S4516-DF1
PROGRAM DEVELOPMENT MANUAL
(M4500 BASED)

Revised: 27 August 2003

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WARNING

To ensure that the equipment described by this User Manual, as well as the equipment connected to and used with it, operates satisfactorily and safely, all applicable local and national codes that apply to installing and operating the equipment must be followed. This includes the National Electrical Code in the USA and other applicable legislation, regulations, and codes in practice elsewhere. Since codes can vary geographically and can change with time, it is the user's responsibility to determine which standards and codes apply, and to comply with them.

FAILURE TO COMPLY WITH APPLICABLE CODES AND STANDARDS CAN RESULT IN DAMAGE TO EQUIPMENT AND/OR SERIOUS INJURY TO PERSONNEL.

Persons supervising and performing installation or maintenance must be suitably qualified and competent in these duties, and should carefully study the User Manual and any other manuals referred to by it prior to installation and/or operation of the equipment.

The manufacturer accepts no liability for any consequences resulting from inappropriate, negligent or incorrect installation, operation, or adjustment of the equipment.

The contents of the User Manual are believed to be correct at the time of printing; however, no responsibility is assumed for inaccuracies. In the interests of a commitment to a policy of continuous development and improvement, the manufacturer reserves the right to change the specification of the product or it's performance or the contents of the User Manual without notice.

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APPENDICES

SECTION 1
GENERAL OVERVIEW

The S4516-DF1 serial communications board contains one S3000 Serial Network Interface port and one RS-232/RS-422 User Port. The S4516-DF1 provides a means for an M4500 module to communicate to other S3000, M4000 or M4500 modules/processors via the S3000 serial network. The RS-232/RS422 port implements the Allen-Bradley DF1 full duplex communication protocol. This allows an M4500 module to reside as a node on the Allen-Bradley Data Highway/Data Highway Plus™/DH-485 serial networks via a Data Link communication controller or RS232 interface. Refer to the M4500 User's Manual, Appendix A for more information on the S4516 serial communications board.

This manual is provided as a programming reference for the S4516-DF1 serial communications board, communicating on the Allen-Bradley Data Highway network. This, in conjunction with the M4500 User's Manual, the M4500 Program Development Manual and the Allen-Bradley Data Highway/Data Highway Plus™/DH-485 Communication Protocol and Command Set Reference Manual, provide the necessary documentation to write M4500 programs to communicate to other Allen-Bradley PLC processors.

SECTION 1
GENERAL OVERVIEW

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SECTION 2
DEVELOPING THE MESSAGE PACKET

This section describes the fundamentals necessary to develop Application Data message packets to send or reply to command messages.

A command message indicates that some function will be performed by a remote node. The reply message is the response to the command message. If the remote node is unable to execute the function, an error message will be generated and returned. For each command message sent, a reply message is generated.

A message may sometimes get lost and a response not returned. If a reply is not received within a given time period, the message should be sent again.

The minimum number of bytes contained in any one message packet is 6. The maximum number varies, however, the maximum number of bytes to be sent or received can not be greater than 250.

The S4516-DF1 attaches a minimum of 5 additional bytes to every message packet while formatting the frame. Additionally, it will initiate “DLE Doubling”. This adds an additional DLE, (10 HEX) character to the data string whenever a DLE character is found. Care should be taken when formatting the message packets that additional bytes will be added prior to transmission. If a frame is too large to transmit, the message will not be sent and an error code will be generated. See section 3.3 - Transmitting Through the User Port (sfunc11) for more details.

Refer to the Allen-Bradley Data Highway/Data Highway Plus™/DH-485 Communication Protocol and Command Set Reference Manual, Chapter 3.1 - Understanding Application Layer Message Packet Protocol, for more information.

SECTION 2
DEVELOPING THE MESSAGE PACKET

2.1 FULL DUPLEX TRANSMISSION CHARACTERS

The following characters are the "Full-Duplex Transmission Symbols:

Abbreviation	HEX Value
STX	02
ETX	03
ENQ	05
ACK	06
DLE	10
NAK	15

These characters are combined to create "Control Symbols" and "Data Symbols". This is a sequence of one or more bytes having a specific meaning to the link protocol.

The following are the Data Link Layer message packet fields used with the full duplex protocol:

DLE STX	Control Symbol - Indicates the START of a message packet.
DLE ETX BCC	Control Symbol - Indicates the END of a message packet.
DLE ACK	Response Control Symbol - Indicates that a message has be successfully received.
DLE NAK	Response Control Symbol - Indicates that a message has not been successfully received.
DLE ENQ	Sender Control Symbol - Indicates a request for retransmission of a message packet or response symbol.
MESSAGE	Data Symbol - Includes data from the application layer.
DLE DLE	Data Symbol - A symbol that represents the data value 10 (hex).

2.2 COMMAND AND REPLY MESSAGE PACKET BYTE DEFINTIONS:

The following are the byte definitions for the "Command" and "Reply" message packets.

Refer to the Allen-Bradley Data Highway/Data Highway Plus™/DH-485 Communication Protocol and Command Set Reference Manual, chapter 3.1 Understanding Application Layer Message Packet Protocol, for more information on the basic command set message packet fields.

DST	Destination node where the message packet is to be delivered.
SRC	Source node from where the message packet originated from.
CMD	Command Code.
STS	Status Code.
TNS	Transaction Number (2-bytes).
FNC	Function Code.
EXT STS	Extended Status Code.
ADDR	Starting Address of memory location.
DATA	Data values being transferred by the message packet.
SIZE	Number of data bytes to be transferred by the message packet. The allowed value for the SIZE is variable, based on the function being executed. In some cases the SIZE is the number of "Elements" being transferred, not "Bytes".

NOTE: 1 element contains 2 bytes.

2.3 PACKET FORMAT FOR FULL DUPLEX PROTOCOL

The Data Link layer message packet always begins with "DLE STX" and ends with "DLE ETX BCC" control symbols. These control symbols, as well as "DLE Doubling", are automatically added to the users message packet as the frame is being prepared for transmission. When a message packet is received, only the message is returned to the user. All other unnecessary control symbols are removed.

Figure 2.1 shows the format of a typical message packet for Full Duplex protocol.

Refer to the Allen-Bradley Data Highway/Data Highway Plus™/DH-485 Communication Protocol and Command Set Reference Manual, chapter 3.2 Message Packet Formats for the Basic Command Set, for more information on formatting the message packet.

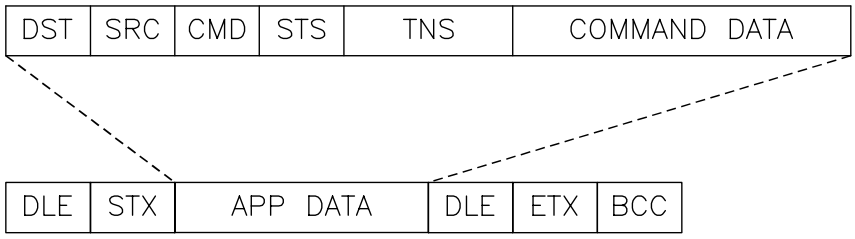


Figure 2.1 Packet Format for Full-Duplex Protocol

2.4 HOW THE TRANSMITTER OPERATES

When transmitting a message packet the S4516-DF1 will first search the data string for any DLE characters (10 HEX), and initiate "DLE Doubling". It will then attach the necessary starting and ending control symbols and calculate the block check character, BCC. Once assembled, the message packet is transmitted, typically to a Data Link or some other RS232 interface. When the transmission is complete, the S4516-DF1 waits for a reply indicating receipt of the message. Once a response is returned the S4516-DF1 will return with a "DONE".

Under normal operation a two byte data string acknowledging the receipt of the message will be returned indicating the success of the delivery. The S4516-DF1 will automatically retry the message up to 3 times if the communication interface is not responding and up to 10 times if a request for retransmission, DLE ENQ, is returned. If the transmission was not successful, the S4516-DF1 will return with "DONE" indicating a problem with the transmission.

System function sfunc11() will be used to transmit the users message packet to another node on the Allen-Bradley Data Highway. The format and function of the sfunc11() has not changed, however, the "Source" data will now contain the message packet to be delivered. The message packet is developed within the users main program code.
See section 2.6 "Message Packet Formats", for additional information on developing an Application Data message packet.

SECTION 2
DEVELOPING THE MESSAGE PACKET

2.5 HOW THE RECEIVER OPERATES

The receiver continually scans for incoming data. Once the start of transmission, DLE STX, control symbol is received, a message packet is assembled and the receiver looks for instances of "DLE Doubling" and removes any additional DLE characters.

Once the end of transmission, DLE ETX BCC, control symbol has been received, the "Block Check Character, BCC, is verified. If the BCC received is valid, a two byte data string acknowledging the message is transmitted back and the message packet is copied into the sfunc10() receive buffer. However if the BCC is not valid, a data string, not acknowledging the message is transmitted back and the message packet is not returned to the user.

System function sfunc10() should be continually called from the users program. As with system function sfunc11(), the format and function have not been changed. However, when a valid message is received, the entire packet, along with the size in bytes, is returned with all the unnecessary formatting and framing control symbols removed. See section 2.6 "Message Packet Formats", for additional information.

2.6 MESSAGE PACKET FORMATS

This section provides two examples for developing message packet formats for the PLC5 and SLC500 family processor commands. Please refer to the Allen-Bradley Data Highway/Data Highway Plus™/DH-485 Communication Protocol and Command Set Reference Manual, Unit III: Application Layer Message Packet Fields, for more information on formatting the message packet.

The S4516-DF1 embedded DF1 driver offers a large flexibility when developing message packets to communicate with other Allen-Bradley PLC processors. The sample code that accompanies this manual demonstrates only a few ways to develop message packet formats.

The following sections provide the most common message formats for reading and writing data to PLC5 and SLC500 processors.

2.6.1 PLC5 WORD RANGE READ/WRITE

The "Word Range Read (Read Block)" or "Word Range Write (Write Block)" are good message packet formats for reading or writing data to a PLC5 processor. The starting address is either a logical binary address or a logical ASCII address and must point to a word or a file.

Message Packet Format - Word Range Read:

Command Format:

CMD 0fH	STS	TNS	FNC 01H	PACKET OFFSET	TOTAL TNS	PLC SYSTEM ADDRESS	SIZE

Reply Format:

CMD 4fH	STS	TNS	DATA (up to 244 Bytes)

An EXT STS (extended status) byte will replace the data field if there is an error, STS (status byte) will not be zero.

Message Packet Format - Word Range Write:

Command Format:

CMD 0fH	STS	TNS	FNC 00H	PACKET OFFSET	TOTAL TNS	PLC SYSTEM ADDRESS	DATA

Reply Format:

CMD 4fH	STS	TNS	EXT STS

An EXT STS (extended status) byte will be attached only if there is an error, STS (status byte) will not be zero.

PACKET OFFSET and TOTAL TNS are in number of "Elements".
DATA is in an even number of "Bytes", (2 bytes = 1 element).
SIZE is number of "DATA Bytes".

SECTION 2
DEVELOPING THE MESSAGE PACKET

The PLC5 System Address uses four levels of encoded addressing. The first byte is the “Mask Byte”. This byte is required. Setting the bits within this byte sets the number of levels and which levels will be encoded. In the sample code that accompanies this manual, this byte is set to 0fH. This sets 4 levels of encoded addressing as follows:

Address Format:

MASK 0FH	LEVEL 1 00H	LEVEL 2 File Num	LEVEL 3 Elmt Num	LEVEL 4 00H

Defalut: 0–999
0 Output
1 Input
2 Status
3 Binary
4 Timer
5 Counter
6 Control
7 Integer
8 Float

9–999 User Config

ADD Mask: Encoded Addressing Byte
ADD Level 1: Data Table - Default = 0
ADD Level 2: File Number
0 - 8 are Default File Types
9 - 999 are User Defined File Types
If this number is greater than 255, set this byte to FFH which will allow the file number to be encoded into the next two bytes.
Floating point are two words long (4 bytes).
ADD Level 3: Element Number - 0 through 999
If this number is greater than 255, set this byte to FFH which will allow the element number to be encoded into the next two bytes.

Address Format:

MASK 0FH	LEVEL 1 00H	LEVEL 2 File Num	LEVEL 3 FFH	LEVEL 3 Elmt LO	LEVEL 3 Elmt HI	LEVEL 4 00H

ADD Level 4: Sub-Element Number - Default = 0

2.6.2 SLC500 PROTECTED TYPED LOGICAL READ/WRITE

The "Protected Typed Logical Read" or "Protected Typed Logical Write" are good message packet formats for reading or writing data to a SLC500 processor.

Message Packet Format - Protected Typed Logical Read with Three Address Fields:

Command Format:

CMD 0fH	STS	TNS	FNC A2H	BYTE SIZE	FILE NO.	FILE TYPE	ELEMENT NO.	SUB–ELMT NO.

Reply Format:

CMD 4fH	STS	TNS	DATA (up to 240 Bytes)

An EXT STS (extended status) byte will replace the data field if there is an error, STS (status byte) will not be zero.

Message Packet Format - Protected Typed Logical Write with Three Address Fields:

Command Format:

CMD 0fH	STS	TNS	FNC A2H	BYTE SIZE	FILE NO.	FILE TYPE	ELEMENT NO.	SUB–ELMT NO.	DATA (up to 240 Bytes)

Reply Format:

CMD 4fH	STS	TNS	EXT STS

An EXT STS (extended status) byte will be attached only if there is an error, STS (status byte) will not be zero.

In these message packet formats the CMD, STS, TNS and FNC fields perform the same typical functions. However, the remaining fields are described below:

Field	Description
Byte Size:	The size of data to be read (in bytes), not including the address fields or other overhead bytes.
File Number:	This byte addresses files 0-254 only. For higher addresses, setting this byte to FF expands this field to three bytes total. Use the second and third bytes for the expanded file address (low address byte first).
File Type:	**Warning:** You must use one of the following values for this field. Do no use any other values; doing so may result in unpredictable results. 80-83 HEX: Reserved 84 HEX: Status 85 HEX: Bit 86 HEX: Timer 87 HEX: Counter 88 HEX: Control 89 HEX: Integer
Element Number:	This byte addresses elements 0-254 only. For higher addresses, setting this byte to FF HEX expands this field to three bytes total. Use the second and third bytes for the expanded element address (last address byte first).
Sub-Element:	This byte addresses elements 0-254 only. For higher addresses, setting this byte to FF HEX expands this field to three bytes total. Use the second and third bytes for the expanded element address (last address byte first).

SECTION 3
USING THE SYSTEM FUNCTIONS

This section describes using the system functions sfunc10/11/13 for the S4516-DF1. Refer to the M4500 Program Development manual for more detailed information.

The sfunc10/11 are no longer used for general purpose User Port communications. The sfunc10() and sfunc11() are used to receive and transmit data utilizing the embedded Allen-Bradley DF1 full duplex protocol.

The format is the same, however, the function has changed. Refer to the M4500 Program Development Manual, Section 5, "Programming Language Reference", for more information on "System Functions".

3.1 INITIALIZING THE S4516-DF1 FOR COMMUNICATIONS

S4516-DF1 is initialized for communications using system function sfunc19(). This is typically done in the initialization file of the M4500

The following code is an example of how to initialize the S4516-DF1 for communications (S4516-DF1 board located in slot02).

```
W8156 = 7552;       /* S4516-DF1 Located in slot-02 */
sfunc19(1,3,1);     /* S4516-DF1 S3000 Network Node 1 */
                    /* S3000 Network Baud Rate = 344k */
                    /* User Port Baud Rate = 19200 */
```

If the S4516-DF1 were to be used as a slave on the S3000 network the board would need to be initialized using the following code.

```
B161.6 = 1;         /* sfunc13 Slave mode Enabled */
W8154 = 7552;       /* Slave slot Address for sfunc13 slave mode */
W8156 = W8154;      /* S4516-DF1 Located in slot-02 */
sfunc19(1,3,1);     /* Initialize S4516-DF1 Board */
                    /* S3000 Network Node 1 */
                    /* S3000 Network Baud Rate = 344k */
                    /* User Port Baud Rate = 19200 */
```

3.2 RECEIVING THROUGH THE USER PORT (sfunc10)

The sfunc10 will perform the following functions:

- Receives message packets
- Check for transmission errors using the Block Check Character, BCC, method.
- Removes the starting and ending control symbols and any unnecessary DLE characters.
- Returns a response upon receipt of the message packet.

General Form: sfunc10(#max,dest);

Parameters: #max: This number is essentially ignored by the sfunc10 call and should be set to 250 which is the maximum number of bytes that can be returned.

dest: This is the address of the first byte of the sfunc10 receive buffer. The receive buffer is where the message packet will be copied to from the S4516-DF1. Variable types: "B" or indirect "*B".

Return Value: The return value is the total number of bytes contained within the message packet. Therefore whenever a message packet is received the format will always be the same. These bytes are as follows:

[DST] [SRC] [CMD] [STS] [TNS (2-bytes)] [DATA]

Type: Simultaneous.

Valid Files: Initialization, Main Program and User Functions.

3.3 TRANSMITTING THROUGH THE USER PORT (sfunc11)

The sfunc11 will perform the following functions:

- Assemble the message packet by attaching the starting and ending control symbols and inserting additional DLE characters as needed.
- Transmit the message packet.
- Wait for an acknowledge of receipt of transmission.
- Retry the message if the transmission is unsuccessful.
- Return with a response indicating the success of the transmission.

General Form: sfunc11(#sent,srce);

Parameters:

#sent: The number of bytes to transmit out the User Port.
Variable Types: Constant (1-250), "B" or indirect "*B".

scre: The address where the first byte transmitted is stored. A consecutive number of bytes (= #sent) is transmitted out the USERPORT starting with this address. Variable types: "B" or indirect "*B".

Return Values:

0 = Not Busy, Ready.
1 = Busy.
2 = Done - "DLE ACK" Received.
3 = Done - Error, "DLE NAK" Received.
4 = Done - Error, "DLE ENQ" Time Out.
5 = Done - Error, No Response Time Out.
6 = Done - Error, Packet too Large.

Type: Simultaneous.

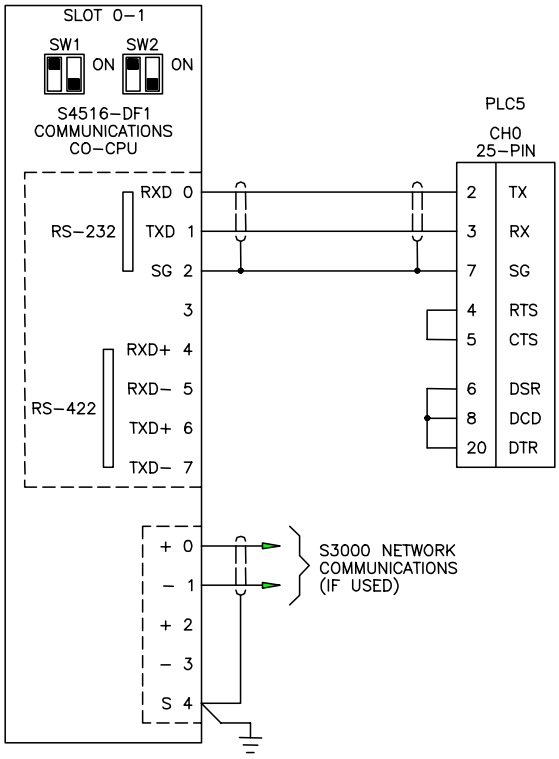
Valid Files: Initialization, Main Program and User Functions.

3.4 COMMUNICATING ON THE S3000 NETWORK (sfunc13)

System function sfunc13 is used to communicate to other S3012s, S3014s, M4000 modules, or other M4500 nodes on the S3000 serial communications network. The operation of the sfunc13 is identical to that described in the "M4500 Program Development Manual".

4.1 HARDWARE

DF1 communications takes place via the Channel 0 port (25-pin) of the PLC5 to the RS-232 communications port on the S4516-DF1 Serial Communications board. The cable should be constructed as follows:



PLC5 TO S4516-DF1

Internally, the PLC5 should be setup for RS-232 communications. Refer to the dip switch setting guide on the side of the processor.

Additionally, Dip switch SW1 on the S4516-DF1 board is the RS-232/RS-422 dip switch and should be set as follows:

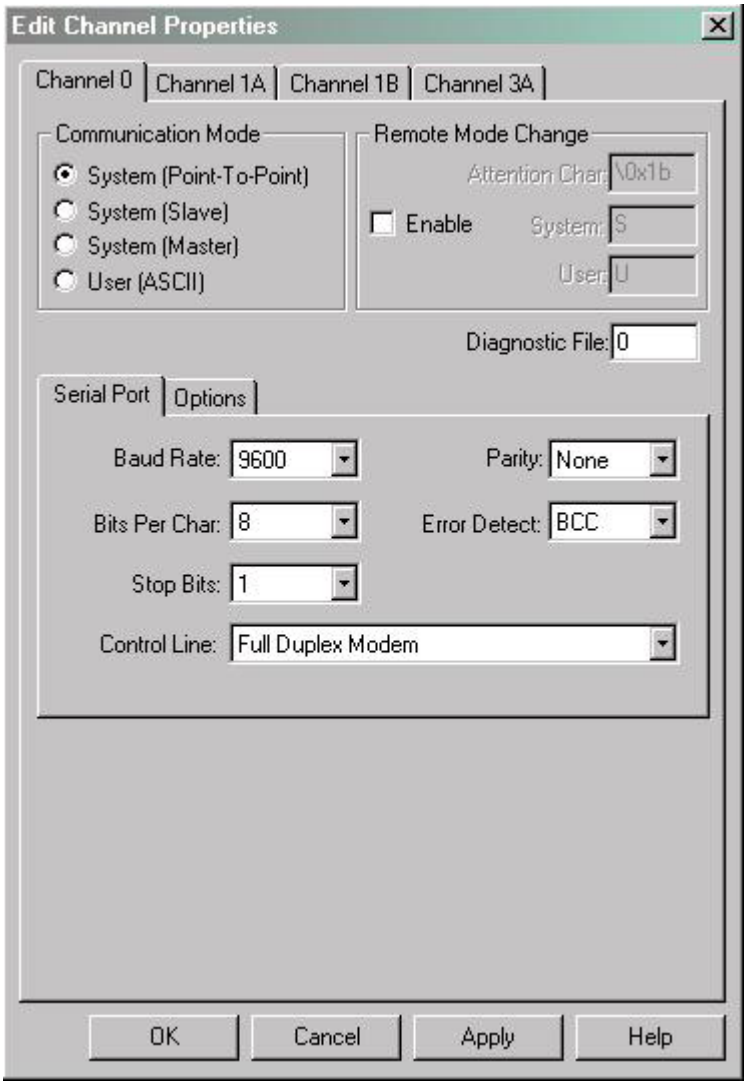
POLE 1 = ON
POLE 2 = off

Dip switch SW2 is the slot address. This is dependent upon the rest of the cards in the M4500 rack. In the above example, the board is setup for slot01 (POLE 1 = ON, POLE 2 = off).

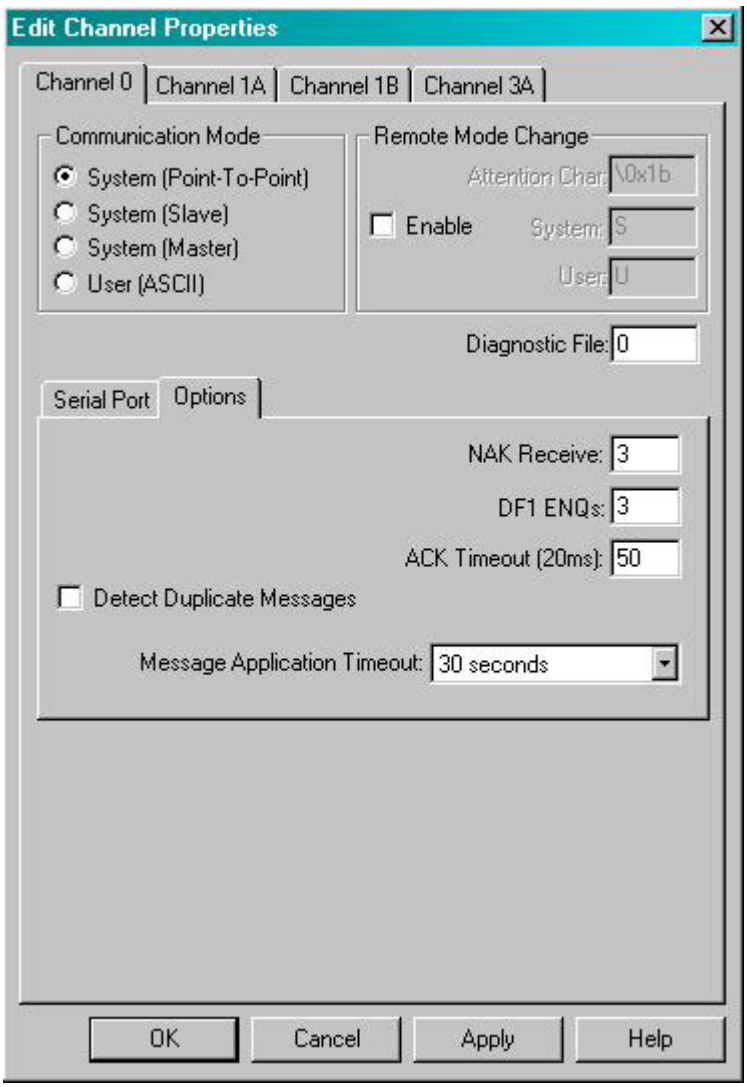
4.2 CHANNEL 0 CONFIGURATION

The Channel 0 Serial port on the PLC5 should be setup as shown below.

Note: The communication mode must be set for System (point-to-point).



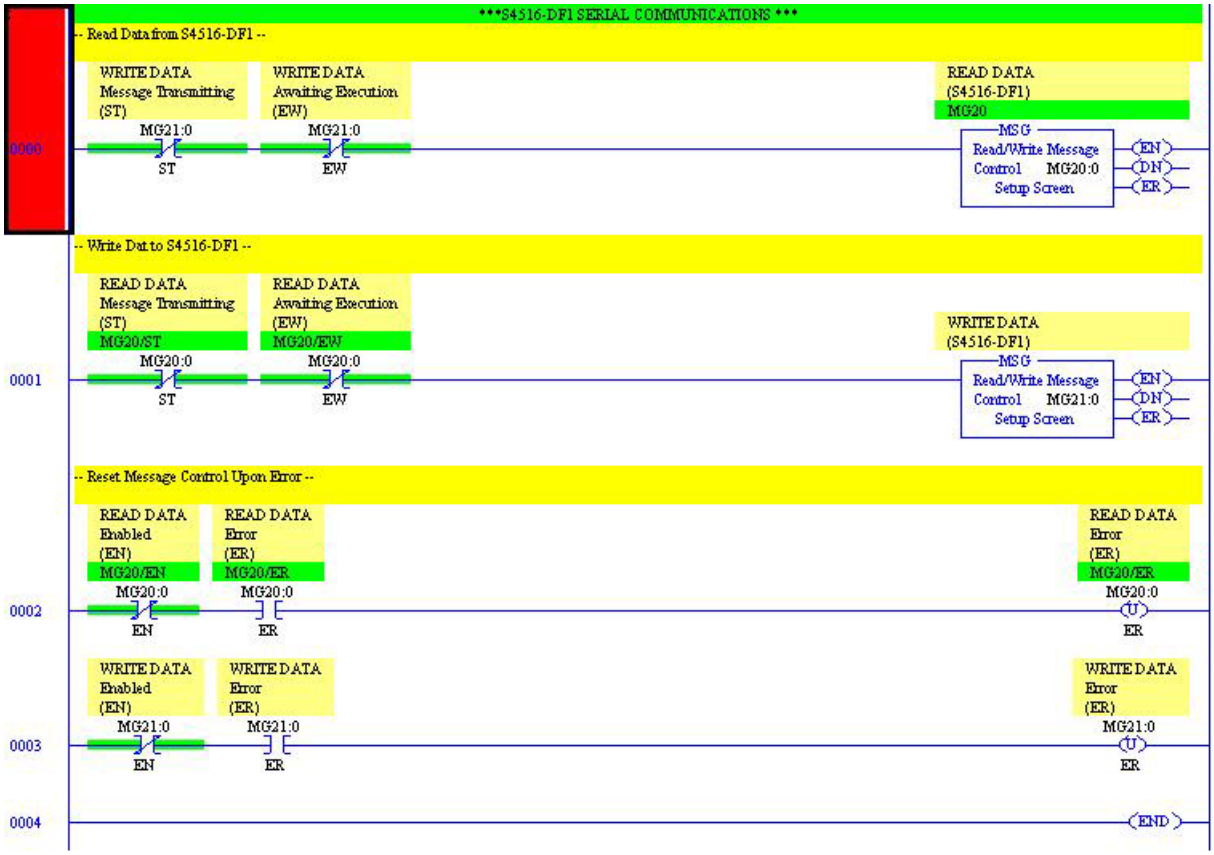
The Channel 0 “Options” are set as follows:



Note: The “Detect Duplicate Messages” should be unchecked.

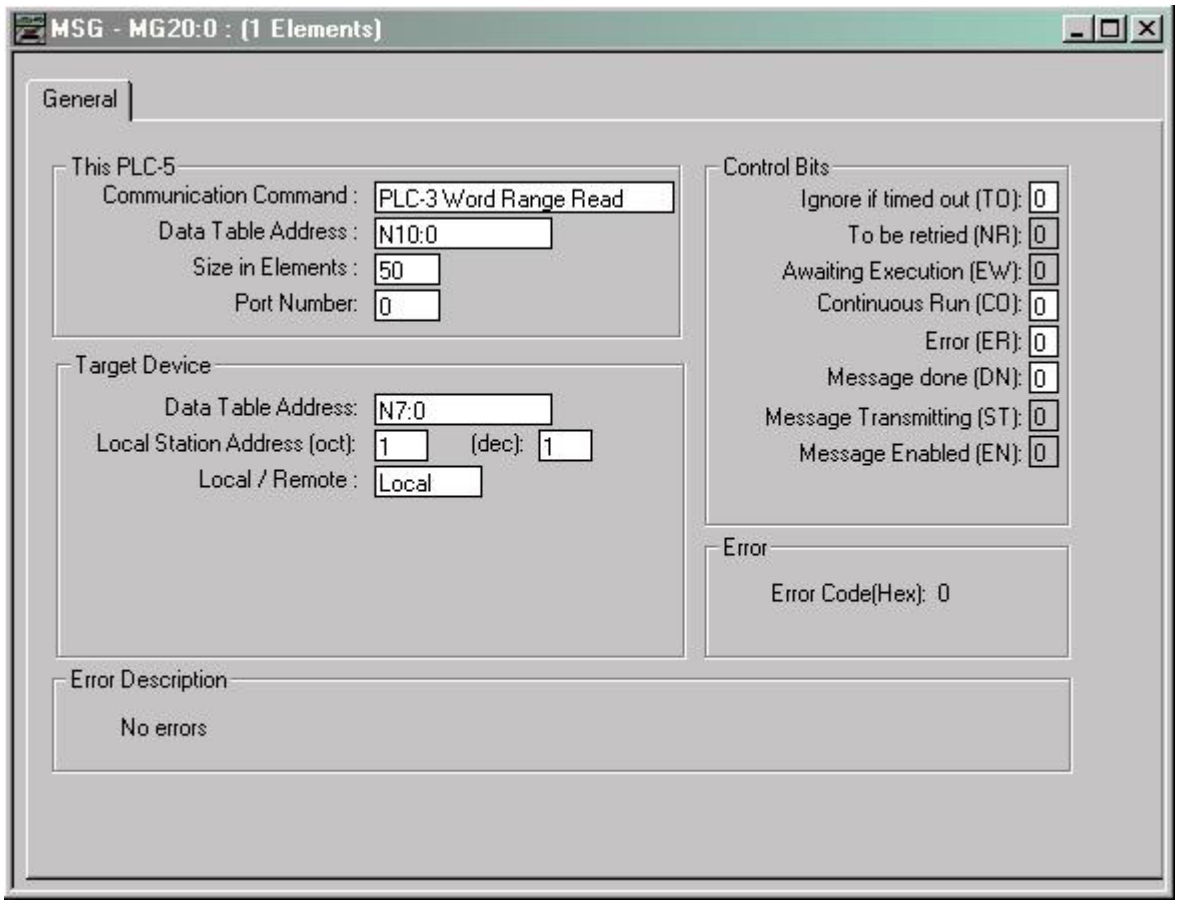
4.3 USING THE MSG INSTRUCTION (sample PLC code)

The following sample RSLogix5 code is used to execute the message control function to allow a PLC5 to communicate with the S4516-DF1 Serial Communications board.



4.4 THE "READ" INSTRUCTION

The "Read" message (MSG) instruction for a PLC5 is setup as follows:

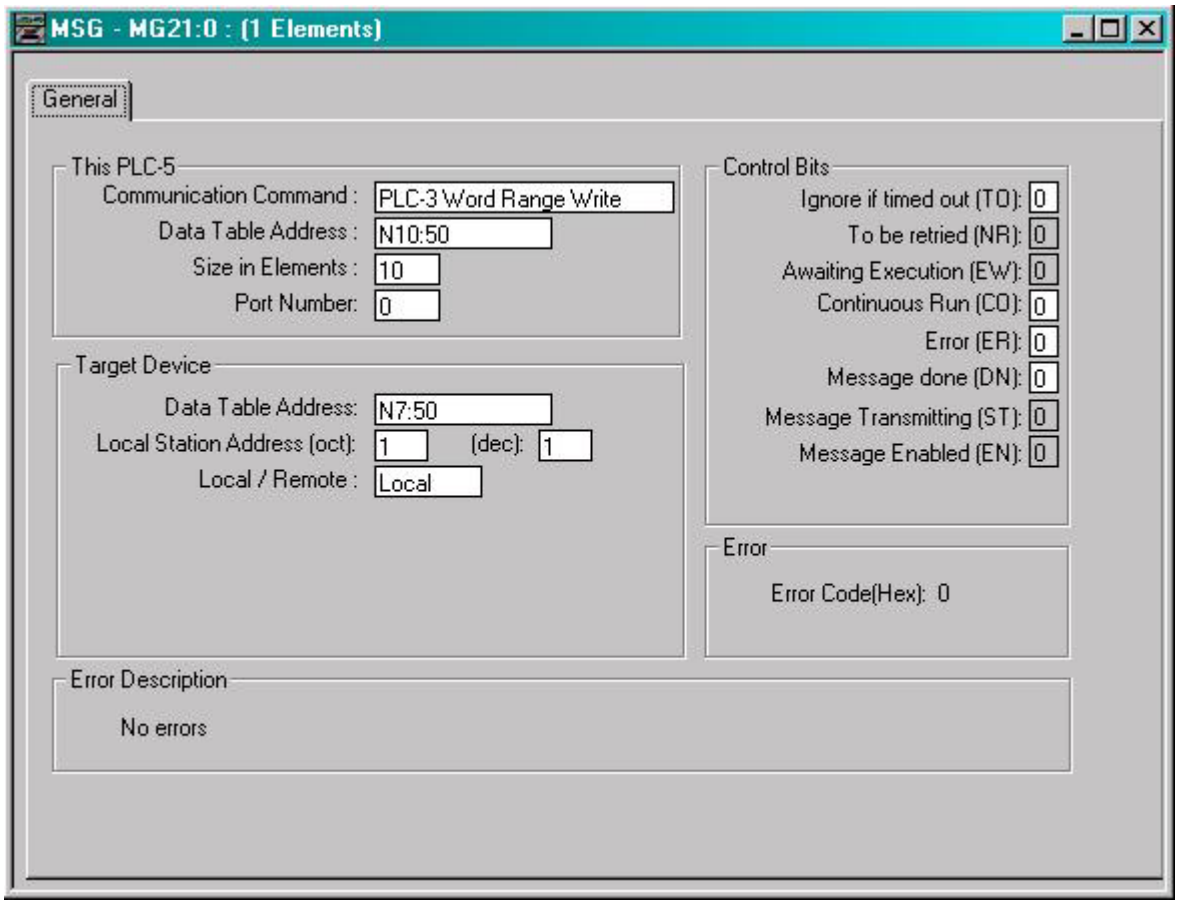


Note: The "Communication Command" is PLC3 Word Range Read. The "Data Table Address" (N7:0) can be any inter file address. The 50 elements read from the M4500 are a set of 50 consecutive words. This value can be anything from 1 to 120. The M4500 PLC code can be written to interpret the data table address (i.e. N7:0 = W4300).

The "Local Station Address" is only necessary to define if communications with the S4516-df1 is executed over the Data Highway network (via a DataLink module).

4.5 THE "Write" INSTRUCTION

The "Write" message (MSG) instruction for a PLC5 is setup as follows:

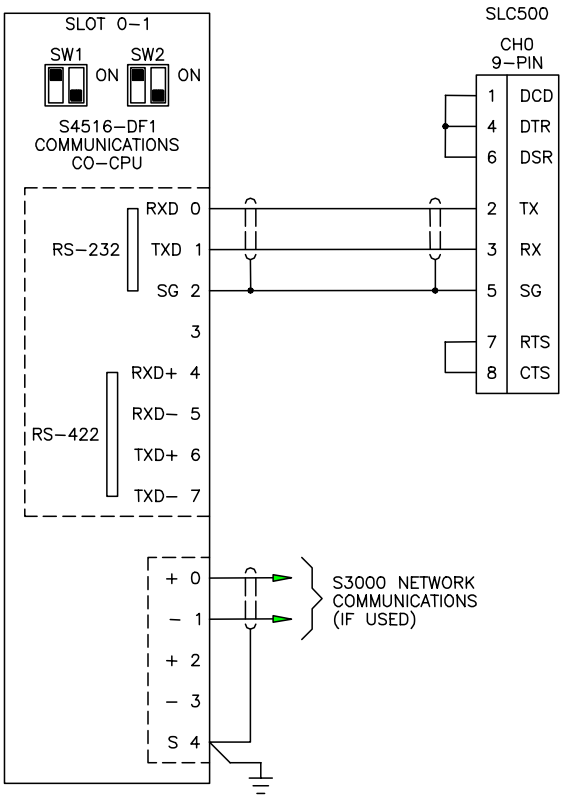


Note: The "Communication Command" is PLC3 Word Range Write. The "Data Table Address" (N7:50) can be any inter file address. The 10 elements written to the M4500 are a set of 10 consecutive words. This value can be anything from 1 to 120. The M4500 PLC code can be written to interpret the data table address (i.e. N7:50 = W4400).

The "Local Station Address" is only necessary to define if communications with the S4516-df1 is executed over the Data Highway network (via a DataLink module).

5.1 HARDWARE

DF1 communications takes place via the Channel 0 port (95-pin) of the SLC500 to the RS-232 communications port on the S4516-DF1 Serial Communications board. The cable should be constructed as follows:



SLC500 TO S4516-DF1

Additionally, Dip switch SW1 on the S4516-DF1 board is the RS-232/RS-422 dip switch and should be set as follows:

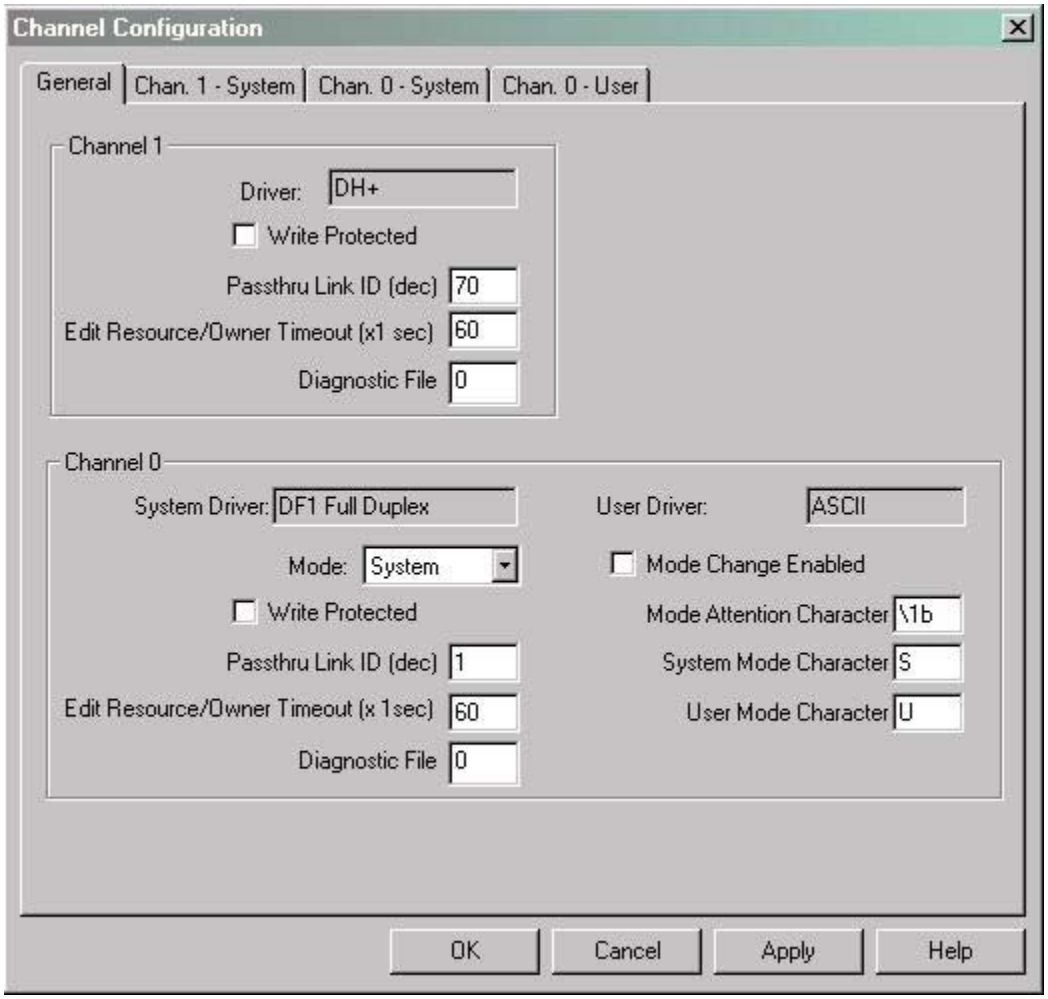
POLE 1 = ON
POLE 2 = off

Dip switch SW2 is the slot address. This is dependent upon the rest of the cards in the M4500 rack. In the above example, the board is setup for slot01 (POLE 1 = ON, POLE 2 = off).

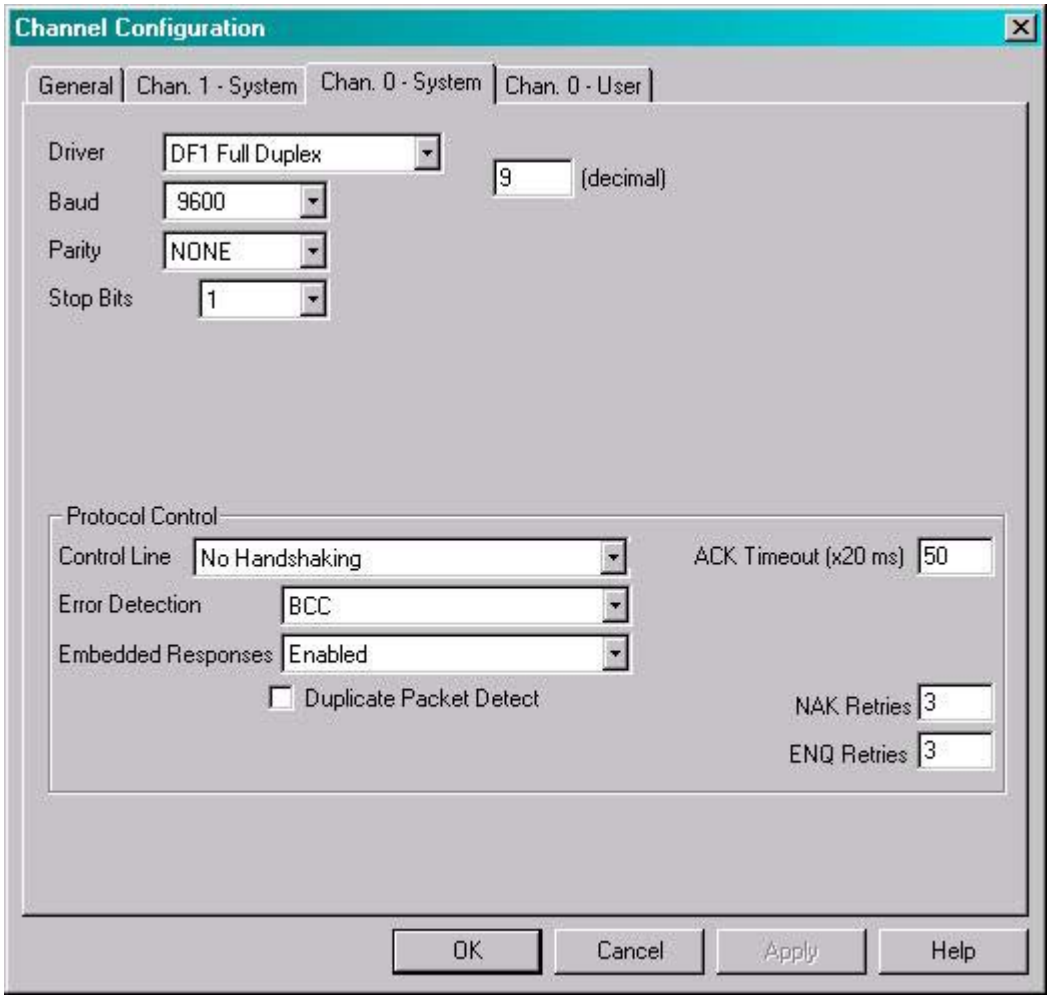
5.2 CHANNEL 0 CONFIGURATION

The Channel 0 Serial port on the PLC5 should be setup as shown below.

Note: The communication mode must be set for System (point-to-point).



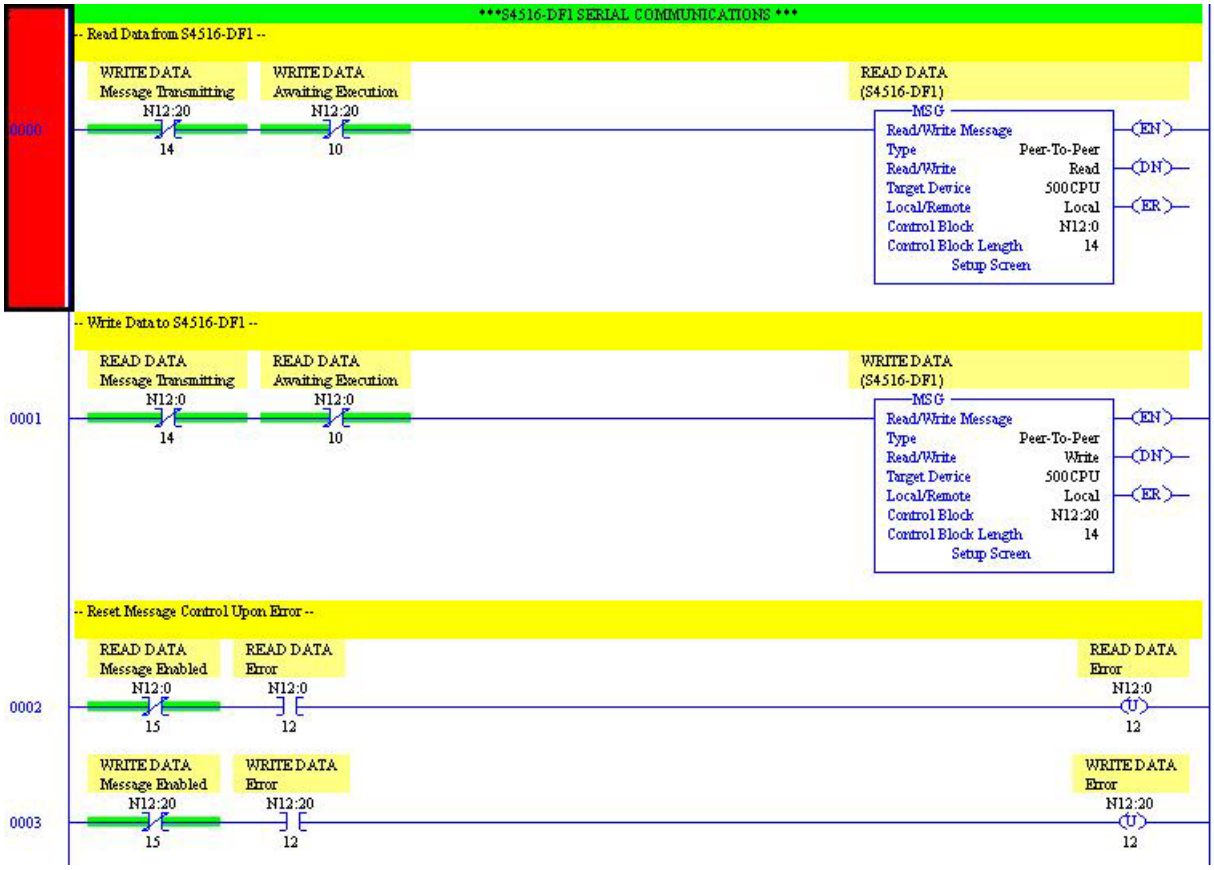
The Channel 0 “Options” are set as follows:



Note: The “Detect Duplicate Messages” should be unchecked.

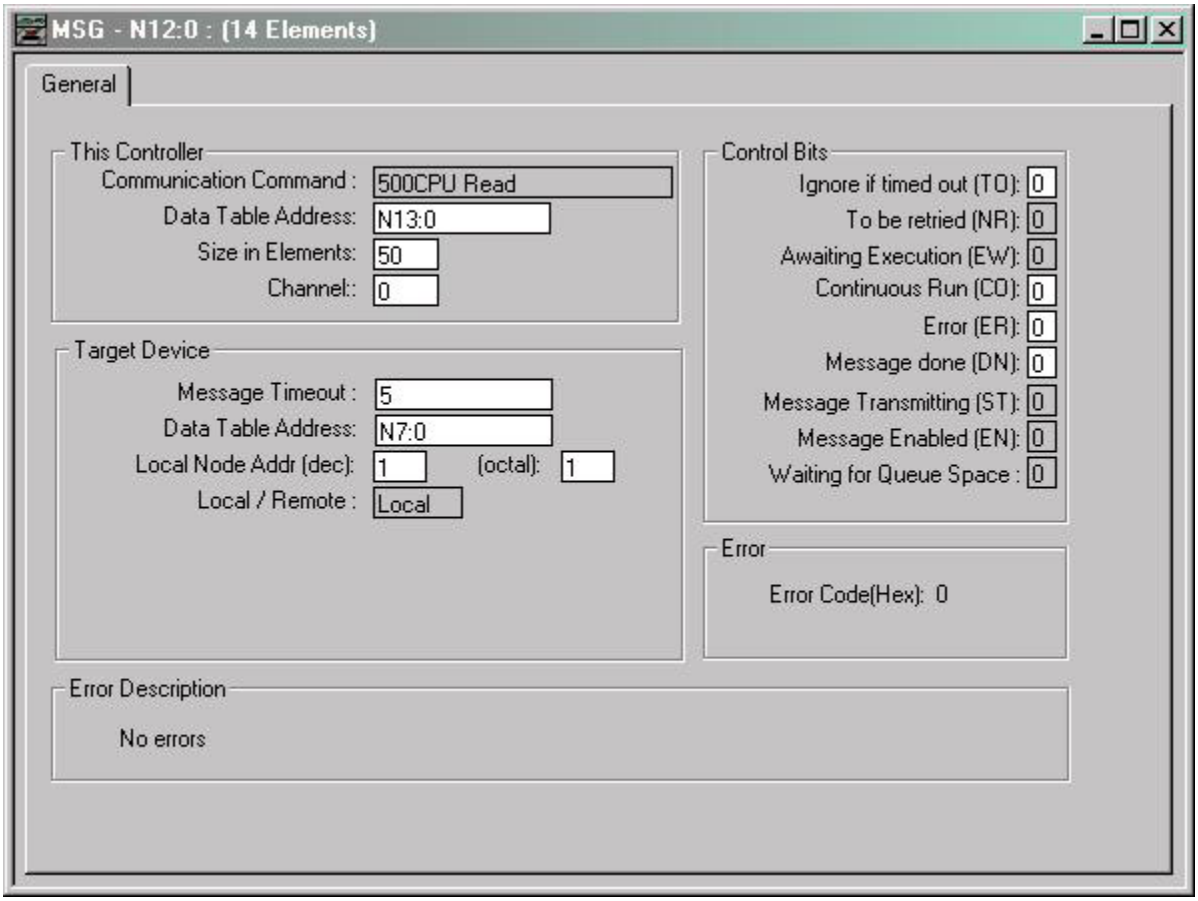
5.3 USING THE MSG INSTRUCTION (sample PLC code)

The following sample RSLogix500 code is used to execute the message control function to allow a SLC to communicate with the S4516-DF1 Serial Communications board.



5.4 THE "READ" INSTRUCTION

The "Read" message (MSG) instruction for a SLC is setup as follows:

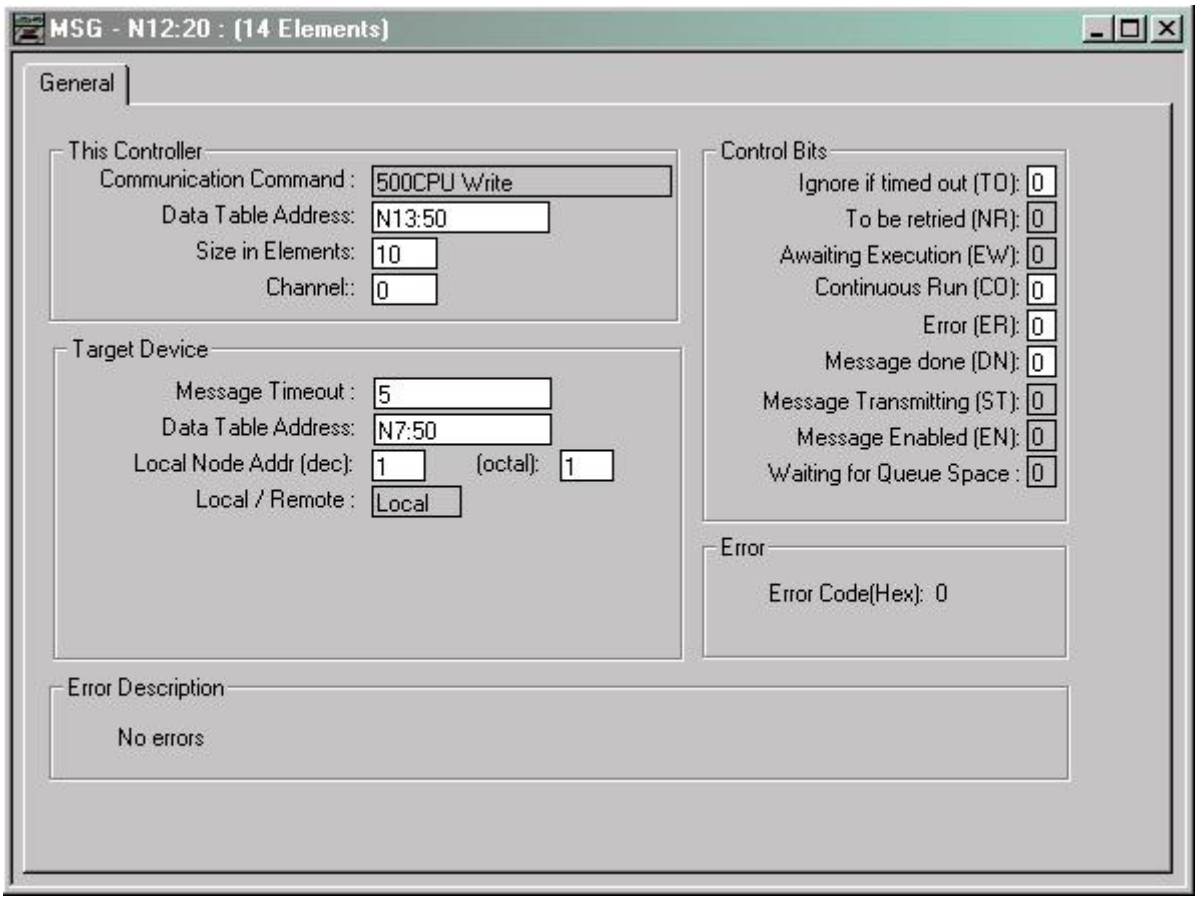


Note: The "Communication Command" is 500CPU Read. The "Data Table Address" (N7:0) can be any inter file address. The 50 elements read from the M4500 are a set of 50 consecutive words. This value can be anything from 1 to 120. The M4500 PLC code can be written to interpret the data table address (i.e. N7:0 = W4300).

The "Local Station Address" is only necessary to define if communications with the S4516-df1 is executed over the Data Highway network (via a DataLink module).

5.5 THE "Write" INSTRUCTION

The "Write" message (MSG) instruction for a SLC is setup as follows:



Note: The "Communication Command" is 500CPU Write. The "Data Table Address" (N7:50) can be any inter file address. The 10 elements written to the M4500 are a set of 10 consecutive words. This value can be anything from 1 to 120. The M4500 PLC code can be written to interpret the data table address (i.e. N7:50 = W4400).

The "Local Station Address" is only necessary to define if communications with the S4516-df1 is executed over the Data Highway network (via a DataLink module).

SECTION 6
CONFIGURING THE DATA LINK

The following instructions are provided as a guideline for setting up the Data Link DL2000 to operate with the S4516-DF1 communications board. For more information, refer to the DATALINK DL2000 Communication Controller User's Guide.

With power applied, perform the following to configure the Data Link DL2000.

- With the DL97 Data Link Configuration software running, select the "FREESTANDING UNIT - DL2000 ALL MODELS" option and then click the "LAUNCH DL97 CONFIGURATION SOFTWARE FOR A FREESTANDING UNIT" command button.
- Then select the "FREESTANDING" model to be configured, i.e. "DL2000-K2F" - Two Serial Interface Ports to A-B DH+.
- Select the "COM PORT" that the computer will be using to interface with the Data Link and make sure the serial communications cable is connected.
- Within the "DATALINK OPERATING PARAMETERS", click the "CONFIGURE PARAMETERS" command button.
- Under the "OPERATING MODE SELECTION", select the "STANDARD DF1 TO DH+" option.
- Set the "STATION NUMBER" to the next available node on the network.
- Set the "NETWORK SPEED". Typically this is set to 57.6k baud.
- Set the "CHANNEL SERIAL SPEED". This is the speed at which the S4516-DF1 will communicate to the Data Link. If using the S4516-DF1 in conjunction with the S3000 network set the speed to 9600 baud, otherwise it can be set to either 9600 or 19.2k baud.
- Click the "SET ADVANCED DF1 PROTOCOL PARAMETERS" command button.
- Under the "DUPLICATE MESSAGE", select the "ACCEPT" option and click the "ACCEPT" command button.
- Then click the "NEXT - TO DOWNLOAD TO DL" command button at the bottom of the screen
- Then click "CLICK HERE TO DOWNLOAD PARAMETERS TO DL" command button. Follow the instructions to place the Data Link into a "Configuration Mode", and download the parameters.
- Then return to the "Welcome Screen".
- Then "QUIT DL97".
- Press the "Reset" to put the Data Link on line.

SECTION 6
CONFIGURING THE DATA LINK

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APPENDIX A
ASYNCHRONOUS LINK STATUS CODES

Local STS Error Codes:

Code (HEX):	Definition:
00	Success - No Error
01	Not Used
02	Cannot Guarantee Delivery: Link Layer
03	Duplicate Token Holder Detected
04	Local Port is Disconnected
05	Application Layer Timed out waiting for a response
06	Duplicate Node Detected
07	Station is Off-Line
08	Hardware Fault

Remote STS Error Codes:

Code (HEX):	Definition:
00	Success - No Error
10	Illegal Command or Format
20	Host has a Problem and Will Not Communicate
30	Remote Node Host is Missing, Disconnected or Shut Down
40	Host Could Not Complete Function Due to Hardware Fault
50	Addressing Problem or Memory Protect Rungs
60	Function Disallowed due to Command Protection Selection
70	Processor is in Program Mode
80	Compatibility Mode File Missing or Communication Zone Problem
90	Remote Node Cannot Buffer Command
A0	Not Used
B0	Remote Node Problem Due to Download
C0	Cannot Execute Command Due to Active IPBs
D0	Not Used
E0	Not Used
F0	There is an Error Code in the EXT STS Byte

APPENDIX A
ASYNCHRONOUS LINK STATUS CODES

EXT STS Codes for Command Code 0E (HEX):

Code (HEX):	Definition:
0	Multi-Defined Processors on Ring
1	Processor is Already Allocated
2	Processor must be Allocated for this Command Extended Function in Progress
3	Extended Function in Progress
4	Function Not Available in this Processor Command Set
5	Function Not Available in this Processor Mode
6	Processor Number in Program and Hardware Do Not Match
7	Invalid Address
8	Memory Protection Access Violation
9	Invalid Parameter
A	Search Unsuccessful
B	Program Needs to be Stored - RAM and PROM Do Not Match
C	External EEPROM is Defective, Cannot transfer Contents Correctly
D	Invalid User Program
E	Not Used
F	Device Resource Unavailable
10 to 1F	Not Used
20	Processor Already Allocated by requesting Node
21	Processor Already Allocated by Another Remote Node.
22	Processor Not Allocated
23	Data Length Invalid
24	Data Size Too Large
25	Data Size Too Large
26	Data Size Too Small
27	At Least One of the Addresses Points to a Read-Only Area
28	Address Past End of Memory
29	Memory Protected, Addresses to Program Area Illegal
2A	Memory Protected, Address to Processor Status Area Illegal

EXT STS Codes for Command Code 0E (HEX) (cont.):

Code (HEX):	Definition:
2B	Memory Protected, Address to Protected Timer or Counter
2C	Processor Not in Program Mode, Address to Program Area.
2D	Address Past "End of Used Memory"
2E	"Program Valid" Bit Not Set in PLC4 Program ID Byte
2F	Invalid PLC4 Select Value
30 to 7B	Not Used
7C	PLC4 Ring Disconnected
7D	No PLC4 Response
7F	Invalid PLC4 Selected Byte
80 to FF	Not Used

APPENDIX A
ASYNCHRONOUS LINK STATUS CODES

EXT STS Codes for Command Code 0F (HEX):

Code (HEX):	Definition:
0	Not Used
1	A Field Has an Illegal Value
2	Less Levels Specified in Address than Minimum for an Address
3	More Levels Specified in Address than System Supports
4	Symbol Not Found
5	Symbol is of Improper Format
6	Address Doesn't Point to Something Usable
7	File is Wrong Size
8	Cannot Complete Request, Situation has Changed Since the Start of the Command
9	Data or File is Too Large
A	Transaction Size Plus Word Address is too Large
B	Access Denied, Improper Privilege
C	Condition Cannot be Generated - Resource is Not Available
D	Condition Already Exists - Resource is Already Available
E	Command Cannot be Executed
F	Histogram Overflow
10	No Access
11	Illegal Data Type
12	Invalid Parameter or Invalid Data
13	Address Reference Exists to Deleted Area
14	Command Execution Failure for Unknown Reason; Possible PLC3 Histogram Overflow
15	Data Conversion Error
16	Scanner Not Able to Communicate with 1771 rack adapter
17	Adapter Cannot Communicate with Module
18	1771 Module Response was not valid
19	Duplicated Label
1A	File is Open; Another Node Owns it
1B	Another Node is the Program Owner
1C to FF	Not Used

APPENDIX B
SAMPLE SYSdev PROGRAM CODE

```
S4516-DF1 Serial Communications - Sample Program Code  02/07/02
SYS96 Init file: C:\PROGRAMS\AB_DF1\DF1_MAIN.LIN


-- DF1_MAIN.R01
   Initial Release:  08/1999
   Revised:          02/2000
   Systems Electronics Group

-- The S4516-DF1 is an application specific serial communications
   board that has been embeded with the Allen-Bradley DF1 communication
   protocol.

   This allows the M4500 PLC to reside as a node on the Allen-Bradley
   Data Highway network.  Communication to the Data Highway is done
   through a Datalink Communication Controller.

   The S4516-Df1 can be setup to communicate to the Datalink at either
   9600 baud or 19.2 kbaud.  At the same time the S4516-DF1 can
   communicate across the S3000 network allowing for seemless
   integration of two networks.

   The following sample code is an example of how to read and write
   data to and Allen-Bradley PLC5 or SLC500.  The code can be used
   "As Is" with very few modifications or, if so desired, completely
   modify this program to suit the users needs.

   The embeded DF1 driver uses sfunc11() to transmit the message packets
   to the Datalink and sfunc10() to receive.  There are no changes in
   the format of these two system functions.

   When transmitting a message packet the DF1 driver will attach the
   necessary control symbols and send the data to the Datalink and
   return with a "DONE" when finished transmitting.

   When receiving data, unnecessary control symbols are stripped from
   the data stream so that only the raw message packet is returned to
   the user.

   This allows for a great deal of flexability when sending and
   receiving message packets with an Allen-Bradley PLC.


   This program uses the following variables:

   B3000 - B3025: Main Program Control Bytes.
   B3050 - B3299: sfunc11() Send Buffer.
   B3300 - B3549: sfunc10() Receive Buffer.
```

APPENDIX B
SAMPLE SYSdev PROGRAM CODE

```
SYS96 Init file: C:\PROGRAMS\AB_DF1\DF1_MAIN.LIN

*************************************************************************
block:  1 - High-level

 0:/* Initialize S4516 Board */
 1:W8154 = &W7552;          /* Slot Address for sfunc13 */
 2:W8156 = &W7552;          /* S4516DF1 Slot Address (02), for sfunc10/11 */
 3:B3023 = sfunc19(1,3,1); /* sta_addr=1, net_buad=344k, user_baud=19200 */
 4:B161 = 40H;              /* Enable Slave Response Mode */
 5:
 6:/* Initialize DF1 Presets */
 7:W3000 = 0;               /* Clear DF1 Control Bits */
 8:B3000.2 = 1;             /* Set = 1 to Initiate Command Message Packet */
 9:B3010 = 110;             /* Num of Elements (Read/Write) = 110 */
10:B3011 = 7;               /* File Number = N7 */
11:W3012 = 40;              /* Starting Element = 40 */
12:W3016 = 1;               /* Initialize TNS Counter */
13:W3018 = 0;               /* Clear Error Code */
14:B3024 = 100;             /* Initialize Timeout Timer Preset (~10sec) */
15:B3025 = B3024;           /* Initialize Timeout Timer Accumulator */
16:


B0161  (SysEnFl) System  Enable  Flags
B3000.2(RespPnd) Waiting for     Respons
B3010  (NumElem) Num of  Elemnts
B3011  (FileNum)   A/B   Target  FileNum
B3023  (sf11Rtn) sfunc19 Respons Code
B3024  (~RespPr) No Resp TimeOut Preset
B3025  (~RespAc) No Resp TimeOut Acum.
W3000  (CtrlBts) DF1     Control Bits
W3012  (StrtElm) Startng Element
W3016  (  TNS  ) AppData   TNS
W3018  (  STS  ) Error   Code      STS
W7552  (SlotAdd) 4516DF1 Slot    Address
W8154  (SlotAdd) sfunc13 Slave   SlotAdd
W8156  (SlotAdd) sfunc10 /11/13  SlotAdd
```

```
SYS96 Main Program: C:\PROGRAMS\AB_DF1\DF1_MAIN.LMN

************************************************************************
block:  1 - High-level

 0:ufunc01();                    /* Call DF1_comm() */
 1:
```

APPENDIX B
SAMPLE SYSdev PROGRAM CODE

```
SYS96 User function 1: C:\PROGRAMS\AB_DF1\DF1_MAIN.L01

DF1_comm(); User Function File:

-- This user funcion file handles the transmitting and receiving
   of Application Data to a Datalink Communications Module.

   B3000 - B3025: Main Program Control Bytes.
   B3050 - B3299: sfunc11() Send Buffer.
   B3300 - B3549: sfunc10() Receive Buffer.

   NOTE:  This code can be used as either a "Command Initiator" (master)
   or a "Command Receiver" (slave) without any modification to the
   code.

-- ufunc02() - DF1_AppData(), is called from this user function file
   to assemble the Application Data packet.  B3014 determines which
   APP DATA packet will be assembled.  This allows the user to generate
   any number of different APP DATA packets to be transmitted to the
   Datalink.

-- Once an APP DATA packet has been assembled, sfunc11 formats the frame
   and transmits the data to the Datalink and then returns the
   appropriate response code.  If the packet sent was a "Command
   Initiator" then a reply should be expected.  If a reply is not
   returned within a period of time, the transaction number (TNS) is
   incremented and the message resent.

-- sfunc10 is continuously called from this user function.  This system
   function returns only the APP DATA received from the Datalink with
   all formating and framing characters removed.

   The command (CMD) and function (FCN) bytes, together define the
   activity to be performed

-- This sample code will allow data to be read or written to a PLC5 or
   SLC500 based on the following message packet formats:

   1) PLC5 - Word Range Read (Read Block)
   2) PLC5 - Word Range Write (Write Block)
   3) SLC500 - Protected Typed Logical Read with Three Address Fields
   4) SLC500 - Protected Typed Logical Write with Three Address Fields

   Refer to the Allen-Bradley, Data Highway/Data Highway Plus(TM)/
   DH-485 Communication Protocol and Command Set Reference Manual,
   Unit III: Application Layer Message Packet Fields for more
   information.
```

```
SYS96 User function 1: C:\PROGRAMS\AB_DF1\DF1_MAIN.L01

************************************************************************
block:  1 - High-level

DF1_comm(); User Function File:

-- This block is used to transmit and receive APP DATA from the
   Datalink.

-- Transmitting Data:
   B3000.0 is set when a message packet is to be delivered to the
   Datalink.  Once sfunc11 is "DONE", this bit is reset, as well as,
   B169.1.  Clearing B169.1 allows the sfunc11 response codes to be
   returned, these are as follows:

      1:    Busy
      2:    Done - DLE ACK Received (Message Acknowledged)
      3:    Done - DLE NAK Received (Message Not Acknowledged)
      4:    Done - DLE ENQ Timeout (Request for Retransmission Timeout)
      5:    Done - No Response Timeout from Datalink
      6:    Done - Message Packet Too Large to Transmit (> 250 Bytes)

   If something other than a "2" is returned, the message packet is
   sent again.  Additional code could be inserted to keep track of the
   number of times an error code is returned and then take appropriate
   action.

   B3000.1, if set, allows user function ufunc02(), DF1_AppData(), to be
   called which will assemble a "Command" Message Packet.

   B3000.2, if set, flags the system to expect a response from a
   "Command" Message Packet.  This enables the "No Response Timeout"
   timer to resend the message packet if a reply is not received.

   W1500 through W1748 (250 bytes), are used as a "Read Data" buffer.
   This should be modified to suit the users needs.

   W1750 through W1998 (250 bytes), are used as a "Write Data" buffer.
   This should be modified to suit the users needs.


-- Receiving Data:
   System function sfunc10() is used to retrieve data sent from the
   Datalink. The entire message packet is returned with all the
   necessary transmission symbols removed.

   Bit 6 of the Command byte (B3302) is the command/reply indicator.
   B3302.6 is set to a "0" in a command message packet and set to a "1"
   in a reply message packet.
```

APPENDIX B
SAMPLE SYSdev PROGRAM CODE

```
 0:/* Transmit APP DATA to Data Link */
 1:if (B3000.0 == 1)                    /* Xmit APP DATA Packet? */
 2:   {                                 /* Yes */
 3:   if (B3000.1 == 1)                 /* Command Initiator? */
 4:      ufunc02();                     /* Assemble APP DATA Packet */
 5:   B3021 = sfunc11(B3015, B3050);    /* Transmit APP DATA Packet */
 6:   if (B3021 > 1)                    /* Done? */
 7:      {                              /* Yes */
 8:      B169.1 = 0;                    /* Reset B169.1 - MANDITORY */
 9:      B3000.0 = 0;                   /* Reset Xmit APP DATA */
10:      B3022 = B3021;                 /* Save Xmit Response */
11:      if (B3021 == 2)                /* "DLE ACK" Received? */
12:         {                           /* Yes */
13:         if (B3000.1 == 1)           /* Command Initiator Set? */
14:            {                        /* Yes */
15:            B3000.1 = 0;             /* Reset Command Initiator */
16:            B3000.2 = 1;             /* Set Response Pending */
17:            }
18:         }
19:      else                           /* "DLE ACK" Not Received */
20:         B3000.0 = 1;                /* Resend APP DATA Packet */
21:      }
22:   }
23:
24:
25:/* Receive APP DATA from Data Link */
26:B3020 = sfunc10(250, B3300);         /* Receive Data From S4516DF1 */
27:if (B3020 > 0)                       /* Message Received? */
28:   {                                 /* Yes - Decipher Command Bit */
29:   if (B3302.6==0)                   /* CMD == Command? */
30:      B3000.3 = 1;                   /* Set CMD = Command */
31:   else                              /* CMD == Reply */
32:      B3000.4 = 1;                   /* Set CMD = Reply */
33:   }
34:
```

```
B0169.1(sf11ErE) sfunc11 ErrCode Enable
B3000.0(XmitPkt) Xmit    AppData Packet
B3000.1(CMDInit) Command Init.
B3000.2(RespPnd) Waiting for     Respons
B3000.3(CMD=CMD) Recievd CMD=CMD
B3000.4(CMD=Rpy) Recievd CMD =   Reply
B3015  (sf11Sen) sfunc11 #sent
B3020  (sf10Rtn) sfunc10 NumByte Return
B3021  (sf11Rtn) sfunc11 Respons Code
B3022  (sf11_Pv) sfunc11 Respons  Prev.
B3050  (App_DST) AppData Send      DST
B3300  (App_DST) AppData Receive   DST
THRU
B3302.6(CMD/Rpy) Command /Reply  Indictr
B3549  (AppDATA) AppData Receive  DATA
```

```
SYS96 User function 1: C:\PROGRAMS\AB_DF1\DF1_MAIN.L01

************************************************************************
block:  2 - High-level

DF1_comm(); User Function File:

-- This block sets up the reply message packet to respond to a command
   message received.

   All command message packets received will have the same basic reply
   message packet format.  The following is typical for a "Write"
   function command:

   [DST][SRC][CMD][STS][TNS-LO][TNS-HI]

   If the function received is a "Read" command then message packet will
   have the following format:

   [DST][SRC][CMD][STS][TNS-LO][TNS-HI][ - DATA - ]

   If the starting address is outside the defined limits, the reply
   message packet will have the following format:

   [DST][SRC][CMD][STS][TNS-LO][TNS-HI][EXT STS]

   Where the EXT STS byte will contain the value 06H - "Address Doesn't
   Point to Something Usable"

   The starting address should always be verified for proper range
   because pointers are used to read and write data to memory within
   the M4500.

   NOTE:    When setting up Message Blocks the following elements will
            determine the starting address in the M4500:

            PLC5 - Message Control Block, Element 07
            SLC500 - Message Control Block, Element 05
```

APPENDIX B
SAMPLE SYSdev PROGRAM CODE

```
 0:/* Command Message Packet Received */
 1:if (B3000.3 == 1)                          /* CMD == Command */
 2:   {                                       /* Yes */
 3:   B3000.0 = 1;                            /* Set Send Message Packet */
 4:   B3015 = 6;                              /* Num of Bytes to Return */
 5:   B3050 = B3301;                          /* DST = SRC */
 6:   B3051 = B3300;                          /* SRC = DST */
 7:   B3052 = B3302 | 40H;                    /* CMD = Reply */
 8:   B3053 = 00H;                           /* STS = 00H */
 9:   W3054 = W3304;                          /* TNS = TNS Recieved */
10:   if (B3306==01H || B3306==00H)           /* PLC5 "Read" or "Write"? */
11:      {                                    /* Yes */
12:      if (B3310 == ffH)                    /* Encoded Element ADD? */
13:         B3006=B3316, B3007=B3315;         /* Yes - Assign ADD (Pointer) */
14:      else                                 /* No */
15:         B3006=B3314, B3007=B3313;         /* Assign ADD (Pointer) */
16:      }
17:   else if (B3306==a2H || B3306==aaH)      /* SLC500 "Read" or "Write"? */
18:      {                                    /* Yes */
19:      if (B3310 == ffH)                    /* Encoded Element ADD? */
20:         B3006=B3311, B3007=B3312;         /* Yes - Assign ADD (Pointer) */
21:      else                                 /* No */
22:         B3006=B3310, B3007=0;             /* Assign ADD (Pointer) */
23:      }
24:   else
25:      ;
26:   if (W3006 < &W1500 || W3006 > &W1750)   /* Address Out of Range? */
27:      {                                    /* Yes */
28:      B3000.3 = 0;                         /* Reset CMD = Command */
29:      B3015 = 7;                           /* Num of Bytes to Return */
30:      B3053 = f0H;                         /* STS = Code in EXT STS */
31:      B3056 = 06H;                         /* EXT STS = Improper ADD */
32:      }
33:   }
34:
```

```
B3000.0(XmitPkt) Xmit    AppData Packet
B3000.3(CMD=CMD) Recievd CMD=CMD
B3006  (Pointer) Pointer
B3007  (Pointer) Pointer
B3015  (sf11Sen) sfunc11 #sent
B3050  (App_DST) AppData Send      DST
B3051  (App_SRC) AppData Send      SRC
B3052  (App_CMD) AppData Send      CMD
B3053  (App_STS) AppData Send      STS
B3056  (App_FCN) AppData Send      FCN
B3300  (App_DST) AppData Receive   DST
THRU
W1500  (DataSen)  W1500   Thru    W1748
W1750  (DataRcv)  W1750   Thru    W1998
W3006  (Pointer) Pointer
W3054  (App_TNS) AppData Send      TNS
W3304  (App_TNS) AppData Receive  TNS LO
```

```
SYS96 User function 1: C:\PROGRAMS\AB_DF1\DF1_MAIN.L01

************************************************************************
block:  3 - High-level

DF1_comm(); User Function File:

-- This block responds to a "Read" function command delivered either
   from a PLC5 or a SLC500.  The function will be deciphered and a
   data block will be formated and added to the reply message packet.

   FCN      Description
   ---      -----------
   01H      PLC5 - Word Range Read (Read Block)
   a2H      SLC500 - Protected Typed Logical Read

   NOTE:    B3306 = FCN Byte
            B3307 = SIZE (bytes) - SLC500
            B3309 = SIZE (words) - PLC5

 0:/* PLC5 or SLC500 Read Mode Command */
 1:if (B3000.3 == 1)                    /* CMD == Command */
 2:   {                                 /* Yes */
 3:   if (B3306==01H || B3306==a2H)     /* FNC = PLC5 or SLC500 Read */
 4:      {                              /* Yes */
 5:      B3000.3 = 0;                   /* Reset CMD = Command */
 6:      if (B3306 == 01H)              /* PLC5 - Word Range Read? */
 7:         {                           /* Yes */
 8:         W3002 = B3309 * 2;          /* Set "FOR LOOP" Limit */
 9:         B3015 = B3015 + B3002;      /* Set Data Bytes to Return */
10:         }
11:      else                           /* SLC500 - Typed Logical Read? */
12:         {                           /* Yes */
13:         B3015 = B3015 + B3307;      /* Set Data Bytes to Return */
14:         B3002 = B3307;              /* Set "FOR LOOP" Limit */
15:         }
16:      W3008 = &B3056;                /* Point to Data Buffer */
17:      for (B3004 = 0; B3004 < B3002; ++B3004)
18:          {
19:          *B3008 = *B3006;           /* Load APP DATA Packet */
20:          ++W3006, ++W3008;          /* Increment Data Pointers */
21:          }
22:      }
23:   }
24:
B3000.3(CMD=CMD) Recievd CMD=CMD
B3002  (Temp(C))  Temp   (calc.)
B3004  (Temp(i))  Temp     (i)
B3006  (Pointer) Pointer
B3008  (Pointer) Pointer
B3015  (sf11Sen) sfunc11 #sent
B3056  (App_FCN) AppData Send      FCN
THRU
W3002  (Temp(C))  Temp   (calc.)
W3006  (Pointer) Pointer
W3008  (Pointer) Pointer
```

APPENDIX B
SAMPLE SYSdev PROGRAM CODE

```
SYS96 User function 1: C:\PROGRAMS\AB_DF1\DF1_MAIN.L01

************************************************************************
block:  4 - High-level

DF1_comm(); User Function File:

-- This block responds to a "Write" function command delivered either
   from a PLC5 or a SLC500.  The function will be deciphered and the
   data written to memory as specified by the PLC, as long as the
   M4500 address is within range.

   FCN      Description
   ---      -----------
   00H      PLC5 - Word Range Write (Write Block)
   aaH      SLC500 - Protected Typed Logical Write

   NOTE:    W3312 = Start of DATA - SLC500 (Element ADD Not Encoded)
            W3314 = Start of DATA - SLC500 (Element ADD Encoded)
            W3316 = Start of DATA - PLC5 (Element ADD Not Encoded)
            W3318 = Start of DATA - PLC5 (Element ADD Encoded)

 0:/* PLC5 or SLC500 Write Command */
 1:if (B3000.3 == 1)                    /* CMD == Command */
 2:   {                                 /* Yes */
 3:   B3000.3 = 0;                       /* Reset CMD = Command */
 4:   if (B3306==00H || B3306==aaH)     /* FCN = PLC5 or SLC500 Write */
 5:      {                              /* Yes */
 6:      if (B3306 == 00H)              /* PLC5 - Word Range Write */
 7:         {                           /* Yes */
 8:         W3002 = B3309 * 2;          /* Set "FOR LOOP" Limit (TOT TNS) */
 9:         if (B3310 == ffH)           /* Encoded Element ADD? */
10:            W3008 = &W3318;          /* Point to Data Received */
11:         else                        /* No */
12:            W3008 = &W3316;          /* Point to Data Received */
13:         }
14:      else                           /* SLC500 - Typed Logical Write */
15:         {
16:         B3002 = B3307;              /* Set "FOR LOOP" Limit (size-bytes)*/
17:         if (B3310 == ffH)           /* Element Encoded? */
18:            W3008 = &W3314;          /* Point to Data Received */
19:         else                        /* Element not Encoded */
20:            W3008 = &W3312;          /* Point to Data Received */
21:         }
22:      for (B3004 = 0; B3004 < B3002; ++B3004)
23:          {
24:          *B3006 = *B3008;           /* Write Data to Memory */
25:          ++W3006, ++W3008;          /* Increment Data Pointers */
26:          }
27:      }
28:   }
29:
```

```
B3000.3(CMD=CMD) Recievd CMD=CMD
B3002  (Temp(C))  Temp   (calc.)
B3004  (Temp(i))  Temp     (i)
B3006  (Pointer) Pointer
B3008  (Pointer) Pointer
THRU
W3002  (Temp(C))  Temp   (calc.)
W3006  (Pointer) Pointer
W3008  (Pointer) Pointer
W3312  (AppDATA) AppData Receive  DATA
W3314  (AppDATA) AppData Receive  DATA
W3316  (AppDATA) AppData Receive  DATA
W3318  (AppDATA) AppData Receive  DATA
```

APPENDIX B
SAMPLE SYSdev PROGRAM CODE

```
SYS96 User function 1: C:\PROGRAMS\AB_DF1\DF1_MAIN.L01

************************************************************************
block:  5 - High-level

DF1_comm(); User Function File:

-- This block responsd to a reply message packet received.  The STS
   and EXT STS bytes are checked for any message packet errors.  W3018
   contains the STS and EXT STS error code information.

   If the STS and EXT STS bytes indicate that no errors have occurred,
   then action is taken to copy any data returned to memory and then
   setup for the next command message packet to be delivered.

   B3303 = STS Byte
   B3306 = EXT STS Byte
   W3306 = Start of DATA Received

   Refer to the Allen-Bradley Data Highway/Data Highway Plus(TM)/
   DH-485 Communication Protocol and Command Set Reference Manual,
   Chapter 4.1:  Asynchronous Link Status Codes, for more information
   on local, remote and extended status error codes.
```

```
 0:/* M4500 Reply Message Packet */
 1:if (B3000.4 == 1)                    /* CMD == Reply */
 2:   {                                 /* Yes */
 3:   B3000.4 = 0;                      /* Reset CMD = Reply */
 4:   if (B3303 != 00H)                 /* Received With Errors? */
 5:      {                              /* Yes */
 6:      B3018 = B3303;                 /* Save STS Code */
 7:      if (B3303 == f0H)              /* Error Code in EXT STS Byte? */
 8:         B3019 = B3306;              /* Yes - Save EXT STS Code */
 9:      else                           /* No */
10:         B3019 = 0;                  /* Reset EXT STS Returned */
11:      }
12:   else if (W3304 == W3016)          /* Current TNS Returned? */
13:      {                              /* Yes */
14:      B3000.0 = 1;                   /* Set Transmit APP DATA */
15:      B3000.1 = 1;                   /* Initiate Command */
16:      B3000.2 = 0;                   /* Reset Response Pending */
17:      ++B3014;                       /* Incr. APP DATA Command Packet */
18:      if (B3014 > 3)                 /* Maximum Number Exceeded? */
19:         B3014 = 0;                  /* Yes - Reset Command Packet # */
20:      ++W3016;                       /* Increment TNS */
21:      if (B3056==01H || B3056==a2H) /* FCN = PLC5 or SLC500 Read? */
22:         {                           /* Yes */
23:         W3006 = &W3306;             /* Point to Data Received */
24:         W3008 = &W1750;             /* Point to Read Data Register */
25:         for (B3004=0; B3004<B3010; ++B3004)
26:             {
27:             *W3008 = *W3006;        /* Load Data Register */
28:             W3006 = W3006 + 2;
29:             W3008 = W3008 + 2;
30:             }
31:         }
32:      }
33:   else
34:      ;
35:   }
36:
```

```
B3000.0(XmitPkt) Xmit    AppData Packet
B3000.1(CMDInit) Command Init.
B3000.2(RespPnd) Waiting for     Respons
B3000.4(CMD=Rpy) Recievd CMD =   Reply
B3004  (Temp(i))  Temp     (i)
B3010  (NumElem) Num of  Elemnts
B3014  (MsgPkt#) Message Packet  Number
B3018  (  STS  ) Error   Code      STS
B3019  (EXT STS) Error   Code    EXT STS
B3056  (App_FCN) AppData Send      FCN
THRU
W1750  (DataRcv)  W1750   Thru    W1998
W3006  (Pointer) Pointer
W3008  (Pointer) Pointer
W3016  (  TNS  ) AppData   TNS
W3304  (App_TNS) AppData Receive  TNS LO
W3306  (App_FCN) AppData Receive   FCN
```

APPENDIX B
SAMPLE SYSdev PROGRAM CODE

```
SYS96 User function 1: C:\PROGRAMS\AB_DF1\DF1_MAIN.L01

*****************************************************************************
block:  6 - Ladder

DF1_comm(); User Function File:

-- This block executes the "No Response Timeout" logic.  If a command
   message packet is deliverd and response should be expected within
   a period of time.  If a reply is not received, then the message
   is considered lost and should be sent again.

    Waiting                                                          No
    for                                                              Respons
    Respons              Timer                                       TimeOut
    B3000.2           +---------+                                    B3000.5
 0:+--] [--+-------+--|         |--+-------+-------+-------+-------+--( )--
    RespPnd           | P:B3024 |                                   |~RespTO
                      | TB:0.10 |                                   |
                      | A:B3025 |                                   |Waiting
                      |(~RespAc)|                                   |for
                      | No Resp |                                   |Respons
                      | TimeOut |                                   |B3000.2
 1:                   | Acum.   |                                  +--(U)--
                      +---------+                                   RespPnd
```

```
SYS96 User function 1: C:\PROGRAMS\AB_DF1\DF1_MAIN.L01

************************************************************************
block:  7 - High-level

DF1_comm(); User Function File:

-- This block is executed whenever a "No Response Timeout" condition
   exists.  The current transaction number (TNS) is incremented and
   the "Initiate Transmit" bit is set to send a new message packet.

 0:if (B3000.5==1 && B3000.0==0) /* No Response Timeout? */
 1:   {                          /* Yes */
 2:   B3000.0 = 1;              /* Set "Initiate Transmit" */
 3:   B3000.1 = 1;              /* Set Command Initiator */
 4:   B3024 = 50;               /* Reset Timeout Timer (~5 sec.) */
 5:   ++W3016;                  /* Increment TNS */
 6:   }
 7:


B3000.0(XmitPkt) Xmit    AppData Packet
B3000.1(CMDInit) Command Init.
B3000.5(~RespTO) No      Respons TimeOut
B3024  (~RespPr) No Resp TimeOut Preset
W3016  (  TNS  ) AppData   TNS
```

APPENDIX B
SAMPLE SYSdev PROGRAM CODE

```
SYS96 User function 2: C:\PROGRAMS\AB_DF1\DF1_MAIN.L02

DF1_AppData(); User Function File:

-- This user function file assembles the APP DATA packet to be
   transmitted to the destination node.

   NOTE:  This user function file is only an example of one way
          to assemble the APP DATA packets.  The following blocks
          demonstrate how to read and write to a PLC5 and a SLC500.

   Bytes B3050 thru B3299 (250 bytes) are used as a temporary buffer
   to assemble the APP DATA packets.

   The value of B3014 determines which APP DATA packet will be
   assembled.

   The value of B3015 sets sfunc11() #sent property.
```

```
SYS96 User function 2: C:\PROGRAMS\AB_DF1\DF1_MAIN.L02

************************************************************************
block:  1 - High-level

-- This block contains the code to assemble the APP DATA packets
   to accomplish reading or writing data to an A/B PLC5 processor.

-- General Format:
   [DST][SRC][CMD][STS][TNS_LO][TNS_HI][ Command Data ]


-- Word Range Read (Read Block)
   Command Data Format:
   [FCN][PKT_Ofst_LO][PKT_Ofst_HI][# ELEM_LO][# ELEM_HI][ADD(7)][SIZE]

   CMD = 0fH
   FCN = 01H
   ADD = PLC5 Starting Element of Address to Read.
   ADD(1) - Number of Encoded Address Levels
   ADD(2) - Level 1 (data table - default = 0)
   ADD(3) - Level 2 (file number - 0,1,2,3,4,5,6,7,8,9-999)
   ADD(4) - Level 3 (Element Number - Encoded into next two bytes)
   ADD(5) - Level 3 (Element Number - LO Byte)
   ADD(6) - Level 3 (Element Number - HI Byte)
   ADD(7) - Level 4 (Sub-Element Number)
   SIZE = Number of Bytes to Read, (2 Bytes = 1 Element).

   Reply Format:
   [DST][SRC][CMD][STS][TNS_LO][TNS_HI][ - Data - ]

   CMD = 4fH

-- Word Range Write (Write Block)
   Command Data Format:
   [FCN][PKT_Ofst_LO][PKT_Ofst_HI][# ELEM_LO][# ELEM_HI][ADD(7)][DATA]

   CMD = 0fH
   FCN = 00H
   DATA = Even number of Bytes sent to DST node.

   Reply Format:
   [DST][SRC][CMD][STS][TNS_LO][TNS_HI]

   CMD = 4fH

   NOTE:
   -----
   An [EXT STS] byte will be added to the data stream if [STS] == f0H.
   [STS] and [EXT STS] bytes determine Asynchronous Link Status code.
   This status code is contained within W3018.
   (B3018 = [STS], B3019 = [EXT STS])
```

APPENDIX B
SAMPLE SYSdev PROGRAM CODE

```
 0:/* Assemble PLC5 Word Range Read / Write APP DATA Packet */
 1:if (B3014==0 || B3014==1)     /* PLC5 Command Set */
 2:   {                         /* Yes */
 3:   B3050 = 3;                /* DST */
 4:   B3051 = 0;                /* SRC */
 5:   B3052 = 0fH;              /* CMD */
 6:   B3053 = 00H;              /* STS */
 7:   W3054 = W3016;            /* TNS */
 8:   B3057 = 0;                /* Packet Offset (Lo Byte) */
 9:   B3058 = 0;                /* Packet Offset (Hi Byte) */
10:   B3059 = B3010;            /* Total TNS (#Elements - Lo Byte) */
11:   B3060 = 0;                /* Total TNS (#Elements - Hi Byte) */
12:   B3061 = 0fH;              /* ADD (4 Levels of Encoded, W102) */
13:   B3062 = 0;                /* ADD (Level 1) - Default = 0 */
14:   B3063 = B3011;            /* ADD (Level 2) - File Number */
15:   B3064 = ffH;              /* ADD (Level 3) - 2 Bytes, Encoded */
16:   B3065 = B3012;            /* ADD (Level 3) - Low Byte */
17:   B3066 = B3013;            /* ADD (Level 3) - High Byte */
18:   B3067 = 0;                /* ADD (Level 4) */
19:   if (B3014 == 0)           /* PLC5 - Word Range Read? */
20:      {                      /* Yes */
21:      B3015 = 19;            /* Set Number of APP DATA Packet Bytes */
22:      B3056 = 01H;           /* FNC (Word Range Read) */
23:      W3002 = 2 * B3010;     /* Num of Elements (2 Bytes = 1 Element) */
24:      B3068 = B3002;         /* Size (Bytes) */
25:      }
26:   if (B3014 == 1)           /* PLC5 - Word Range Write? */
27:      {                      /* Yes */
28:      W3002 = 2*B3010 + 18;  /* Calculate Number of APP DATA Bytes */
29:      B3015 = B3002;         /* Set Number of APP DATA Packet Bytes */
30:      B3056 = 00H;           /* FNC (Word Range Write) */
31:      W3006 = &W3068;        /* Point to Data Send Buffer */
32:      W3008 = &W1500;        /* Point to Stored Data Register */
33:      for (B3004=0; B3004<B3010; ++B3004)
34:          {
35:          *W3006 = *W3008;   /* Load Send Buffer */
36:          W3006 = W3006 + 2;
37:          W3008 = W3008 + 2;
38:          }
39:      }
40:   }
41:
```

```
B3002  (Temp(C))  Temp   (calc.)
B3004  (Temp(i))  Temp     (i)
B3010  (NumElem) Num of  Elemnts
B3011  (FileNum)   A/B   Target  FileNum
B3012  (StrtElm) Startng Element
B3013  (StrtElm) Startng Element
B3014  (MsgPkt#) Message Packet  Number
B3015  (sf11Sen) sfunc11 #sent
B3050  (App_DST) AppData Send      DST
B3051  (App_SRC) AppData Send      SRC
B3052  (App_CMD) AppData Send      CMD
B3053  (App_STS) AppData Send      STS
B3056  (App_FCN) AppData Send      FCN
B3057  (AppDATA) AppData Send     DATA
B3058  (AppDATA) AppData Send     DATA
B3059  (AppDATA) AppData Send     DATA
B3060  (AppDATA) AppData Send     DATA
B3061  (AppDATA) AppData Send     DATA
B3062  (AppDATA) AppData Send     DATA
B3063  (AppDATA) AppData Send     DATA
B3064  (AppDATA) AppData Send     DATA
B3065  (AppDATA) AppData Send     DATA
B3066  (AppDATA) AppData Send     DATA
B3067  (AppDATA) AppData Send     DATA
B3068  (AppDATA) AppData Send     DATA
W1500  (DataSen)  W1500   Thru    W1748
W3002  (Temp(C))  Temp   (calc.)
W3006  (Pointer) Pointer
W3008  (Pointer) Pointer
W3016  (  TNS  ) AppData   TNS
W3054  (App_TNS) AppData Send      TNS
W3068  (AppDATA) AppData Send     DATA
```

APPENDIX B
SAMPLE SYSdev PROGRAM CODE

```
SYS96 User function 2: C:\PROGRAMS\AB_DF1\DF1_MAIN.L02

************************************************************************
block:  2 - High-level

DF1_AppData(); User Function File:

-- This block contains the code to assemble the APP DATA packets
   to accomplish reading or writing data to an SLC500 processor.

   General Format:
   [DST][SRC][CMD][STS][TNS_LO][TNS_HI][ Command Data ]


-- Protected Typed Logical Read, with Three Address Fields:
   Command Data Format:
   [FCN][SIZE][FILE NO.][FILE TYPE][ELEMENT NO.(3)][SUB-ELEMENT NO.]

   CMD = 0fH
   FCN = a2H
   SIZE = Number of Bytes to Read, (2 Bytes = 1 Element).
   FILE NO. = Files 0-254 only.
   FILE TYPE = 80H-84H Reserved
               85H - Bit, 86H - Timer, 87H - Counter,
               88H - Control, 89H - Integer.
   ELEMENT NO.(1) = ffH - Encoded into the next two bytes.
   ELEMENT NO.(2) = Lo Byte
   ELEMENT NO.(3) = Hi Byte
   SUB-ELEMENT NO. = 0 - Default

   Reply Format:
   [DST][SRC][CMD][STS][TNS_LO][TNS_HI][ - Data - ]

   CMD = 4fH

-- Protected Typed Logical Write with Three Address Fields
   Command Data Format:
   [FCN][SIZE][FILE NO.][FILE TYPE][ELEM NO.(3)][SUB-ELEM NO.][ DATA ]

   CMD = 0fH
   FCN = aaH
   DATA = Even number of Bytes sent to DST node.

   Reply Format:
   [DST][SRC][CMD][STS][TNS_LO][TNS_HI]

   CMD = 4fH

   NOTE:
   An [EXT STS] byte will be added to the data stream if [STS] == f0H.
   [STS] and [EXT STS] bytes determine Asynchronous Link Status code.
   This status code is contained within W3018.
   (B3018 = [STS], B3019 = [EXT STS])
```

```
 0:/* Assemble SLC500 Typed Logical Read / Write APP DATA Packet */
 1:if (B3014==2 || B3014==3)     /* SLC500 Command Set */
 2:   {                          /* Yes */
 3:   B3050 = 5;                 /* DST */
 4:   B3051 = 0;                 /* SRC */
 5:   B3052 = 0fH;               /* CMD */
 6:   B3053 = 00H;               /* STS */
 7:   W3054 = W3016;             /* TNS */
 8:   W3002 = 2 * B3010;         /* Num of Bytes (1 Element = 2 Bytes) */
 9:   B3057 = B3002;             /* Size (Bytes) */
10:   B3058 = B3011;             /* File Number */
11:   B3059 = B3011 + 82H;       /* File Type */
12:   B3060 = ffH;               /* Element - Encoded into Next 2 Bytes */
13:   B3061 = B3012;             /* Element - Low Byte */
14:   B3062 = B3013;             /* Element - High Byte */
15:   B3063 = 0;                 /* Sub Element */
16:   if (B3014 == 2)            /* SLC500 - Protected Logical Read? */
17:      {                       /* Yes */
18:      B3015 = 14;             /* Number of APP DATA Packet Bytes */
19:      B3056 = a2H;            /* FCN */
20:      }
21:   if (B3014 == 3)            /* SLC500 - Protected Logical Write? */
22:      {                       /* Yes */
23:      W3002 = 2*B3010 + 14;   /* Calculate Number of APP DATA Bytes */
24:      B3015 = B3002;          /* Number of APP DATA Packet Bytes */
25:      B3056 = aaH;            /* FCN */
26:      W3006 = &W3064;         /* Point to Data Send Buffer */
27:      W3008 = &W1500;         /* Point to Stored Data Register */
28:      for (B3004=0; B3004<B3010; ++B3004)
29:          {
30:          *W3006 = *W3008;    /* Load Send Buffer */
31:          W3006 = W3006 + 2;
32:          W3008 = W3008 + 2;
33:          }
34:      }
35:   }
36:
```

```
B3002  (Temp(C))  Temp   (calc.)
B3004  (Temp(i))  Temp     (i)
B3010  (NumElem) Num of  Elemnts
B3011  (FileNum)   A/B   Target  FileNum
B3012  (StrtElm) Startng Element
B3013  (StrtElm) Startng Element
B3014  (MsgPkt#) Message Packet  Number
B3015  (sf11Sen) sfunc11 #sent
B3050  (App_DST) AppData Send      DST
B3051  (App_SRC) AppData Send      SRC
B3052  (App_CMD) AppData Send      CMD
B3053  (App_STS) AppData Send      STS
B3056  (App_FCN) AppData Send      FCN
B3057  (AppDATA) AppData Send     DATA
B3058  (AppDATA) AppData Send     DATA
B3059  (AppDATA) AppData Send     DATA
B3060  (AppDATA) AppData Send     DATA
B3061  (AppDATA) AppData Send     DATA
B3062  (AppDATA) AppData Send     DATA
B3063  (AppDATA) AppData Send     DATA
W1500  (DataSen)  W1500   Thru    W1748
W3002  (Temp(C))  Temp   (calc.)
W3006  (Pointer) Pointer
W3008  (Pointer) Pointer
W3016  (  TNS  ) AppData   TNS
W3054  (App_TNS) AppData Send      TNS
W3064  (AppDATA) AppData Send     DATA
```

```
   Typical Cross reference format for variable:

      file:block-line(usage)

      where: file  = file where variable is referenced.
             block = block number in file.
             line  = line number in block.
             usage = sense that variable is referenced.

      file key: INI = initialization file.
                MNF = main program file.
                TMD = Timed interrupt file.
                COM = co-cpu com interrupt file.
                Uxx = User function file (xx = ufunc num).

      Usage key: * = variable value altered at referenced location.
                     (output coil, timer accumulator, set equal, etc.)

                 + = variable used in Assembly block.
                     (usage in Assembly block unknown)

                 @ = variable used as pointer in High-
                     level block.

                 if *, +, or @ is not associated with variable,
                 the variable is not altered at location.
                 (contact, timer preset , tested for value, etc.)
```

Addr (nicname)	description	location used
B0161 (SysEnFl)	System Enable Flags	INI: 1-4*
B0169.1(sf11ErE)	sfunc11 ErrCode Enable	U01: 1-8*
B3000.0(XmitPkt)	Xmit AppData Packet	U01: 1-1 1-9* 1-20* 2-3* U01: 5-14* 7-0 7-2*
B3000.1(CMDInit)	Command Init.	U01: 1-3 1-13 1-15* 5-15* U01: 7-3*
B3000.2(RespPnd)	Waiting for Respons	INI: 1-8* U01: 1-16* 5-16* 6-0 6-1*
B3000.3(CMD=CMD)	Recievd CMD=CMD	U01: 1-30* 2-1 2-28* 3-1 U01: 3-5* 4-1 4-3*
B3000.4(CMD=Rpy)	Recievd CMD = Reply	U01: 1-32* 5-1 5-3*
B3000.5(~RespTO)	No Respons TimeOut	U01: 6-0* 7-0
B3002 (Temp(C))	Temp (calc.)	U01: 3-9 3-14* 3-17 4-16* U01: 4-22 U02: 1-24 1-29 2-9 2-24

APPENDIX B
SAMPLE SYSdev PROGRAM CODE

Addr	(nicname)	description	location used
B3004	(Temp(i))	Temp (i)	U01: 3-17* 3-17 3-17* 4-22* U01: 4-22 4-22* 5-25* 5-25 U01: 5-25* U02: 1-33* 1-33 1-33* 2-28* U02: 2-28 2-28*
B3006	(Pointer)	Pointer	U01: 2-13* 2-15* 2-20* 2-22* U01: 3-19@ 4-24@
B3007	(Pointer)	Pointer	U01: 2-13* 2-15* 2-20* 2-22*
B3008	(Pointer)	Pointer	U01: 3-19@ 4-24@
B3010	(NumElem)	Num of Elemnts	INI: 1-9* U01: 5-25 U02: 1-10 1-23 1-28 1-33 U02: 2-8 2-23 2-28
B3011	(FileNum)	A/B Target FileNum	INI: 1-10* U02: 1-14 2-10 2-11
B3012	(StrtElm)	Startng Element	U02: 1-16 2-13
B3013	(StrtElm)	Startng Element	U02: 1-17 2-14
B3014	(MsgPkt#)	Message Packet Number	U01: 5-17* 5-18 5-19* U02: 1-1 1-1 1-19 1-26 U02: 2-1 2-1 2-16 2-21
B3015	(sf11Sen)	sfunc11 #sent	U01: 1-5 2-4* 2-29* 3-9* U01: 3-9 3-13* 3-13 U02: 1-21* 1-29* 2-18* 2-24*
B3018	(STS)	Error Code STS	U01: 5-6*
B3019	(EXT STS)	Error Code EXT STS	U01: 5-8* 5-10*
B3020	(sf10Rtn)	sfunc10 NumByte Return	U01: 1-26* 1-27
B3021	(sf11Rtn)	sfunc11 Respons Code	U01: 1-5* 1-6 1-10 1-11
B3022	(sf11_Pv)	sfunc11 Respons Prev.	U01: 1-10*
B3023	(sf11Rtn)	sfunc19 Respons Code	INI: 1-3*
B3024	(~RespPr)	No Resp TimeOut Preset	INI: 1-14* 1-15 U01: 6-0 7-4*
B3025	(~RespAc)	No Resp TimeOut Acum.	INI: 1-15* U01: 6-0*
B3050	(App_DST)	AppData Send DST	U01: 1-5 2-5* U02: 1-3* 2-3*

Addr	(nicname)	description		location used			
B3051	(App_SRC)	AppData Send	SRC	U01: 2-6*			
				U02: 1-4*	2-4*		
B3052	(App_CMD)	AppData Send	CMD	U01: 2-7*			
				U02: 1-5*	2-5*		
B3053	(App_STS)	AppData Send	STS	U01: 2-8*	2-30*		
				U02: 1-6*	2-6*		
B3056	(App_FCN)	AppData Send	FCN	U01: 2-31*	3-16	5-21	5-21
				U02: 1-22*	1-30*	2-19*	2-25*
B3057	(AppDATA)	AppData Send	DATA	U02: 1-8*	2-9*		
B3058	(AppDATA)	AppData Send	DATA	U02: 1-9*	2-10*		
B3059	(AppDATA)	AppData Send	DATA	U02: 1-10*	2-11*		
B3060	(AppDATA)	AppData Send	DATA	U02: 1-11*	2-12*		
B3061	(AppDATA)	AppData Send	DATA	U02: 1-12*	2-13*		
B3062	(AppDATA)	AppData Send	DATA	U02: 1-13*	2-14*		
B3063	(AppDATA)	AppData Send	DATA	U02: 1-14*	2-15*		
B3064	(AppDATA)	AppData Send	DATA	U02: 1-15*			
B3065	(AppDATA)	AppData Send	DATA	U02: 1-16*			
B3066	(AppDATA)	AppData Send	DATA	U02: 1-17*			
B3067	(AppDATA)	AppData Send	DATA	U02: 1-18*			
B3068	(AppDATA)	AppData Send	DATA	U02: 1-24*			
B3300 THRU	(App_DST)	AppData Receive	DST	U01: 1-26	2-6		
B3302.6	(CMD/Rpy)	Command /Reply	Indictr	U01: 1-29			
B3549	(AppDATA)	AppData Receive	DATA	U01: 1-26			
W1500	(DataSen)	W1500 Thru	W1748	U01: 2-26			
				U02: 1-32	2-27		
W1750	(DataRcv)	W1750 Thru	W1998	U01: 2-26	5-24		
W3000	(CtrlBts)	DF1 Control Bits		INI: 1-7*			
W3002	(Temp(C))	Temp (calc.)		U01: 3-8*	4-8*		
				U02: 1-23*	1-28*	2-8*	2-23*

APPENDIX B
SAMPLE SYSdev PROGRAM CODE

Addr	(nicname)	description	location used
W3006	(Pointer)	Pointer	U01: 2-26 2-26 3-20* 4-25* U01: 5-23* 5-27@ 5-28* 5-28 U02: 1-31* 1-35@ 1-36* 1-36 U02: 2-26* 2-30@ 2-31* 2-31
W3008	(Pointer)	Pointer	U01: 3-16* 3-20* 4-10* 4-12* U01: 4-18* 4-20* 4-25* 5-24* U01: 5-27@ 5-29* 5-29 U02: 1-32* 1-35@ 1-37* 1-37 U02: 2-27* 2-30@ 2-32* 2-32
W3012	(StrtElm)	Startng Element	INI: 1-11*
W3016	(TNS)	AppData TNS	INI: 1-12* U01: 5-12 5-20* 7-5* U02: 1-7 2-7
W3018	(STS)	Error Code STS	INI: 1-13*
W3054	(App_TNS)	AppData Send TNS	U01: 2-9* U02: 1-7* 2-7*
W3064	(AppDATA)	AppData Send DATA	U02: 2-26
W3068	(AppDATA)	AppData Send DATA	U02: 1-31
W3304	(App_TNS)	AppData Receive TNS LO	U01: 2-9 5-12
W3306	(App_FCN)	AppData Receive FCN	U01: 5-23
W3312	(AppDATA)	AppData Receive DATA	U01: 4-20
W3314	(AppDATA)	AppData Receive DATA	U01: 4-18
W3316	(AppDATA)	AppData Receive DATA	U01: 4-12
W3318	(AppDATA)	AppData Receive DATA	U01: 4-10
W7552	(SlotAdd)	4516DF1 Slot Address	INI: 1-1 1-2
W8154	(SlotAdd)	sfunc13 Slave SlotAdd	INI: 1-1*
W8156	(SlotAdd)	sfunc10 /11/13 SlotAdd	INI: 1-2*