length. The contents of the data table referenced by the MSG instruction will be sent to the Comm-Master. The Comm-Master interprets this data and forms the actual command sent to the remote. The following figure details the contents of the data block for a command MSG instruction.

| Word | Byte Numbers | Function                              |
|------|--------------|---------------------------------------|
| 0    | 00,01        | Command Message Time-out (X10msec)    |
| 1    | 02,03        | Linked Poll Number; Linked Poll Delay |
| 2    | 04,05        | Reserved-set to 0000H                 |
| 3    | 06,07        | Reserved; Command Opcode              |
| 4    | 08,09        | Start Register Address                |
| 5    | 10,11        | Destination Route 1; Route2           |
| 6    | 12,13        | Destination Route 3; Route4           |
| 7    | 14,15        | Destination Route 5; Route 6          |
| 8    | 16,17        | Destination Route 7; Route 8          |
| 9-N  | 18-          | Start of data                         |
| 7-N  | 14-N         | Data for command                      |

Figure E-8 Command Message Data

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Word offset 0 is used to specify the time out value to be used for the command. The time out value is 10msec times the value stored in word 0.

Word 1 is used to optionally specify a "linked poll message". A linked poll message is a poll that is forced after the command is issued. This may be used for example to immediately read back a status line to confirm the control action specified in the control command did indeed occur. Byte 0 is used to specify the linked poll number. If no linked poll message is required set byte 0 to 00<sub>H</sub>. Byte 1 is used to specify an optional delay time. The delay time is specified in 10 msec increments. The delay time is altered by the delay timer multiplier factor stored in the header. If no delay is required set the delay time byte to 00<sub>H</sub>.

Word 2 is used to specify an error address for the command. The error address will be updated with the status returned by the remote that receives the command if an error is detected. The error word will always be updated if the command is a Priority Write Register command. If the command is a Write Register (non-priority) the error word will only be updated if an error occurs. The error address will be located in the same PLC and file that contains the configuration data.

Word 3 is used to specify the command opcode in byte 1. Valid entries are 02 (write register), or 1E (priority Write Register).

Word 4 is used to specify the Starting Register Address for the command

Words 5 thru 8 are used to specify the route fields for the command message. The format of this address field is the same as defined in the poll table entries.

Words 9 thru N are used to contain the actual data that is to be sent as part of the command. The message instruction includes a specification field for the number of data elements to send. The write register command (opcode 02) requires at least two bytes of data and a two byte mask word so words 9 and 10 would be used and the number of elements specified would be 11. If the write register command is to be sent to a Powerlogic device a "password" is also required. The "password" is entered in word 10 and the mask word moved down to word 11. The number of elements to be sent is increased to 12. The mask word is not required for priority write register commands so the number of elements sent should be set to 10 for priority writes to a PLC and to 11 for priority writes to a Powerlogic device.

Comm-Master™ Square D SY/MAX® Protocol

**JUMPER SELECTIONS FOR SY/MAX PROTOCOL**

The Comm-Master jumper settings and EPROM part numbers for Comm-Master SY/MAX protocol operation is detailed in the following figure. All configuration jumpers will be set to their default setting when the Comm-Master is shipped. Port P2 will be set for operation using RS422 voltage levels (J21 installed 1-2). If RS232 communication is required move jumper J21 to the 2-3 position.

| JUMPER | POSITION | JUMPER | POSITION | SY/MAX Protocol Communication is on       |
|--------|----------|--------|----------|---|
| J10    | NOT USED | J10    | NOT USED | Port P1 (top port), Allen-Bradley         |
| J11    | 1-2      | J11    | 1-2      | Communication is on Port P2 (center port) |
| J12    | 1-2      | J12    | 1-2      | U13 = # ???-??-?                          |
| J13    | NOT USED | J13    | NOT USED | U23 = # ???-??-?                          |
| J14    | NOT USED | J14    | NOT USED | U16 = PCMAID6.0                           |
| J15    | 1-2      | J15    | 1-2      |   |
| J16    | NOT USED | J16    | NOT USED |   |
| J17    | NOT USED | J17    | NOT USED |   |

Figure E-9 Jumper Settings

The Comm-Master is connected to the Allen-Bradley PLC equipment using port P1. Standard cable assemblies for most Allen-Bradley module connections are detailed in Section 3 of this manual. Standard cable assemblies can be purchased using the part numbers noted on each of the cable drawings in Section 3. Other cable assemblies may be required depending on the application. The pin-outs for connector P1 are shown below.

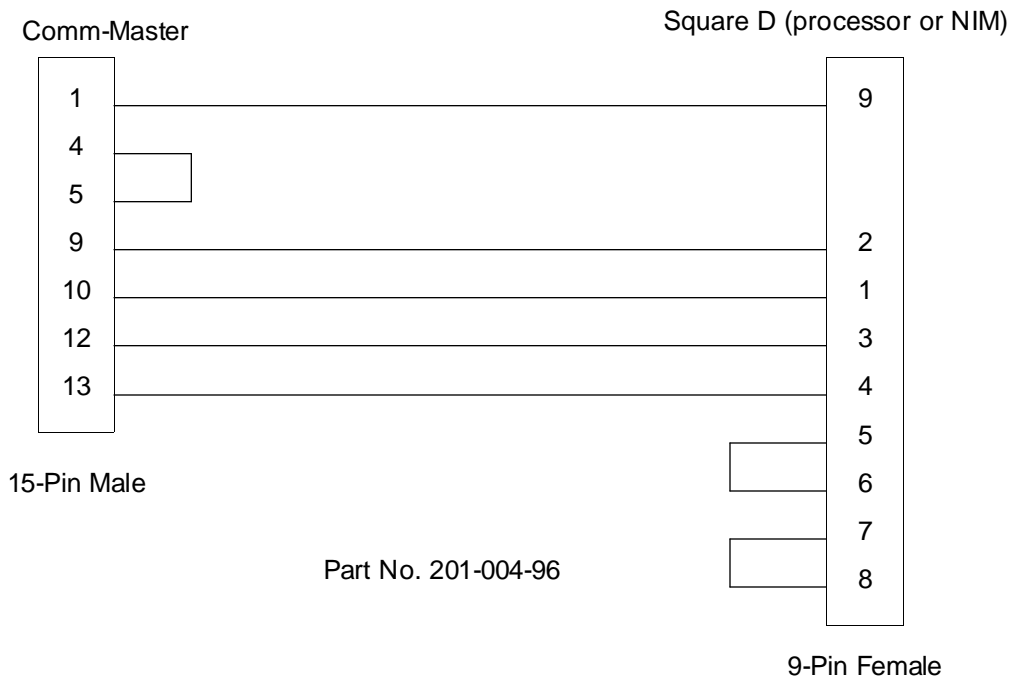
| PIN | SIGNAL NAME | FUNCTION                     |
|-----|-------------|------------------------------|
| 1   | GND         | Signal Ground                |
| 2   | TXD         | Transmit Data (output)       |
| 3   | RXD         | Receive Data (input)         |
| 4   | RTS         | Request To Send (output)     |
| 5   | CTS         | Clear To Send (input)        |
| 6   | DSR         | Data Set Ready (input)       |
| 7   | GND         | Signal Ground                |
| 8   | DCD         | Data Carrier Detect (input)  |
| 9   | DTR         | Data Terminal Ready (output) |

# Comm-Master™ Square D SY/MAX® Protocol

Connections to the Square D equipment are made using connector P2 (center connector). A Comm-Master to Square D adapter cable (PN 201-004-96) can be ordered separately if required. The standard adapter cable or a modem cable (PN 127-060-96) shown in Section 3 will work in most applications. Some applications may require the fabrication of a custom cable. The connector pin-outs for connector P2 are listed below for use in configuring a custom cable.

| PIN | SIGNAL NAME | FUNCTION                     |
|-----|-------------|------------------------------|
| 1   | GND         | Signal Ground                |
| 2   | TXD         | Transmit (output)            |
| 3   | RXD         | Receive Data (input)         |
| 4   | RTS         | Request To Send (output)     |
| 5   | CTS         | Clear To Send (input)        |
| 6   | DSR         | Data Set Ready (input)       |
| 7   | GND         | Signal Ground                |
| 8   | DCD         | Data Carrier Detect (input)  |
| 9   | TX+         | RS-422 Transmit +            |
| 10  | TX-         | RS-422 Transmit -            |
| 11  | DTR         | Data Terminal Ready (output) |
| 12  | RX-         | RS-422 Receive -             |

1



# COMM-MASTER CONFIGURATION HEADER WORKSHEET FOR SY/MAX PROTOCOL

| WORD | BYTE  | ADDRESS | BYTE0 | BYTE1 | DESCRIPTION                                   |
|------|-------|---------|-------|-------|---|
| 00   | 00,01 |         |       |       | Comm-Master address; number of Polling tables |
| 01   | 02,03 |         |       |       | Radio turn-on delay (x 10ms)                  |
| 02   | 04,05 |         |       |       | Radio turn-off delay (x 10ms)                 |
| 03   | 06,07 |         |       |       | RTS/CTS Delay (x 10ms)                        |
| 04   | 08,09 |         |       |       | Remote baud rate; # data bits                 |
| 05   | 10,11 |         |       |       | Remote parity; stop bits                      |
| 06   | 12,13 |         | 00    | 00    | Reserved                                      |
| 07   | 14,15 |         | 00    | 00    | Reserved                                      |
| 08   | 16,17 |         | 00    |       | Reserved; Multi-drop Protocol Enable          |
| 09   | 18,19 |         | 00    | 00    | Reserved                                      |
| 10   | 20,21 |         |       |       | Radiokey Address                              |
| 11   | 22,23 |         |       |       | Poll Timer Multiplier Factor                  |
| 12   | 24,25 |         | 00    | 00    | Spare   |
| 13   | 26,27 |         | 00    | 00    | Spare   |
| 14   | 28,29 |         | 00    | 00    | Spare   |
| 15   | 30,31 |         | 00    | 00    | Spare   |
| 16   | 32,33 |         | 00    | 00    | Spare   |
| 17   | 34,35 |         | 00    | 00    | Spare   |
| 18   | 36,37 |         | 00    | 00    | Spare   |
| 19   | 38,39 |         | 00    | 00    | Spare   |

# COMM-MASTER POLLING TABLE WORKSHEET FOR SY/MAX PROTOCOL

| WORD | BYTE  | ADDRESS | BYTE0 | BYTE1 | DESCRIPTION  |
|------|-------|---------|-------|-------|--|
| 00   | 00,01 |         |       |       | Command Opcode; Data Point Count                   |
| 01   | 02,03 |         |       |       | Number of Registers                                |
| 02   | 04,05 |         |       |       | Route 1; Route 2                                   |
| 03   | 06,07 |         |       |       | Route 3; Route 4                                   |
| 04   | 08,09 |         |       |       | Route 5; Route 6                                   |
| 05   | 10,11 |         |       |       | Route 7; Route 8                                   |
| 06   | 12,13 |         |       |       | <b>Data Destination Address-</b> PLC Type; Address |
| 07   | 14,15 |         |       |       | L.P.; File Type                                    |
| 08   | 16,17 |         |       |       | File Number  |
| 09   | 18,19 |         |       |       | Starting Element                                   |
| 10   | 20,21 |         |       |       | Poll Update Frequency (x 10 ms)                    |
| 11   | 22,23 |         |       |       | Poll Timeout (x 10ms)                              |
| 12   | 24,25 |         | 00    | 00    | Reserved   |
| 13   | 26,27 |         | 00    | 00    | Spare  |
| 14   | 28,29 |         | 00    | 00    | Spare  |
| 15   | 30,31 |         | 00    | 00    | Spare  |
| 16   | 32,33 |         |       |       | <b>Error Address-</b> PLC Type; Address            |
| 17   | 34,35 |         |       |       | L.P.; File Type                                    |
| 18   | 36,37 |         |       |       | File Number  |
| 19   | 38,39 |         |       |       | Starting Element                                   |

## POLL TABLE #

| WORD | BYTE  | ADDRESS | BYTE0 | BYTE1 | DESCRIPTION  |
|------|-------|---------|-------|-------|--|
| 00   | 00,01 |         |       |       | Command Opcode; Data Point Count                   |
| 01   | 02,03 |         |       |       | Number of Registers                                |
| 02   | 04,05 |         |       |       | Route 1; Route 2                                   |
| 03   | 06,07 |         |       |       | Route 3; Route 4                                   |
| 04   | 08,09 |         |       |       | Route 5; Route 6                                   |
| 05   | 10,11 |         |       |       | Route 7; Route 8                                   |
| 06   | 12,13 |         |       |       | <b>Data Destination Address-</b> PLC Type; Address |
| 07   | 14,15 |         |       |       | L.P.; File Type                                    |
| 08   | 16,17 |         |       |       | File Number  |
| 09   | 18,19 |         |       |       | Starting Element                                   |
| 10   | 20,21 |         |       |       | Poll Update Frequency (x 10 ms)                    |
| 11   | 22,23 |         |       |       | Poll Timeout (x 10ms)                              |
| 12   | 24,25 |         | 00    | 00    | Reserved   |
| 13   | 26,27 |         | 00    | 00    | Spare  |
| 14   | 28,29 |         | 00    | 00    | Spare  |
| 15   | 30,31 |         | 00    | 00    | Spare  |
| 16   | 32,33 |         |       |       | <b>Error Address-</b> PLC Type; Address            |
| 17   | 34,35 |         |       |       | L.P.; File Type                                    |
| 18   | 36,37 |         |       |       | File Number  |
| 19   | 38,39 |         |       |       | Starting Element                                   |

## POLL TABLE #

# COMM-MASTER COMMAND WORKSHEET FOR SY/MAX PROTOCOL

| WORD | BYTE  | ADDRESS | BYTE0 | BYTE1 | DESCRIPTION                                |
|------|-------|---------|-------|-------|--|
| 00   | 00,01 |         |       |       | Message time out (x 10ms)                  |
| 01   | 02,03 |         |       |       | Linked Poll # ; Linked Poll delay (x 10ms) |
| 02   | 04,05 |         | 00    | 00    | Reserved                                   |
| 03   | 06,07 |         | 00    |       | Command Opcode                             |
| 04   | 08,09 |         |       |       | Start Register                             |
| 05   | 10,11 |         |       |       | Route 1; Route 2                           |
| 06   | 12,13 |         |       |       | Route 3; Route 4                           |
| 07   | 14,15 |         |       |       | Route 5; Route 6                           |
| 08   | 16,17 |         |       |       | Route 7; Route 8                           |
| 09   | 18,19 |         |       |       | Start of data                              |

## COMMAND #

| WORD | BYTE  | ADDRESS | BYTE0 | BYTE1 | DESCRIPTION                                |
|------|-------|---------|-------|-------|--|
| 00   | 00,01 |         |       |       | Message time out (x 10ms)                  |
| 01   | 02,03 |         |       |       | Linked Poll # ; Linked Poll delay (x 10ms) |
| 02   | 04,05 |         | 00    | 00    | Reserved                                   |
| 03   | 06,07 |         | 00    |       | Command Opcode                             |
| 04   | 08,09 |         |       |       | Start Register                             |
| 05   | 10,11 |         |       |       | Route 1; Route 2                           |
| 06   | 12,13 |         |       |       | Route 3; Route 4                           |
| 07   | 14,15 |         |       |       | Route 5; Route 6                           |
| 08   | 16,17 |         |       |       | Route 7; Route 8                           |
| 09   | 18,19 |         |       |       | Start of data                              |

## COMMAND #

| WORD | BYTE  | ADDRESS | BYTE0 | BYTE1 | DESCRIPTION                                |
|------|-------|---------|-------|-------|--|
| 00   | 00,01 |         |       |       | Message time out (x 10ms)                  |
| 01   | 02,03 |         |       |       | Linked Poll # ; Linked Poll delay (x 10ms) |
| 02   | 04,05 |         | 00    | 00    | Reserved                                   |
| 03   | 06,07 |         | 00    |       | Command Opcode                             |
| 04   | 08,09 |         |       |       | Start Register                             |
| 05   | 10,11 |         |       |       | Route 1; Route 2                           |
| 06   | 12,13 |         |       |       | Route 3; Route 4                           |
| 07   | 14,15 |         |       |       | Route 5; Route 6                           |
| 08   | 16,17 |         |       |       | Route 7; Route 8                           |
| 09   | 18,19 |         |       |       | Start of data                              |

## COMMAND #