ALLEN-BRADLEY

Bulletin 1203 Remote I/O Communications Module

Catalog Number 1203-GD1, -GK1, -GM1

Reference Manual

Important User Information

Because of the variety of uses for this equipment and because of the differences between this solid-state equipment and electromechanical equipment, the user of and those responsible for applying this equipment must satisfy themselves as to the acceptability of each application and use of the equipment. In no event will Allen-Bradley Company be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The illustrations shown in this manual are intended solely to illustrate the text of this manual. Because of the many variables and requirements associated with any particular installation, the Allen-Bradley Company cannot assume responsibility or liability for actual use based upon the illustrative uses and applications.

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This information in this manual is organized in numbered chapters. Read each chapter in sequence and perform procedures when you are instructed to do so. Do not proceed to the next chapter until you have completed all procedures.

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage or economic loss.

Attentions help you:

- identify a hazard
- avoid the hazard
- recognize the consequences

IMPORTANT: Identifies information that is especially important for successful application and understanding of the product.

Summary Information

We would like to call your attention to the following changes to the 1203-5.0 manual which have occurred since the previous version published in December, 1994. All references to page, table, and figure numbers refer to the December publication. Page, table, and figure numbers in the September, 1995 publication may not match the page, table, and figure number references mentioned here due to omissions or inclusions and, likewise, text and graphics shifting somewhat from page to page.

General

A Customer Response form has been added to the end of this manual.

Chapter 5

SMC Dialog Plus information has been added to the Message Response Description on page 5-21.

Table of Contents

Chapter 1

Introduction

Manual Objectives

The purpose of this manual is to provide the necessary information to help you transfer data from a logic controller to the SCANport device using datalinks or PLC Block Transfers. Described in this manual are:

- Datalinks
- Datalink emulation of block transfer (for multiple parameter transfer)
- PLC® block transfer communication with a SCANport™device

This manual is intended for people familiar with PLC programming and the block transfer function. If you are not familiar with block transfer, please read Chapter 3, “Introduction to Block Transfer” completely.
For information on specific product features, refer to the Getting Started manual.

IMPORTANT: This manual should be read in its entirety before installing, operating, servicing or initializing the Remote I/O Communications Module.

Who Should Use This Manual

This manual is intended for qualified service personnel responsible for setting up and configuring these devices. You must have previous experience with and a basic understanding of electrical terminology, configuration procedures, required equipment and safety precautions.
To make efficient use of this Block Transfer Manual you must be able to program and operate an Allen–Bradley programmable controller. In particular you must be be familiar with Remote I/O concepts and configuration and be able to program block transfer instructions.

Vocabulary

In this manual we refer to the:

- Remote I/O Communications Module as “Remote I/O Module”, or “RIO Module”.
- Any device that can be controlled or monitored by the RIO Module as the “Drive” or “SCANport Device”. This includes 1305, 1336 FORCE and 1336 PLUS Variable Frequency AC Drives.
- The Programmable Logic Controller as the “Programmable Controller” or “PLC”.
- Allen–Bradley Remote Input/Output network as “Remote I/O”.
- Earth Ground as “Gnd”.

Firmware Version

This manual supports communication module firmware versions 1.xx and 2.xx (the “xx” designator may vary). Features that work with specific firmware versions will be denoted as such.

Manual Organization

This manual is divided into chapters as detailed in Table 1.A.

Table 1.A
Manual Organization

Chapter	Title	Topics Covered
2	Installation	DIP switch configuration
3	Introduction to Block Transfer	Addressing, Block Transfer description.
4	Datalink Configuration	Datalink explanation and Block Transfer emulation using Datalink.
5	Block Transfer Message Structure	Block Transfer configurations and examples.

Safety Precautions

ATTENTION: Only personnel familiar with SCANport devices and the associated machinery should plan or implement the installation, start-up, configuration and subsequent maintenance of this Remote I/O Communication Module. Failure to comply may result in personal injury and/or equipment damage.

ATTENTION: This Module contains ESD (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, reference Allen–Bradley Publication 8000-4.5.2, *Guarding against Electrostatic Damage* or any other applicable ESD protection handbook.

PLC Product Compatibility

This Adapter is designed to be used with the following Allen–Bradley Programmable Controllers:

- PLC-2/30® with SD2 (Communication module version 1.02 or later)
- PLC-3®
- SLC 500™ with 1747-SN Scanner
- PLC-5/10™, PLC-5/15™, PLC-5/25™ family
- PLC-5/30™, PLC-5/40™, PLC-5/40L™, PLC-5/60™, PLC-5/60L™ family, PLC-5/80™
- PLC-5/250™
- PLC® scanner modules and subscanners.

SCANport Device Compatibility

IMPORTANT: (1305) Version 1.xx (“xx” designator may vary) of the 1305 Drive is not supported by the Remote I/O Communication Module. If an attempt is made to use the Remote I/O Communication Module with a Version 1.xx 1305, the Remote I/O Communication Module will continually reset itself, resulting in the flashing of the Adapter Status LED’s. Firmware Revision 2.xx or higher on the 1305 is required to support Remote I/O Communication and block transfer.

Chapter 2

Installation

Chapter Objectives

In this chapter you will:

- Configure the hardware to be used for Block Transfers

Read this chapter completely before you attempt to install or configure your Remote I/O Block Transfer function. Double check all connections and option selections before you apply power. If additional information on dipswitch settings is required, please refer to the Bulletin 1203 RIO Getting Started Manual.

IMPORTANT: Switch selections will not take effect if changed after power is applied.

Setting Module Configuration Switches

This publication describes switches as being either on or off. If the switch assembly has the word OPEN printed on it, the word OPEN corresponds to OFF (O).
When you are making configuration changes to the adapter board, keep in mind the addressing conventions of the type of processor that you are using. In all cases, each Remote I/O device must have a unique address the processor can recognize.

IMPORTANT: This adapter is not compatible with complementary I/O configurations because the adapter utilizes both output and input image words for proper drive control.

ATTENTION: When you make changes to the switch settings, use a blunt, pointed instrument such as a ball point pen. Do not use a pencil because the lead (graphite) of the pencil may damage the switch assembly.

ATTENTION: Failure to check connections and switch settings for compatibility with your application when configuring the communications module, could result in personal injury and/or equipment damage due to unintended or undesirable operation of the drive or process equipment.

Switch SW1 – Verify that SW1 is set for the proper rack address as shown in Table 2.A.

IMPORTANT: When using a PLC-2 family processor it is necessary to offset the value of the rack number by one. The PLC-2 cannot have a remote I/O rack numbered zero. Therefore, add a value of one to the “Rack No” value in Table 2.A when writing your PLC code.

Figure 2.1
Configuration Switch SW1 Settings

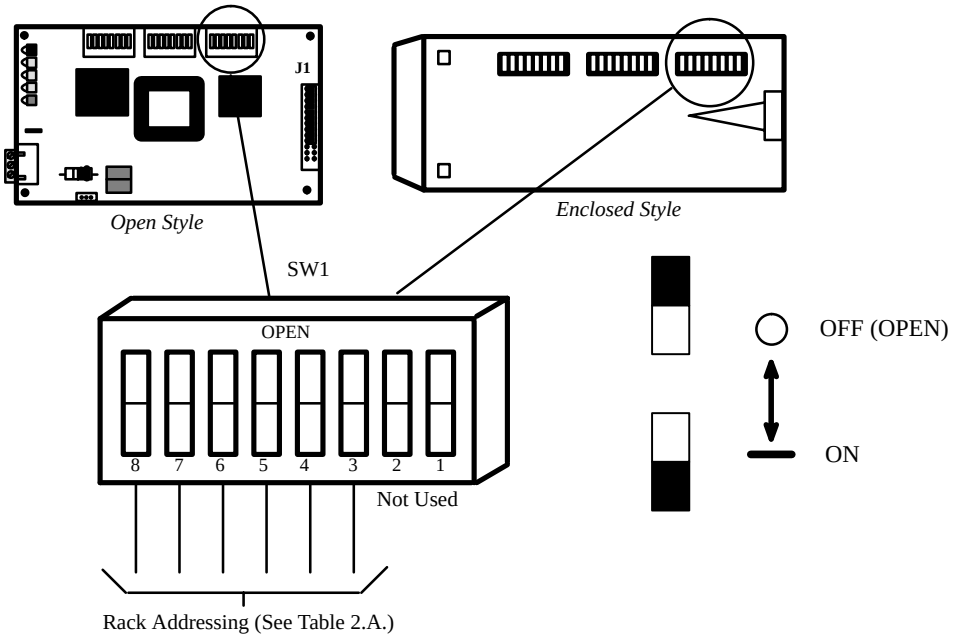
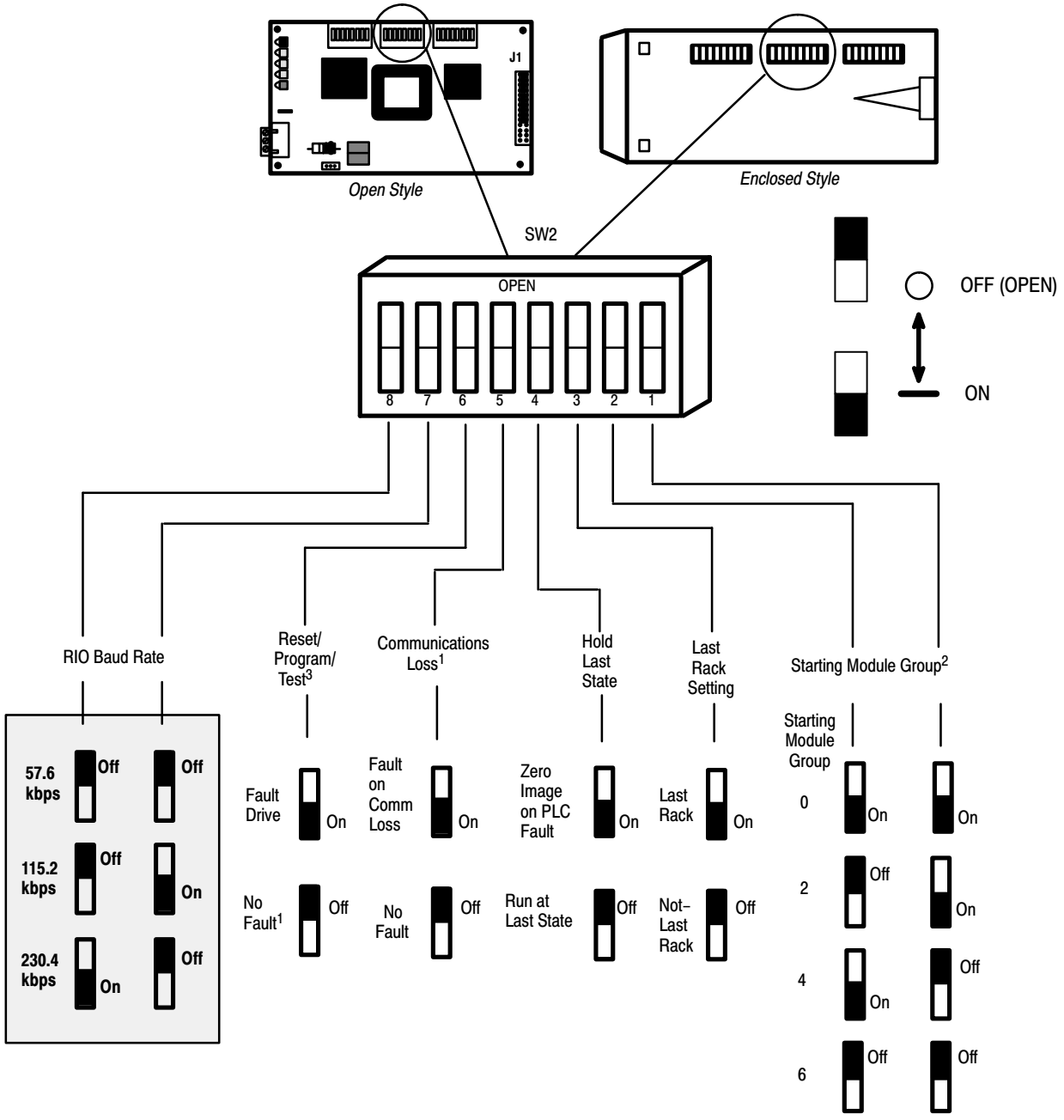


Table 2.A
Switch SW1 Settings
SW1 – 8 thru SW1 – 1 Dip Switch Definitions, Rack Address

Rack No.	SW1–8	SW1–7	SW1–6	SW1–5	SW1–4	SW1–3	SW1–2	SW1–1
00	On	On	On	On	On	On	NOT USED	
01	Off	On	On	On	On	On	NOT USED	
02	On	Off	On	On	On	On	NOT USED	
03	Off	Off	On	On	On	On	NOT USED	
04	On	On	Off	On	On	On	NOT USED	
05	Off	On	Off	On	On	On	NOT USED	
06	On	Off	Off	On	On	On	NOT USED	
07	Off	Off	Off	On	On	On	NOT USED	
10	On	On	On	Off	On	On	NOT USED	
11	Off	On	On	Off	On	On	NOT USED	
12	On	Off	On	Off	On	On	NOT USED	
13	Off	Off	On	Off	On	On	NOT USED	
14	On	On	Off	Off	On	On	NOT USED	
15	Off	On	Off	Off	On	On	NOT USED	
16	On	Off	Off	Off	On	On	NOT USED	
17	Off	Off	Off	Off	On	On	NOT USED	
20	On	On	On	On	Off	On	NOT USED	
21	Off	On	On	On	Off	On	NOT USED	
22	On	Off	On	On	Off	On	NOT USED	
23	Off	Off	On	On	Off	On	NOT USED	
24	On	On	Off	On	Off	On	NOT USED	
25	Off	On	Off	On	Off	On	NOT USED	
26	On	Off	Off	On	Off	On	NOT USED	
27	Off	Off	Off	On	Off	On	NOT USED	
30	On	On	On	Off	Off	On	NOT USED	
31	Off	On	On	Off	Off	On	NOT USED	
32	ON	Off	On	Off	Off	On	NOT USED	
33	Off	Off	On	Off	Off	On	NOT USED	
34	ON	On	Off	Off	Off	On	NOT USED	
35	Off	On	Off	Off	Off	On	NOT USED	
36	On	Off	Off	Off	Off	On	NOT USED	
37	Off	Off	Off	Off	Off	On	NOT USED	

Switch SW2 – Verify switches 7 & 8 of SW2 are set for the proper communication baud rate.
The switches are labeled in the same orientation as they appear on the board.

Figure 2.2
Configuration Switch SW2 Settings



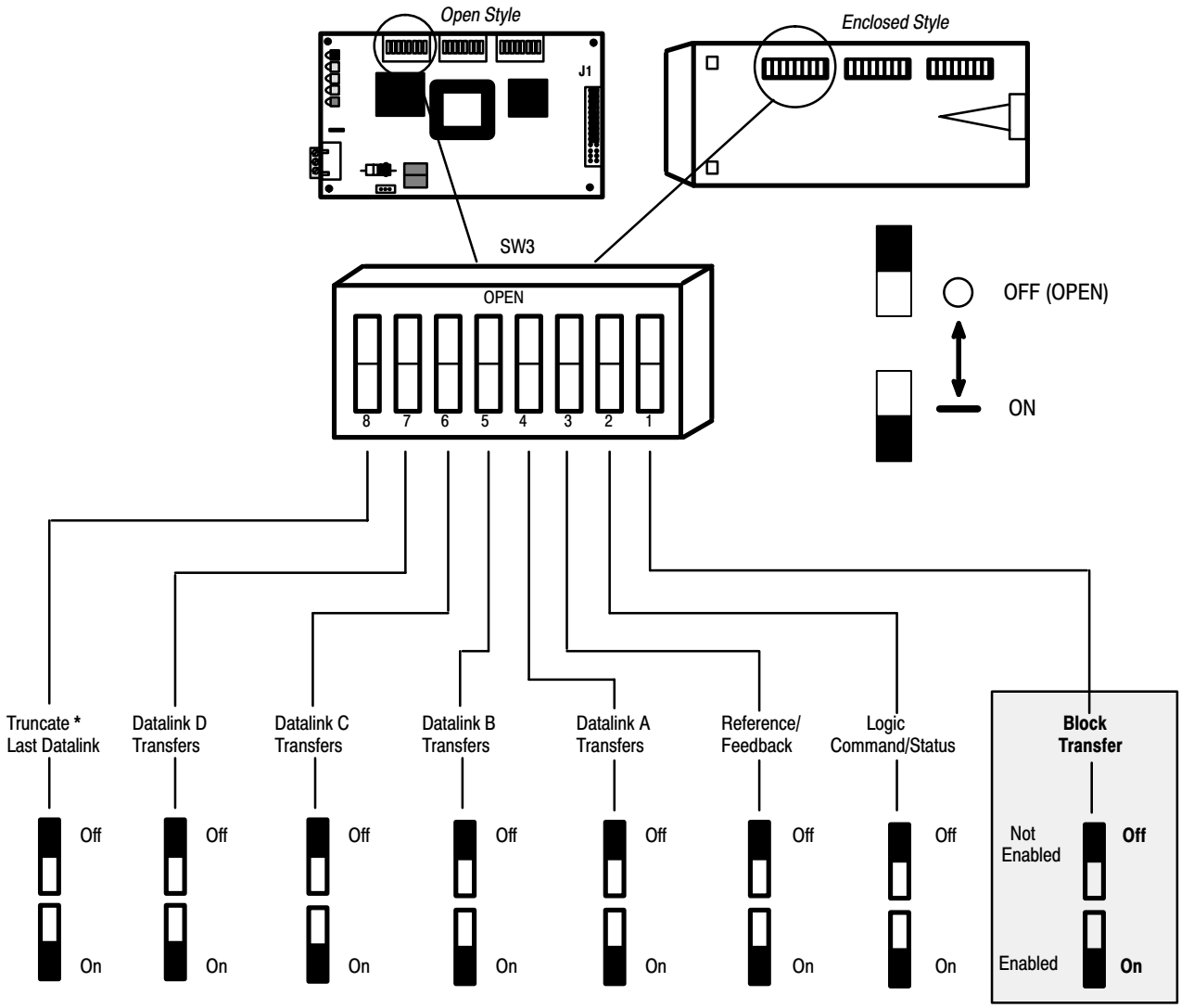
[1] If this switch is set to "No Fault", the setting of the "Hold Last State" switch will deter mine the data sent to the SCANport device when the PLC is in Reset/Program/Test.

[2] The setting of this switch is determined by the amount of Discrete I/O that will be passed between the PLC and Drive. Refer to the Getting Started Manual, Chapter 3 for more information.

[3] This switch is active on Firmware Version 2.xx modules only. It is not used by modules containing Firmware Version 1.xx.

Switch SW3 – Verify Switch 1 of SW3 is in the ON position. This will enable Block Transfer operations for the adapter.
The switches are labelled in the same orientation as they appear on the board.

Figure 2.3
Configuration Switch SW3 Settings



IMPORTANT: Only available on communications modules with version 1.02 or later firmware.

*All datalinks are two words, the truncate function will delete the last datalink word. (If "Datalink B" is the last used, "Data in B2" and "Data Out B2" will be truncated.)

Chapter 3

Introduction to Block Transfer

Introduction

Chapter 3 contains a general description of PLC block transfer operation, and sample PLC block transfer routines.

Terminology

A brief description of terms and concepts covered in this chapter are:
BTW – A PLC Block Transfer Write Instruction
BTR – A PLC Block Transfer Read Instruction

General

The Remote I/O Module does not scale or manipulate data that is transferred between the PLC and SCANport device. The data in the PLC must be converted to device units before being sent to the SCANport device.

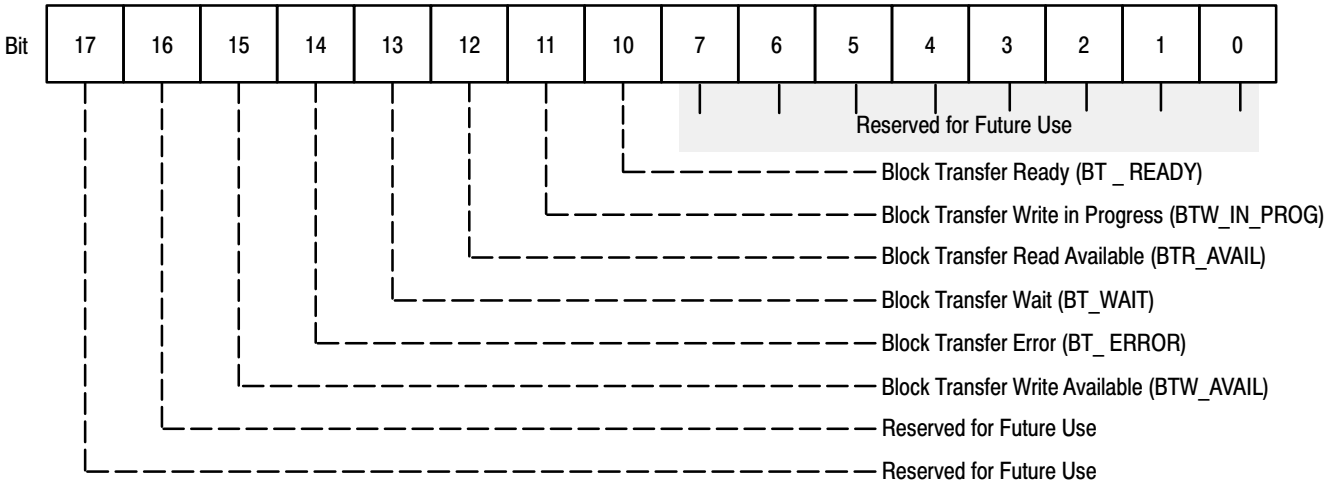
Block Transfer

Discrete transfer is the method used by a PLC to transfer data to and from the Module during every rack scan. The Adapter transfers this data to and from the SCANport device.
Block transfer is the method used by a PLC to transfer data that does not require continuous updates. To perform this function, the Module provides a status word to the PLC during the normal discrete transfer scan. This status word occupies the first module group in the PLC I/O image table for the designated rack. The status word is then used by the PLC program to control the BTW and BTR functions of the PLC.

Remote I/O Module Status Word

The Status Word is returned from the Remote I/O Module in addition to the Block Transfer Status Word. The Remote I/O Status is the first word associated with the rack in the PLC input image table. This status word indicates the condition of the Remote I/O Module itself and is not part of the standard block transfer instructions in the PLC program. Figures 3.1 and 3.2 detail the information contained in this word. Individual bits from this word are used in the PLC program to control the block transfer functions (refer to the block transfer examples).

Figure 3.1
Remote I/O Status Word



Block Transfer Ready – Indicates that the SCANport Device and Remote I/O Adapter are communicating and are ready to process block transfers.

Block Transfer Write In Progress – Indicates a block transfer write is in progress between the PLC and RIO Module. This bit is cleared when the data transfer to the RIO Module is complete.

Block Transfer Read Data Available* – Indicates the Remote I/O Module has data available for the PLC to read.

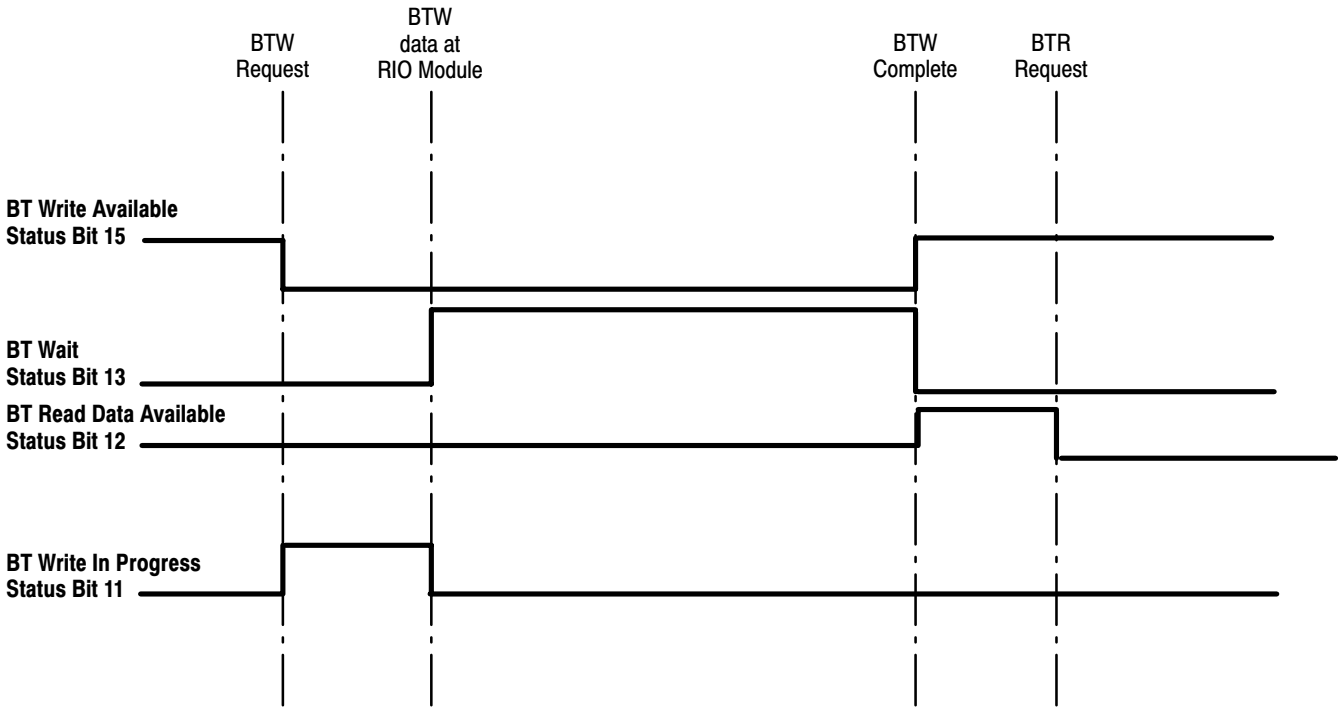
Block Transfer Wait – Indicates that the Remote I/O Module is communicating with the SCANport device. This bit is cleared when the data transfer between the RIO Module and SCANport device is complete.

Block Transfer Error *– indicates that an error has occurred during communications with the SCANport device or the BTW data table is invalid.

Block Transfer Write Available *– indicates the Remote I/O Module is ready to receive a Block Transfer Write.

** These bits are used in the block transfer PLC example program.*

Figure 3.2
Bit Timing



Data Storage

In order to use the block transfer instructions in the PLC program, it is necessary to reserve several words for data storage. Some of these words are required for internal use by the block transfer function and some contain the block transfer message information. In the PLC 5™,the BTW and BTR blocks require the use of two sets of words. Figures 3.3 and 3.4 illustrate the BTW and BTR blocks used for block transfer in the PLC 5™ along with example information associated with these blocks. A brief description of the information contained in these blocks specifically for the PLC 5™ follows. For more detailed information on the PLC 5™ and the PLC 3™ refer to the appropriate PLC documentation.

Figure 3.3
PLC 5/15, 5/25 Block Transfer Instructions

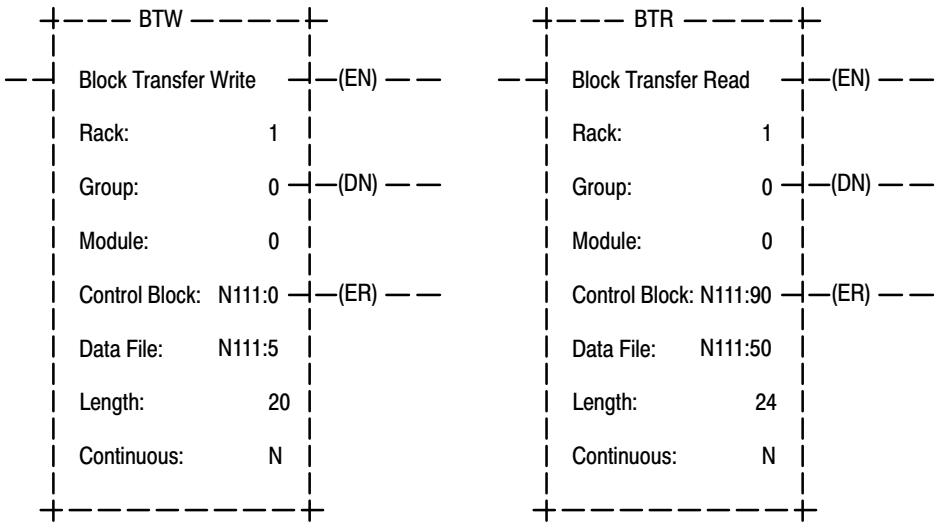
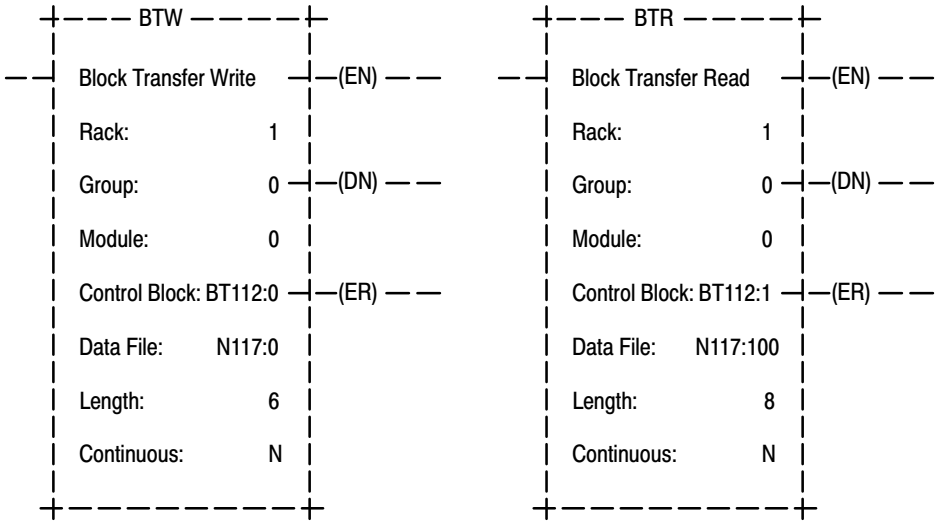


Figure 3.4
PLC 5/40, 5/60 Block Transfer Instructions



Rack – the rack number is determined by the switch settings on the Remote I/O Module.

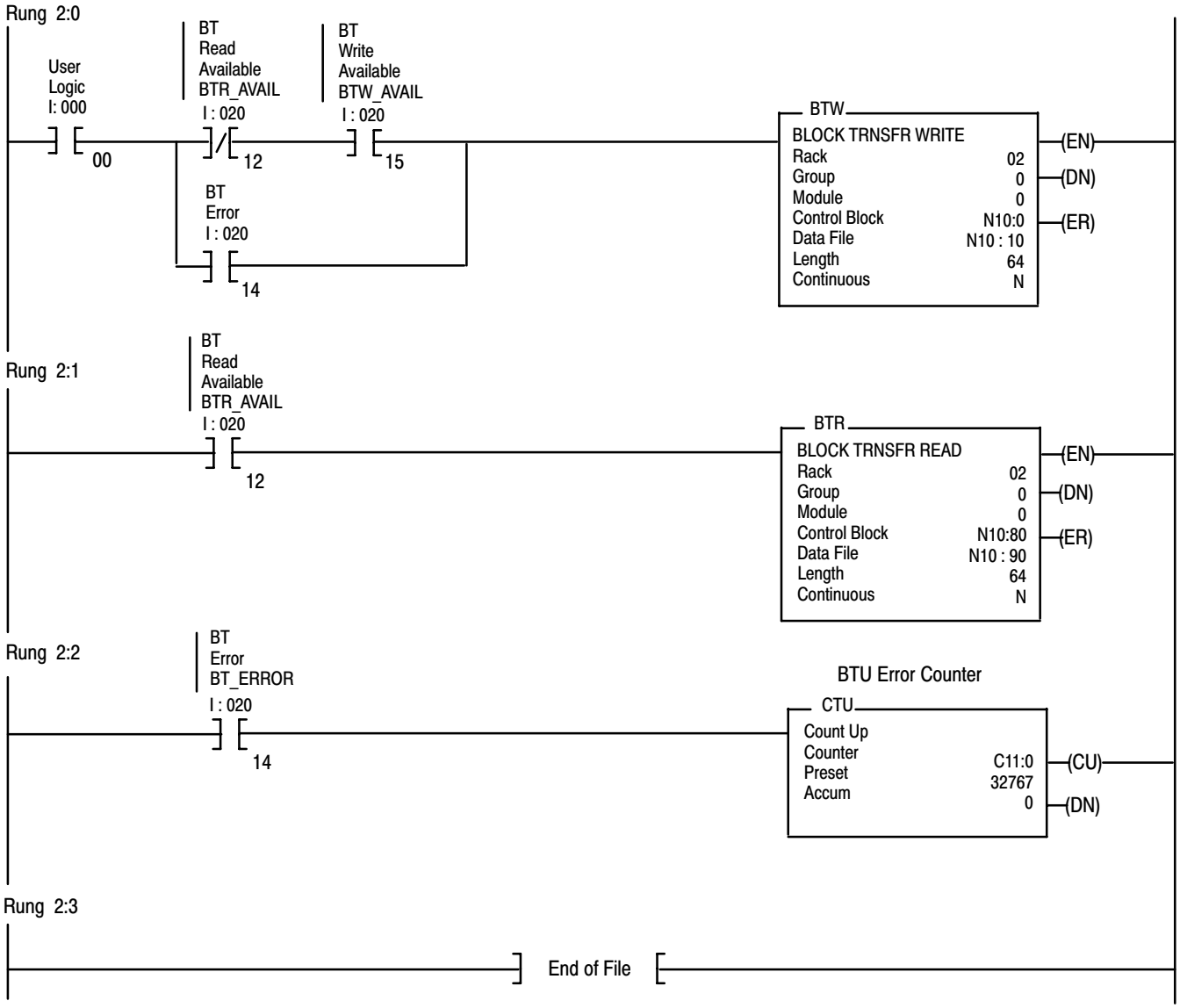
Group – the group number of the first group in the rack associated with the Remote I/O Module. In Figure 3.3, the rack has been set up as a full 8 group rack, therefore, the first group is 0. If half rack is selected the first group in the rack is 0 or 4. If quarter rack is selected, the first group in the rack is 0, 2, 4, or 6.

Module – the module number associated with the block transfer in the associated slot. In all cases this will be 0.
Control Block – is a predefined set of words which contain bit information associated with the PLC block transfer function. In the PLC 5/15 and 5/25, the control block requires 5 contiguous words. In Figure 3.3, words N111:0 through N111:4 have been reserved for the bit array in the BTW block and words N111:90 through N111:94 have been reserved for the BTR block. In the PLC 5/40 and 5/60 the control block may be either an integer type, and would require 5 contiguous words, or a block transfer type and would require 1 element (see Figure 3.4).
Data File – is the address of the message sent by the BTW or received by the BTR block and contains both header and data information. The number of words required for the data file is dependent on the type of message being sent. In Figure 3.3, N111:5 is the first word in the data file for the BTW block and N111:50 is the first word for the BTR block. See Chapter 5 for information regarding the header and data that must be included in the data file.
Length – specifies the length of the block transfer message in words. This will vary depending on the message being sent. The BTW and BTR instruction lengths may be different. Refer to the message examples in Chapter 5 for the minimum lengths required for each message.
Continuous – specifies whether the block transfer block is to be executed continuously or only when the rung is true. This should always be set to N.

PLC–5 Block Transfer Rung Example

The programs shown in Figure 3.5 and Figure 3.6 are examples of block transfer programming for the Adapter. Figure 3.5 is for a PLC5/15 or 5/25. Figure 3.6 is used for PLC 5/20, 5/40, 5/60 or 5/80. The BTW_Avail, BTR_AVAIL, and BT_Error bits from the module status word (I:020 in these examples) are used in these examples. The examples also show how user logic can be used to enable or disable the block transfer operations.

Figure 3.5
Block Transfer Example PLC 5/15, 5/25

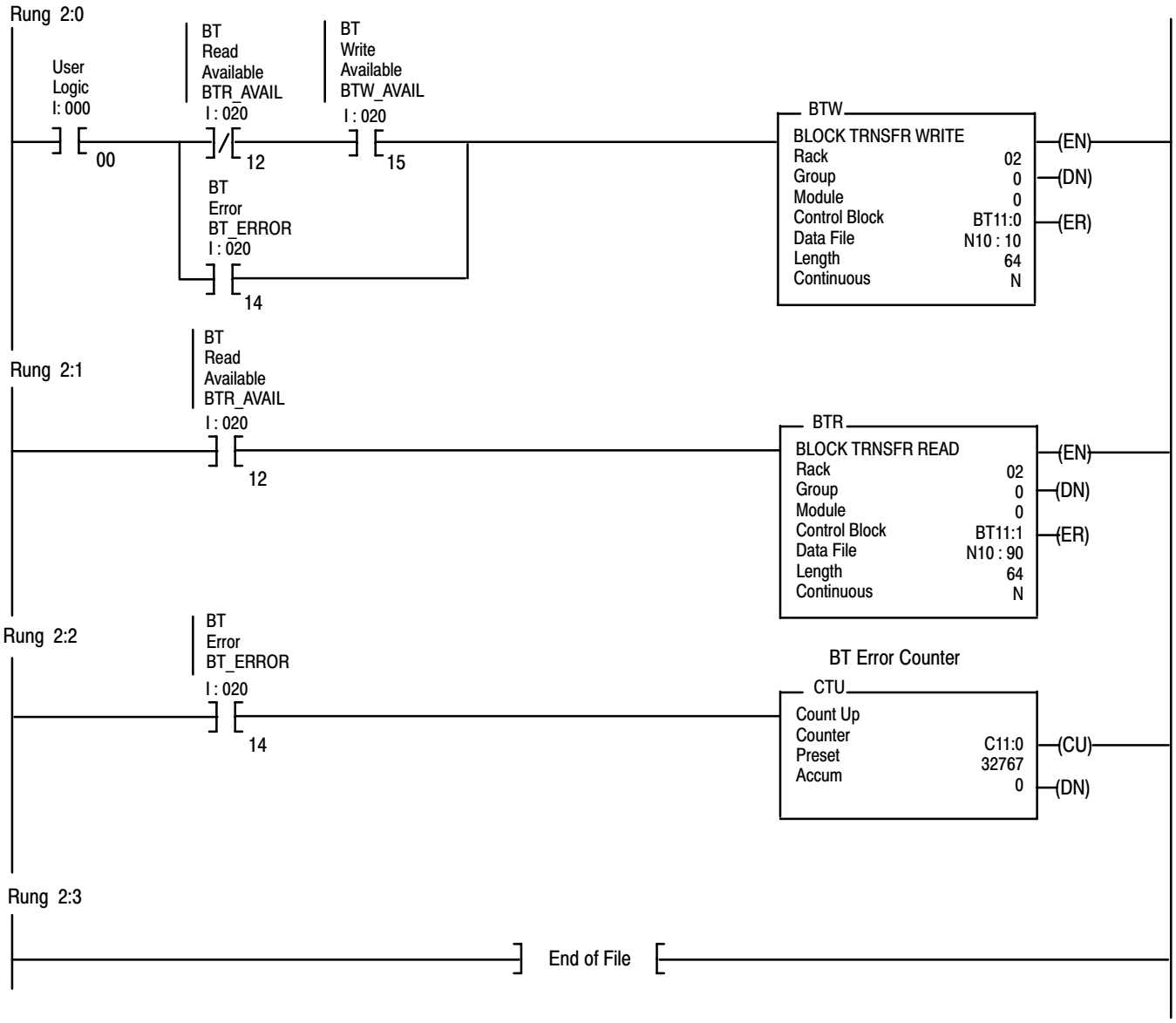


The first rung causes a block transfer write to the Adapter when the user logic bit is true, the BTR_AVAIL bit is false, and the BTW_AVAIL bit is true.

The second rung causes a block transfer read from the Adapter whenever the BTR_AVAIL bit is true. The BTR rung is not conditioned with any user logic since a block transfer read should occur whenever there is data available for the PLC to read from the Adapter.

The third rung causes a counter to increment each time the BT_ERROR bit (I:020/14) goes true. This bit can be used to detect problems with the link from the PLC to the SCANport device.

Figure 3.6
Block Transfer Example PLC 5/20, 5/40, 5/60, 5/80



Additional Notes Regarding Block Transfer Programming:

1. A Block transfer subroutine can be used to transfer more data than can be moved in a single block transfer. If this is done, the block transfers must be carefully sequenced so that one Block Transfer Write and one Block Transfer Read occur for each portion of the sequence. One method of doing this is to set a latch bit to enable the Block Transfer Write and unlatch this bit when the Block Transfer Write is completed. When the Block Transfer Read completes, the program can then set up the data for the next transfer.
2. The status bits from the BTW and BTR Control files (.EN, .DN, .ER) may change at any time during a program scan. If they are used by the program they should be copied to a file and the program should use the copied versions.

Chapter 4

Datalink Configuration

Introduction

Chapter 4 explains the Datalink function and contains examples to help you interface with the Scanbus device using datalinks. This chapter also contains a sample SLC program that emulates a Block Transfer parameter write operation using the drive datalinks.

SCANport Datalink Function

A Datalink is a type of pointer used by some SCANport devices to transfer information between the PLC and the device. Datalinks allow a parameter value to be changed without using the PLC block transfer function. SCANport devices that support this function have a group of parameters for datalink configuration. These parameters are identified as “Data In” and “Data Out” parameters. Datalinks are enabled by DIP switch settings (SW3) that are explained in the Bulletin 1203 Remote I/O Communications Module Getting Started manual.

Each Datalink on the Remote I/O Module consumes two words in both the input and output image table of the PLC. The Remote I/O Module can be configured (by DIP switch settings) to truncate the last Datalink to use one word instead of two in the input and output image tables. Truncation can be used to minimize the required rack size used by the Remote I/O Module. See Figure 4.1 for a Datalink configuration example using two datalinks and no block transfer.

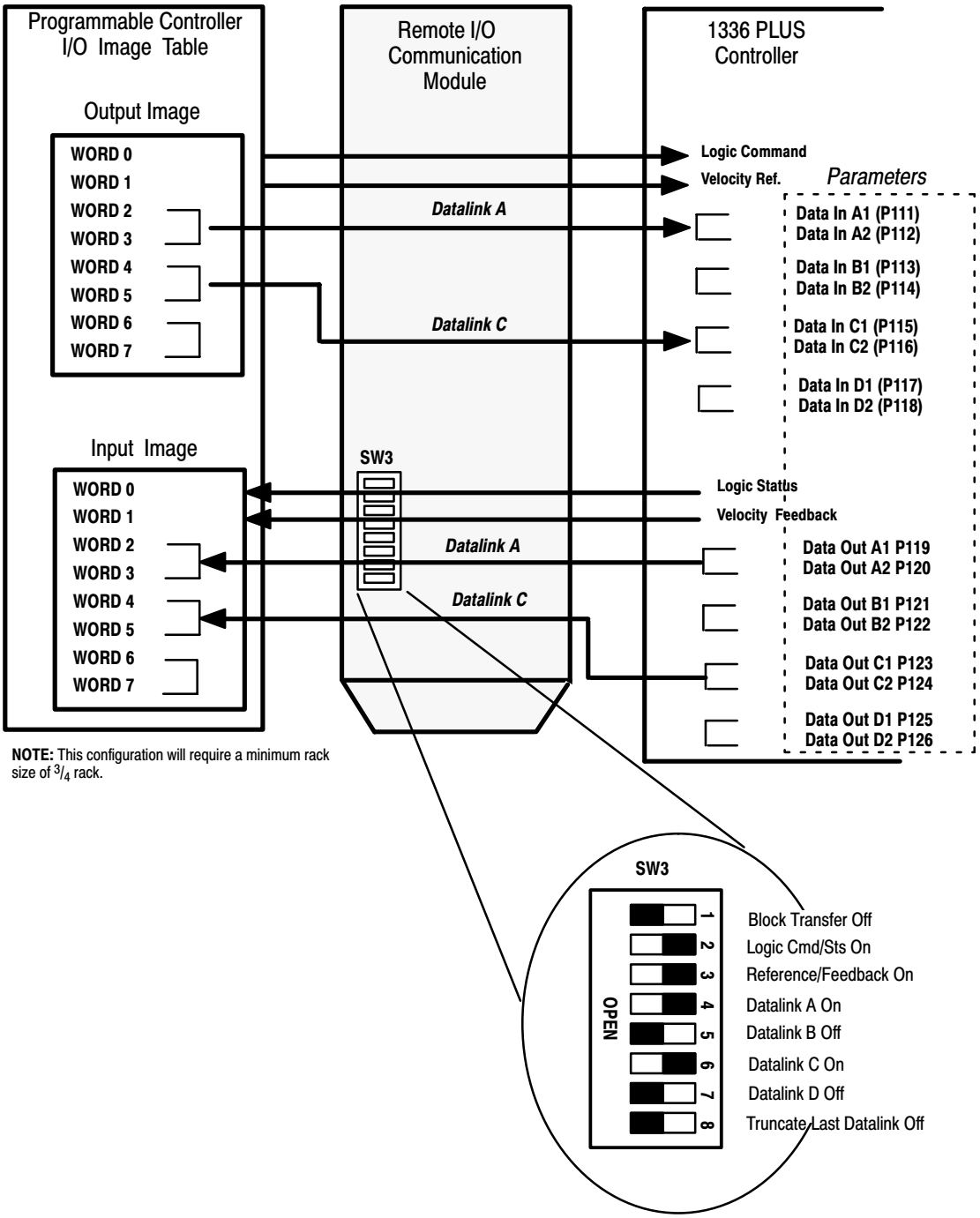
The simplest application for datalinks is to set a parameter number into a “Data In” parameter. The PLC output image table word connected to this datalink will then control the value of the parameter programmed into the “Data in” parameter.

For example: On a 1336 PLUS drive use Datalink A to change the value of parameter 27. Set parameter 111 (Data In A1) to “27”. If the Remote I/O Module is configured as shown in Figure 4.1, the value in the PLC output image table word 2 will be sent to parameter 27.

A similar application is to set a parameter number into a “Data Out” parameter. The PLC input image table word connected to this datalink will then receive the value of the parameter programmed into the “Data Out” parameter.

For example: On a 1336 PLUS drive use Datalink A to monitor the value of parameter 27. Set parameter 119 (Data Out A1) to “27”. If the Remote I/O Module is configured as shown in Figure 4.1, the PLC input image table word 2 will receive the value of parameter 27.

Figure 4.1
Example Configuration for 1305 & 1336 PLUS without Block Transfer



SLC 500 Block Transfer Emulation

The following example program is used to sequence a block transfer emulation between the SLC 500 and a 1336 PLUS drive using Datalinks. A set of parameters and corresponding values will be sent from the SLC 500 through the SCANport Adapter module, to the 1336 PLUS.
For information on how to configure the Adapter and Scanner Modules, please refer to Chapter 4 of publication 1747–PA2E, the Getting Started Guide for APS.

ATTENTION: The sample program and block transfer emulation examples shown in this manual are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Allen-Bradley does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Block Transfer Emulation Example

This program (Figure 4.2 thru Figure 4.6) is designed to allow 2 sets of values to be transferred, which are selectable from separate inputs. Data Set A, stored in file N11, will be transferred to the drive when B3/0 is set. Data Set B, stored in file N12, will be transferred to the drive when B3/1 is set. The number of parameters to be transferred must be defined in N7:0. A counter (“Parameter Counter”) is used to keep track of the current parameter number and value being transferred. A three step sequence is required to transfer the data. A second counter (“Download Sequence Step”) is used to sequence these three steps prior to advancing a pointer in the data table. The three steps are:

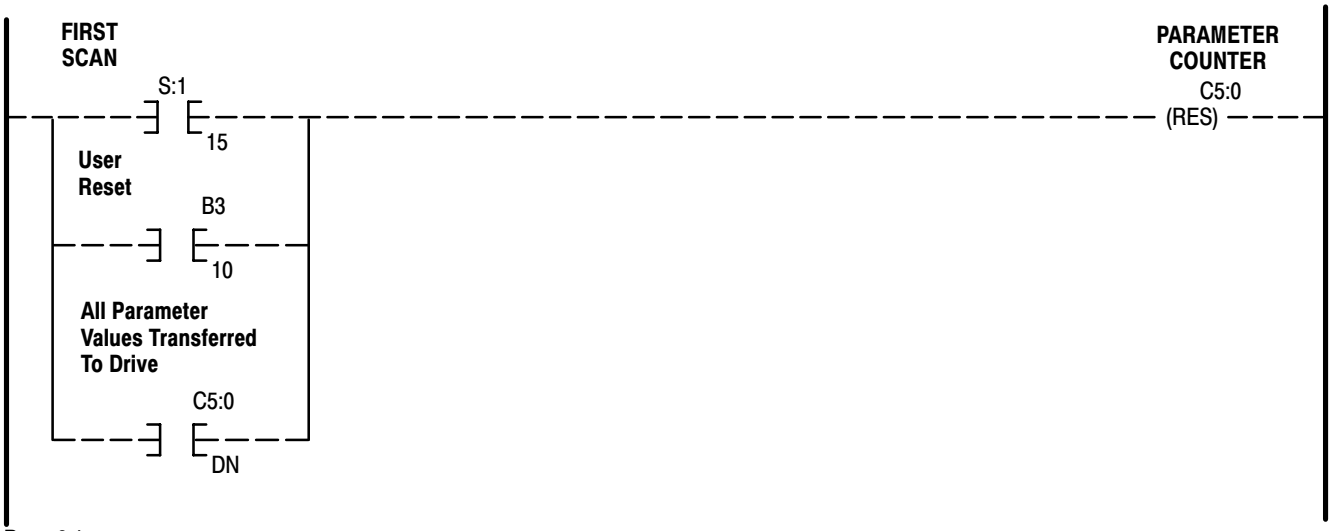
1. Send a “0” to Data In A1 prior to each data transfer so that Data In A2 is not pointing to any parameter.
2. Move the Parameter Number and Parameter Value from the selected data file (N11 for Data Set A, N12 for Data Set B), into buffer registers N7:10 and N7:11 as the pointer increments. Send the parameter number and parameter value from N7:10 and N7:11, to A1(P111) and A2 (P112). Send the same parameter number (N7:10) to B1 (P113), to be directed to Data Out A2 (P120) for verification.
3. Verify data transfer by comparing data table registers N7:10 and N7:11, with Data Out A1 out and Data Out A2. If the values sent to the drive match the values returned from the drive, the data transfer was successful. The parameter counter will then increment, and the same three step sequence will be repeated for the next parameter.

If the values do not match, the sequence will stop at the invalid transfer. N7:10 will store the parameter number and N7:11 will store the value of the attempted transfer. I:1.27 will store the value that was sent from the drive. As an example, if a value that is out of range is sent to the drive, the sequence will stop and the parameter number will be held in N7:10. I:1.27 will hold the value of the parameter that the drive sees, and N7:11 will hold the attempted transfer value.
Another indication of an invalid transfer can be seen at counter C5:1. This counter will count the steps of the download sequence. The counter will remain at Step 3 until the data is verified, then it resets. If this counter remains at an ACCUM value of 2 for an extended period of time, an error has occurred in the download sequence. A timer is used to monitor this. When it times out, an error bit, B3:5, will indicate an invalid transfer has been attempted.
This program will continue to download data unless the user disable bit, B3:11, is set. It is recommended that this bit be defined by a selector switch, enabling the download function only when requested. Refer to Figure 4.7.

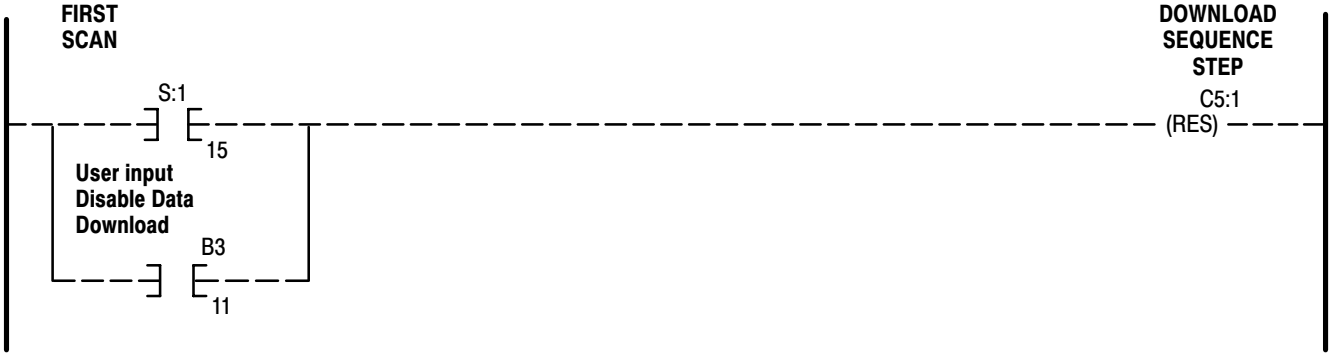
IMPORTANT: The G File of the SLC must match the configuration of the communication network. For more detailed information on the G File, please refer to the Remote I/O Scanner User's Manual, Catalog Number 1747-SN.

Figure 4.2
Example Program

Rung 2:0
Counter C5:0 counts the parameters as they are transferred to the drive.
This counter is reset on the first program scan or by the user reset (this could be from a pushbutton, etc.).
The counter is also reset when all parameters have been transferred.



Rung 2:1
Each parameter value is sent to the drive in a 3 step sequence. The steps of this sequence are counted by counter C5:1. This counter is reset on the first program scan. When the user disable bit is set, the parameter download is disabled (this bit could be a selector switch, etc.).



Rung 2:2
The user must enter the number of parameters to transfer in register N7:0
This value is the preset for parameter counter C5:0.

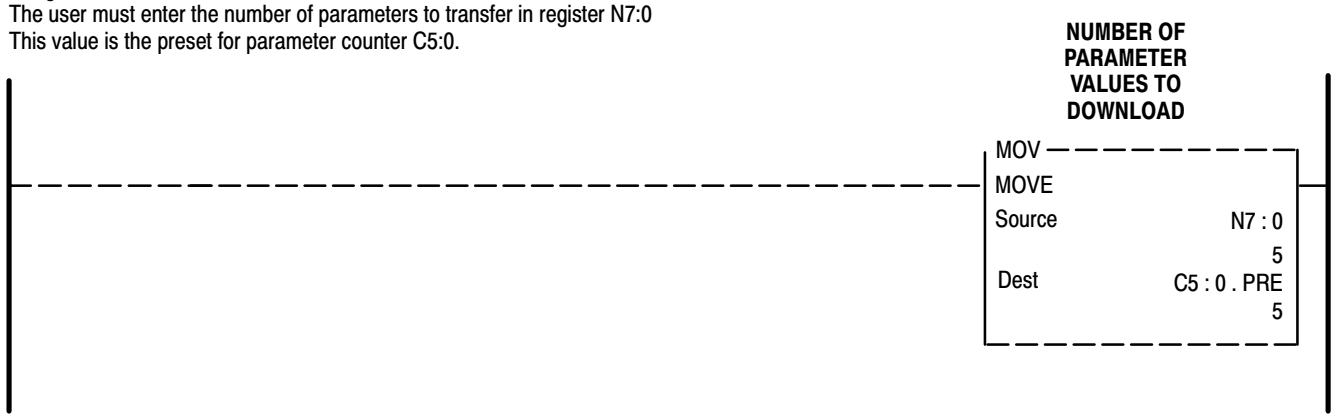
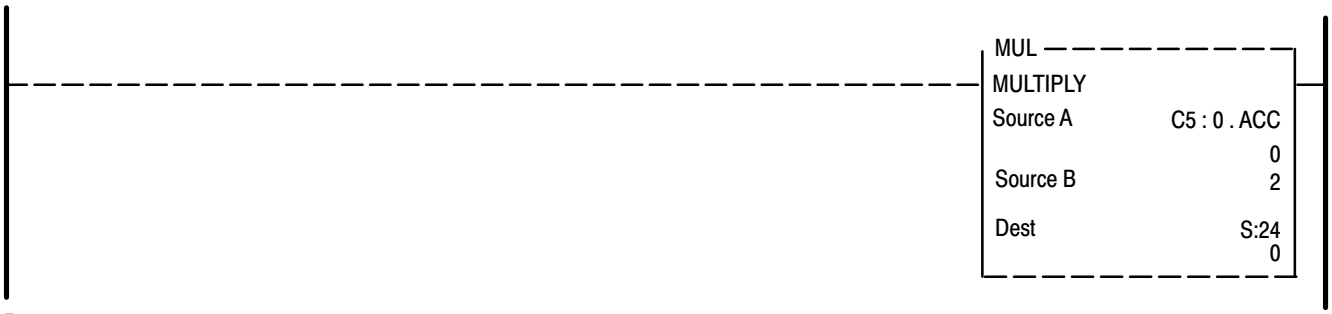


Figure 4.3
Example Program continued

Rung 2:3
S:24 is an index value used to “point” to the next set of data (parameter number and parameter value) that will be transferred to the drive. As counter C5:0 counts the parameters that are transferred to the drive, the pointer increments to point at the next parameter.



Rung 2:4
The user can download parameters from data list A or data list B. Data list A is entered by the user in data file N11 and data list B is entered in data file N12. Each parameter number and value will be moved into buffer registers N7:10 and N7:11 as the pointer increments.

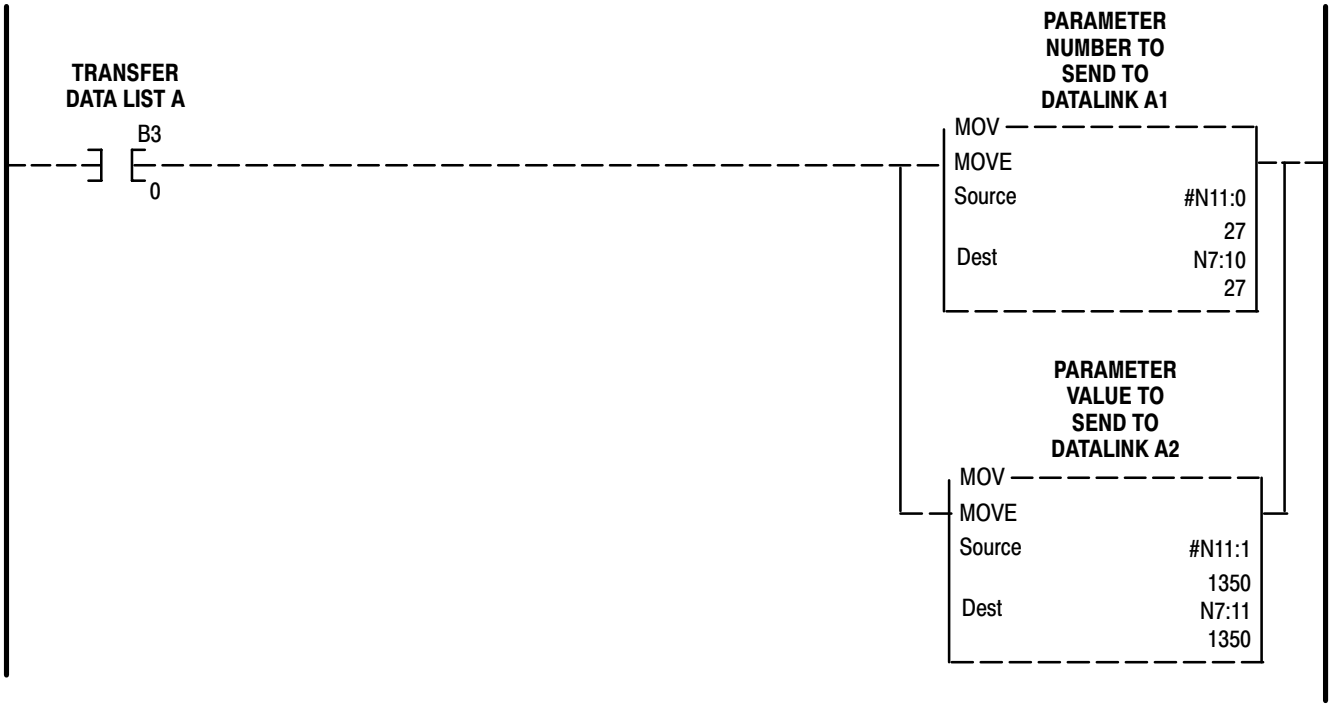
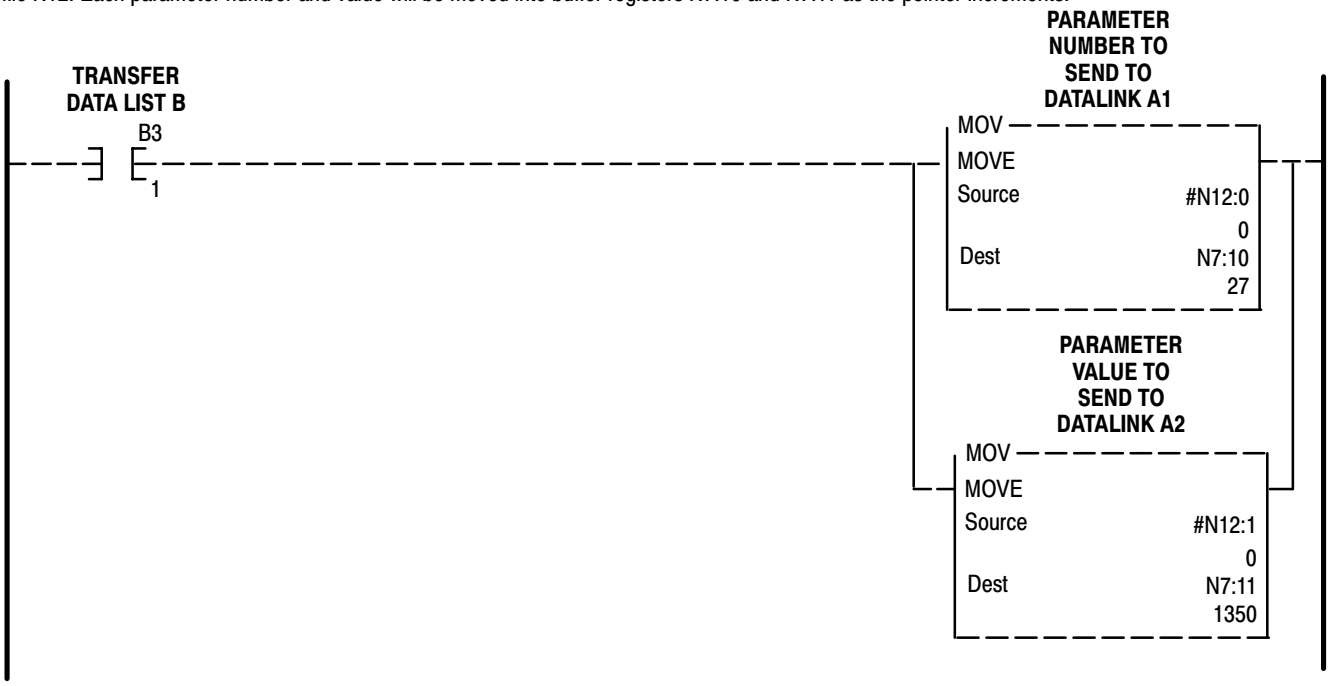
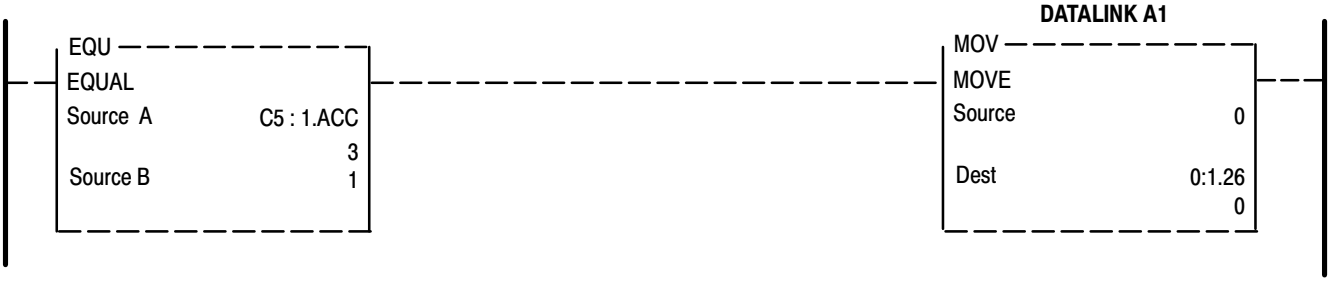


Figure 4.4
Example Program continued

Rung 2:5
The user can download parameters from data list A or data list B. Data list A is entered by the user in data file N11 and data list B is entered in data file N12. Each parameter number and value will be moved into buffer registers N7:10 and N7:11 as the pointer increments.



Rung 2:6
Step 1 of the download sequence: Set Data link A1 to 0. Data link A1 will be the parameter number that will be transferred.
The data link is set to 0 between each parameter transfer.



Rung 2:7
Step 2 of the download sequence: Send the parameter number and parameter value from buffer registers N7:10 and N7:11 to the drive datalink A1 and datalink A2.

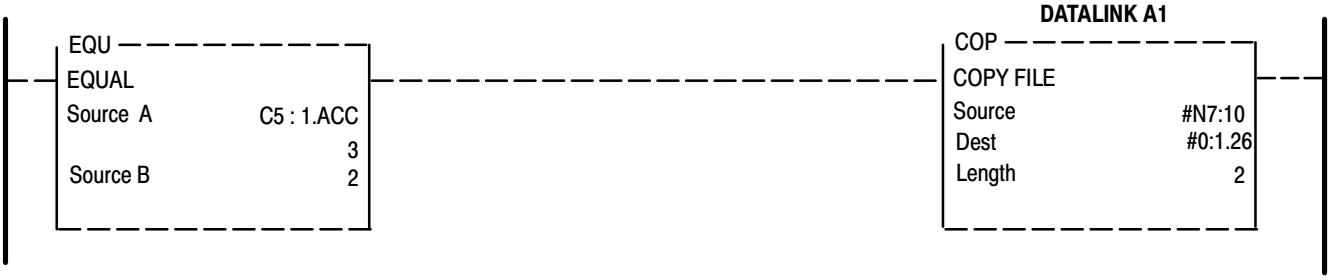
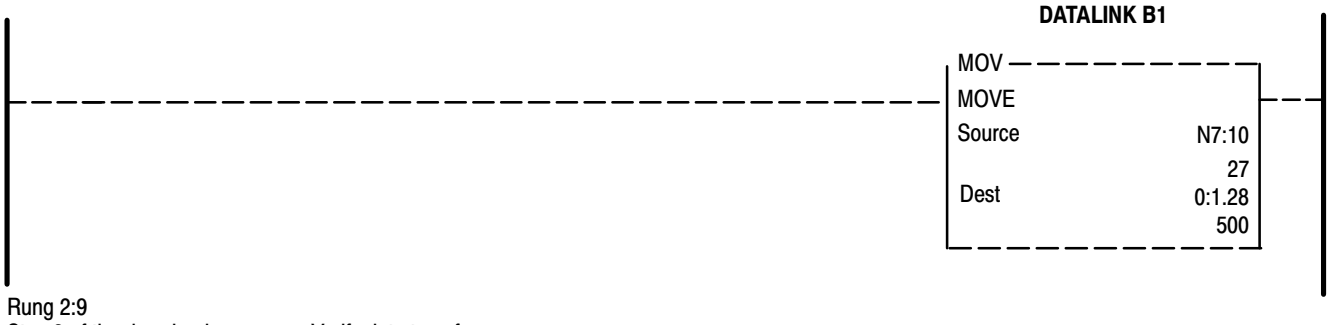
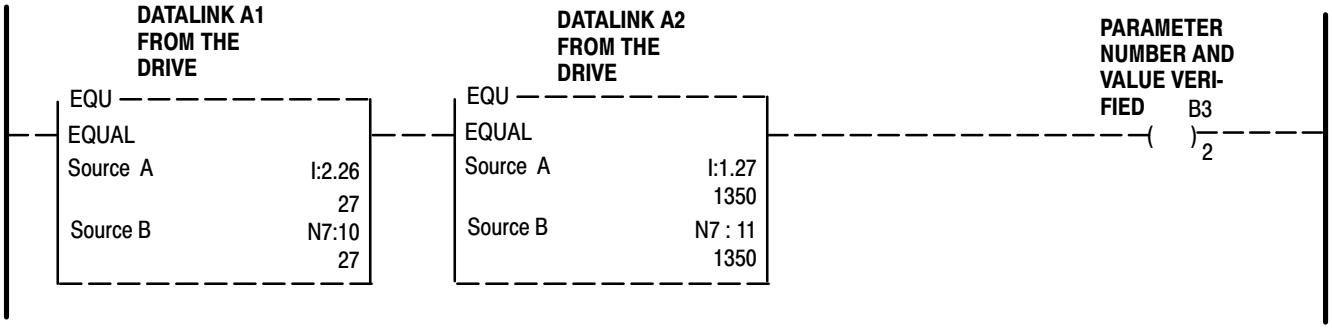


Figure 4.5
Example Program continued

Rung 2:8
Send the parameter number to datalink B1. This value will be directed to parameter 120 (datalink A2 output) so the actual parameter value will be returned to the SLC for verification.



Rung 2:9
Step 3 of the download sequence: Verify data transfer
Datalink A1 output from the drive will return the value that was sent to the Datalink A1 input A1. Datalink A2 output from the drive will return the value of the drive parameter that was sent to datalink A1. If the values returned from the drive match the values that were sent to the drive, the data transfer was successful.



Rung 2:10
When the download sequence has completed the 3 steps and the data transfer is verified, increment the parameter counter and reset the sequence counter. This will begin the process of transferring the next parameter.

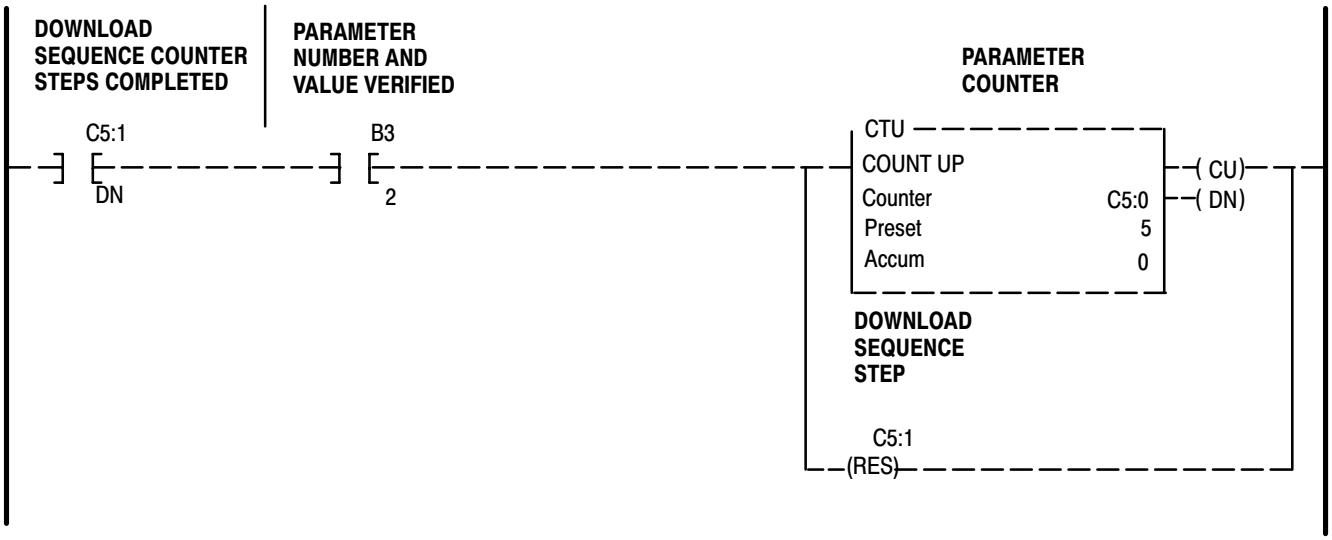
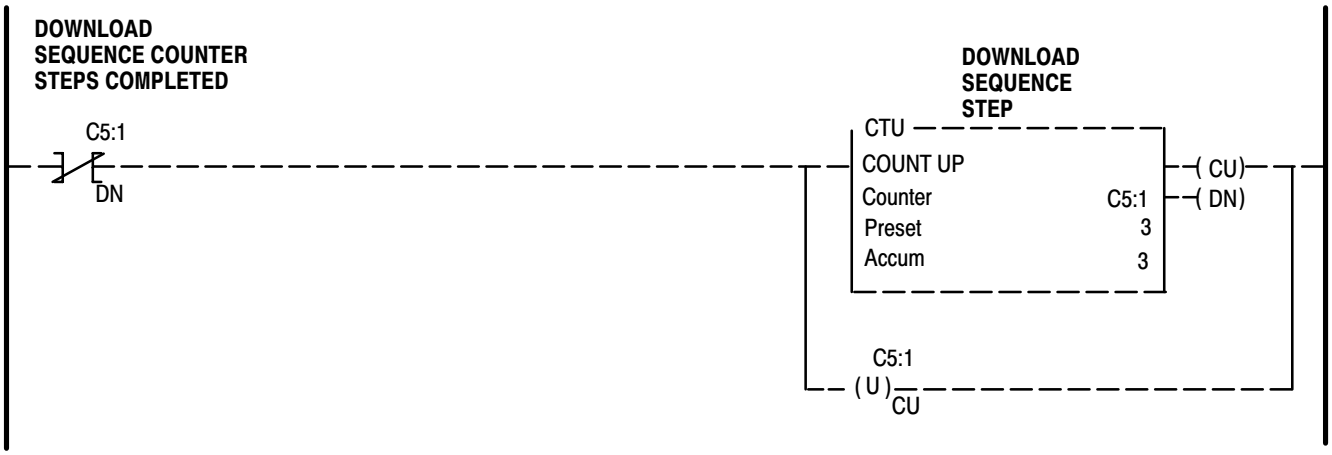
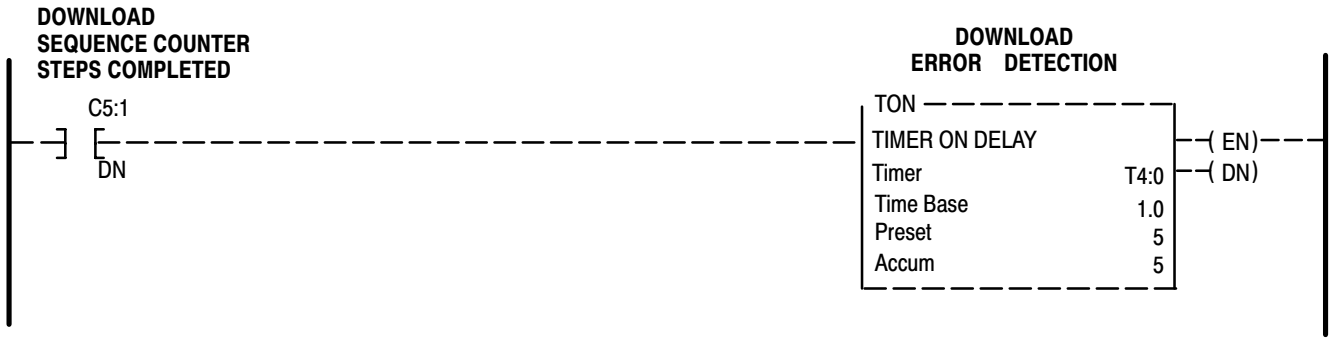


Figure 4.6
Example Program continued

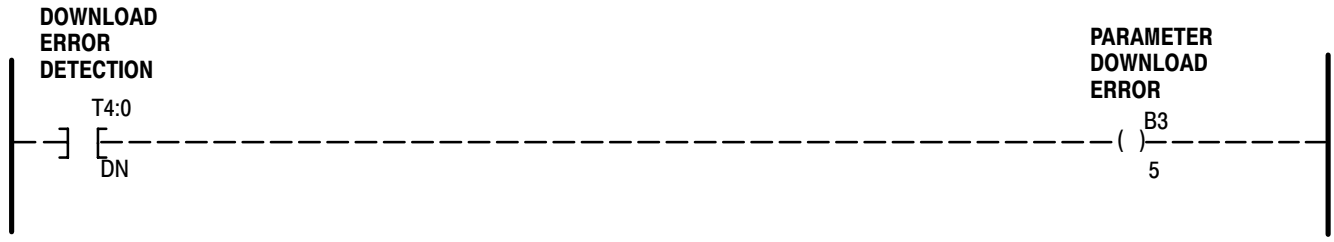
Rung 2:11
Count the steps of the download sequence. The first two steps each occur in one program scan. The counter remains at step 3 until the data is verified. Once the data is verified, the sequence counter is reset. If the user input bit "DISABLE DATA DOWNLOAD" is set, this counter will remain at 0 and the download sequence will not occur.



Rung 2:12



Rung 2:13
If the sequence counter remains at step 3 for 5 seconds, the parameter download is faulted. Verify the parameter number in N7:10 is a valid parameter number. Verify the parameter value in N7:11 is a valid value (consider range and scaling). After the data is corrected, toggle the user RESET bit to begin the download process.



Rung 2:14

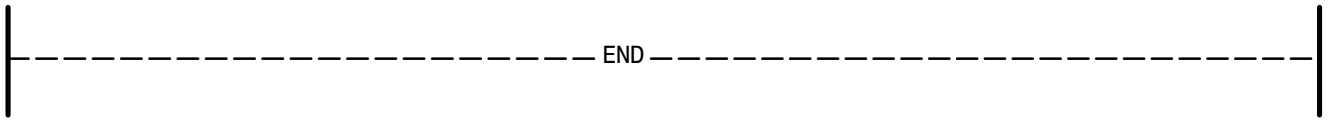
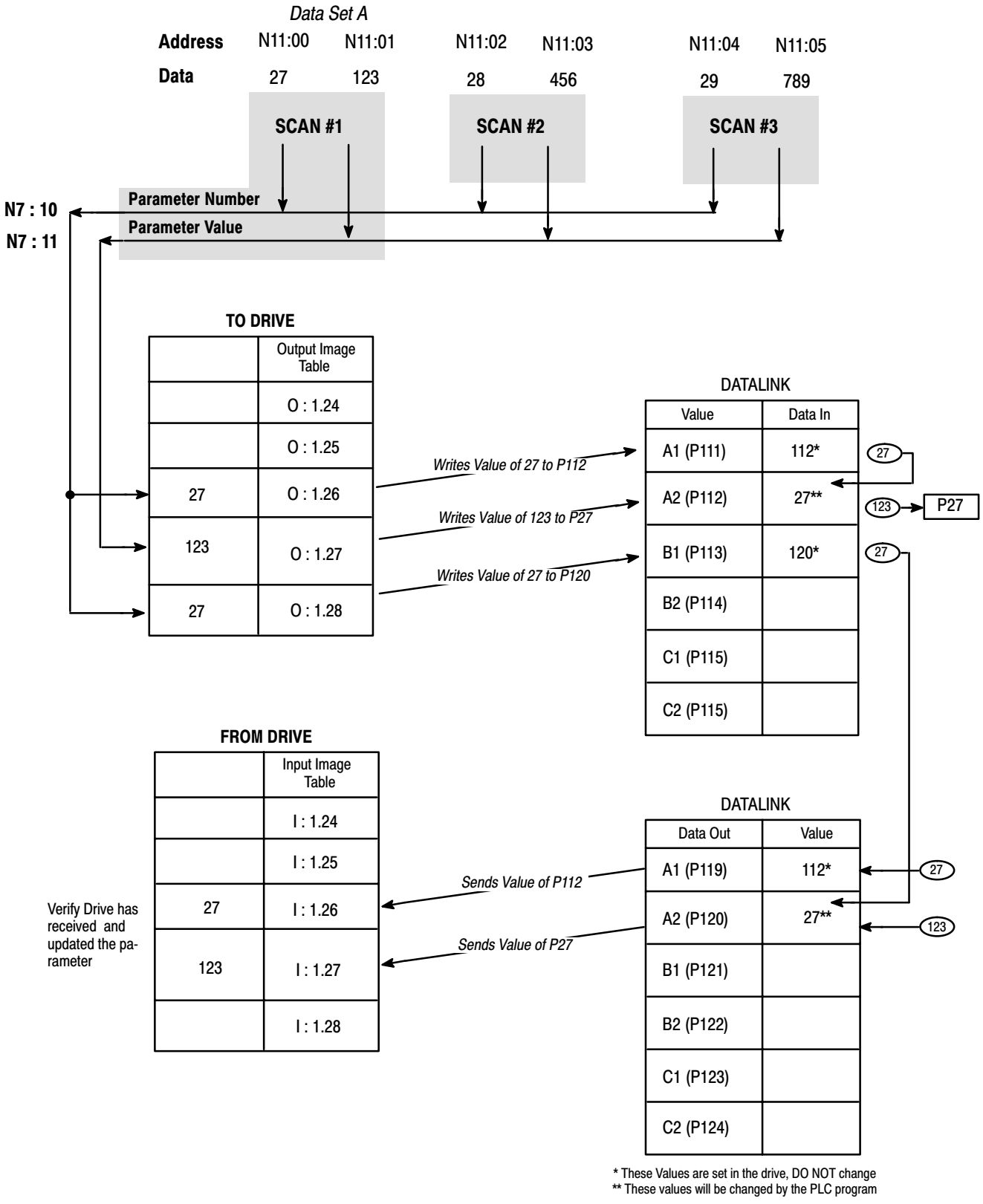


Figure 4.7
Data Transfer between the Logic Controller and the Datalink



Data Setup for Block Transfer Emulation Example – The program data files and their definitions are provided here for user set-up. Values shown are for the example program only. These files must be defined by the user for the specific application.

DATA FILES

Address	**N7: 0**	**N7: 10**	**N7: 11**
Data	**4**	**27**	**123**

N7:0 defines the number of parameters that are to be transferred. (Value must be set by the user)
N7:10 contains the current parameter number being transferred. (Value set by PLC program)
N7:11 contains the value of the current parameter being transferred. (Value set by PLC program)

DATA FILES

Address	**N11: 0**	**N11: 1**	**N11: 2**	**N11: 3**	**N11: 4**	**N11: 5**
Data	**27**	**123**	**28**	**456**	**29**	**789**
Address	**N12: 0**	**N12: 1**	**N12: 2**	**N12 3**	**N12: 4**	**N12: 5**
Data	**24**	**1000**	**43**	**10**	**44**	**2**

Data Set A

N11:0 to N11:XX contains the parameters and values of Data Set A
N12:0 to N12:XX contains the parameters and values of Data Set B

NOTE: This data is entered using the format N11/12:0 = Parameter Number, N11/12:1 = Parameter Value, N11/12:XX = Parameter Number, N11/12:XX +1 = Parameter Value.

B3/0 selects Data List A for download
B3/1 selects Data List B for download.

NOTE: One of these must be selected.

B3/10 – optional – RESET – resets the data transfer to the beginning of the Data List.
B3/11 – optional – DISABLE DOWNLOAD – if this bit is set to 0, data download will be continuous.
If set to 1, data download will be disabled.

Chapter 5

Block Transfer Message Structure

Introduction

Chapter 5 contains the header and data configurations necessary to help you set up the data files in the Block Transfer instructions. The header and data values will vary depending on the operation to be performed.
This chapter also contains a description of the status word that is returned from the drive and appears in the Block transfer read header information.

Parameter Value Read

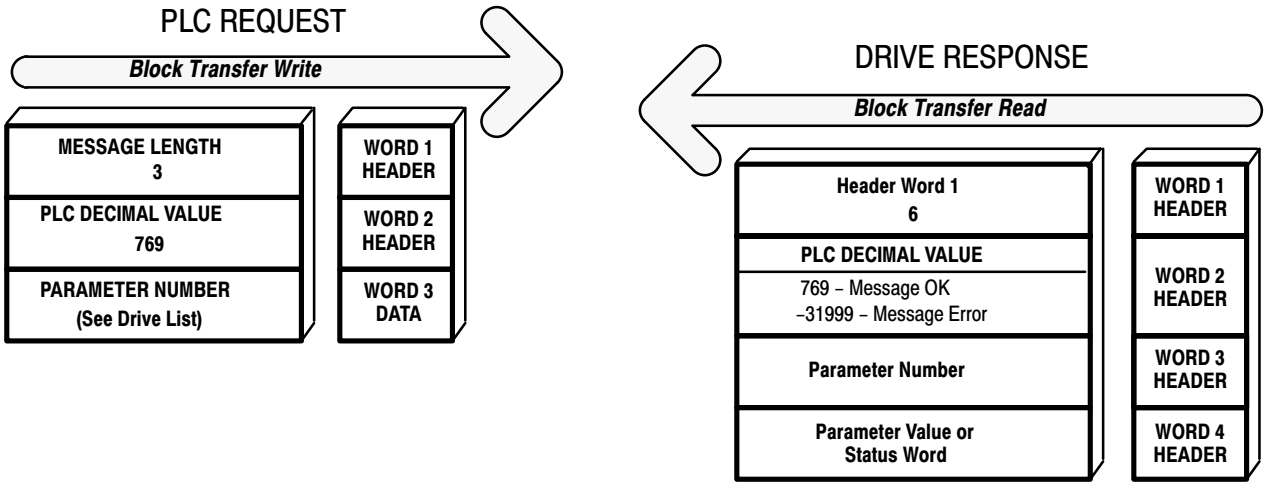
Message Description – This message is sent by the Remote I/O Adapter and will read the 16 bit parameter data value for the parameter number selected.

PLC Block Transfer Instruction Data –

BTW Instruction Length: 3 words

BTR Instruction Length: 4 words

Message Structure –



Message Operation – The Parameter Value Read function specified in the BTW will read parameter values from the drive and place that value (or an error code) in word 4 of the BTR Data file. The value shown will be in Device units. Device units are listed in the user manual. If an error has occurred, word 2 of the BTR will return a value of –31999, and word 4 will contain the status code. Please refer to Table 5.A for a description of Status Word codes.

Example: In this example the value of Parameter 20 was requested from a 1336 PLUS and a value of 4096 was returned. 4096 is the internal Drive Unit value for the Maximum Rated Voltage Parameter. This corresponds to a value of 100% Drive Rated Volts in Display Units.

Data Format –

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	3	769	20*							
BTR Data File	N10:90	6	769	20*	4096*						

* EXAMPLE ONLY – These values vary depending on parameters and products

EE Memory Functions

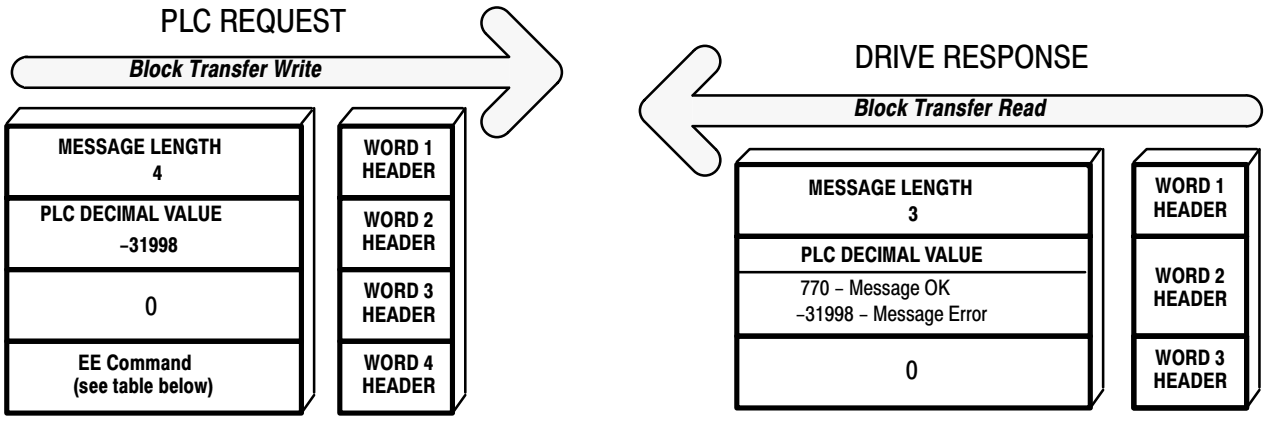
Message Description – This message is sent by the Remote I/O Adapter, and will activate the EE functions detailed in the Message Request.

PLC Block Transfer Instruction Data –

BTW Instruction Length: 4 words

BTR Instruction Length: 3 words

Message Structure –



Message Request

Value	EE Command
00	Not Used
01	EE Save
02	EE Recall
03	EE Default Initialize

Message Operation – The EE memory function allows 3 different Message Requests. EE Save will save parameter information from working memory or RAM to EEPROM. EE Recall will retrieve the last saved data from EEPROM and place it in working memory or RAM. EE Default Initialize will clear RAM and EEPROM and set all parameter values to default.

If an error has occurred, Word 2 of the response will return a value of –31998. Please refer to Table 5.A for a description of status word codes.

Example: This example is requesting an EEPROM save.

Data Format –

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	4	–31998	0*	1*						
BTR Data File	N10:90	3	770	0*							

* EXAMPLE ONLY – These values vary depending on parameters and products

Continuous Parameter Value Read

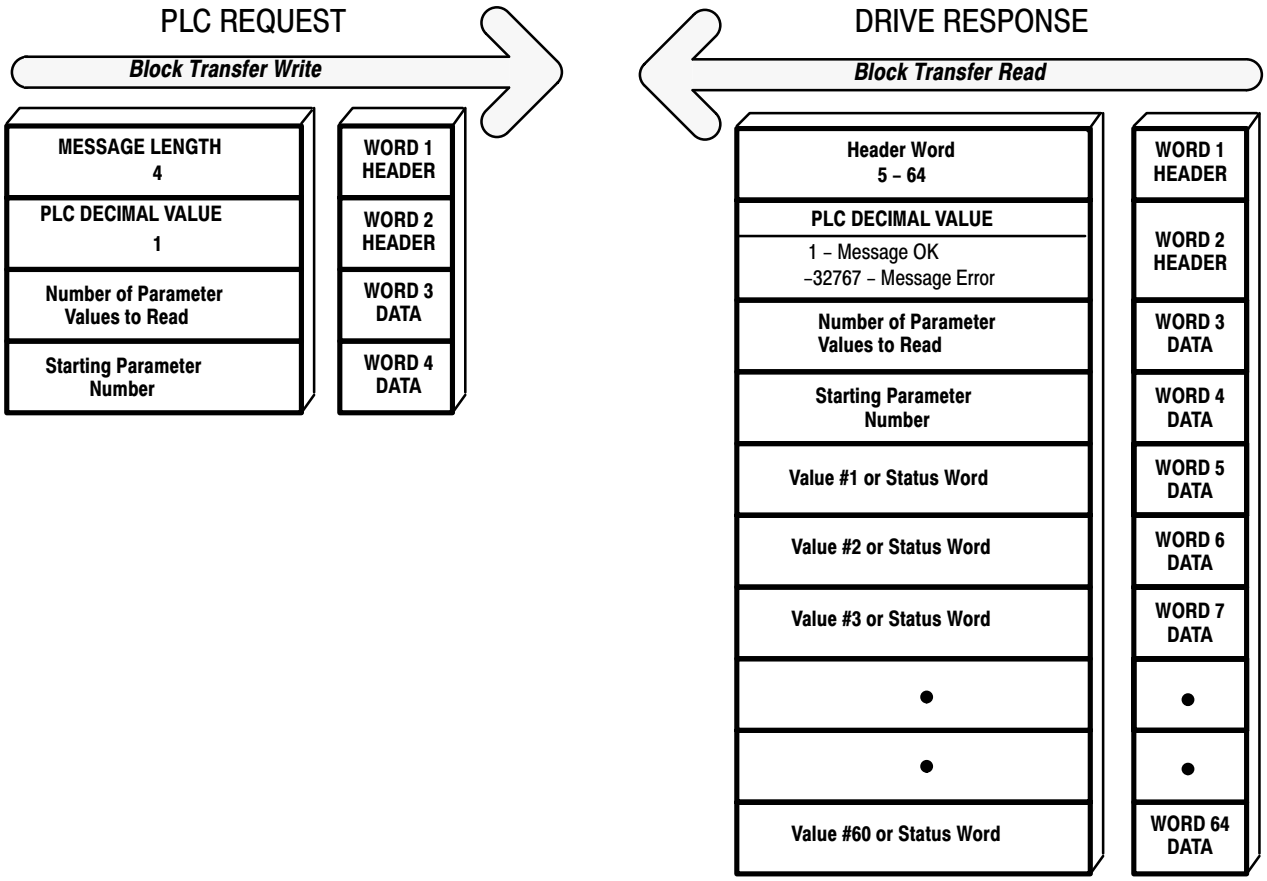
Message Description – This function reads a continuous list of parameters beginning with the starting parameter number.

PLC Block Transfer Instruction Data –

BTW Instruction Length: 4 words

BTR Instruction Length: 5–64 words

Message Structure –



Message Operation – The Continuous Parameter Value Read function specified in the BTW will read a consecutive group of parameter values from the device, beginning with the starting parameter number defined in Word 4 of the BTW message. The number of parameters to be read is defined in Word 3 of the BTW message. The values will return in the BTR response, beginning with Word 5 of the message. If an error has occurred in reading any of the parameters, word 2 of the BTR message will return a value of –32767 and the BTR message word for that parameter will return a Status Word instead of the parameter value. Please refer to Table 5.A for a description of Status Word codes.

Example: In this example, 60 parameters were read from a 1336 PLUS Drive, beginning with parameter 10. The values of these parameters are returned in the BTR Data file, beginning at N10:94. The values are in Drive Units.

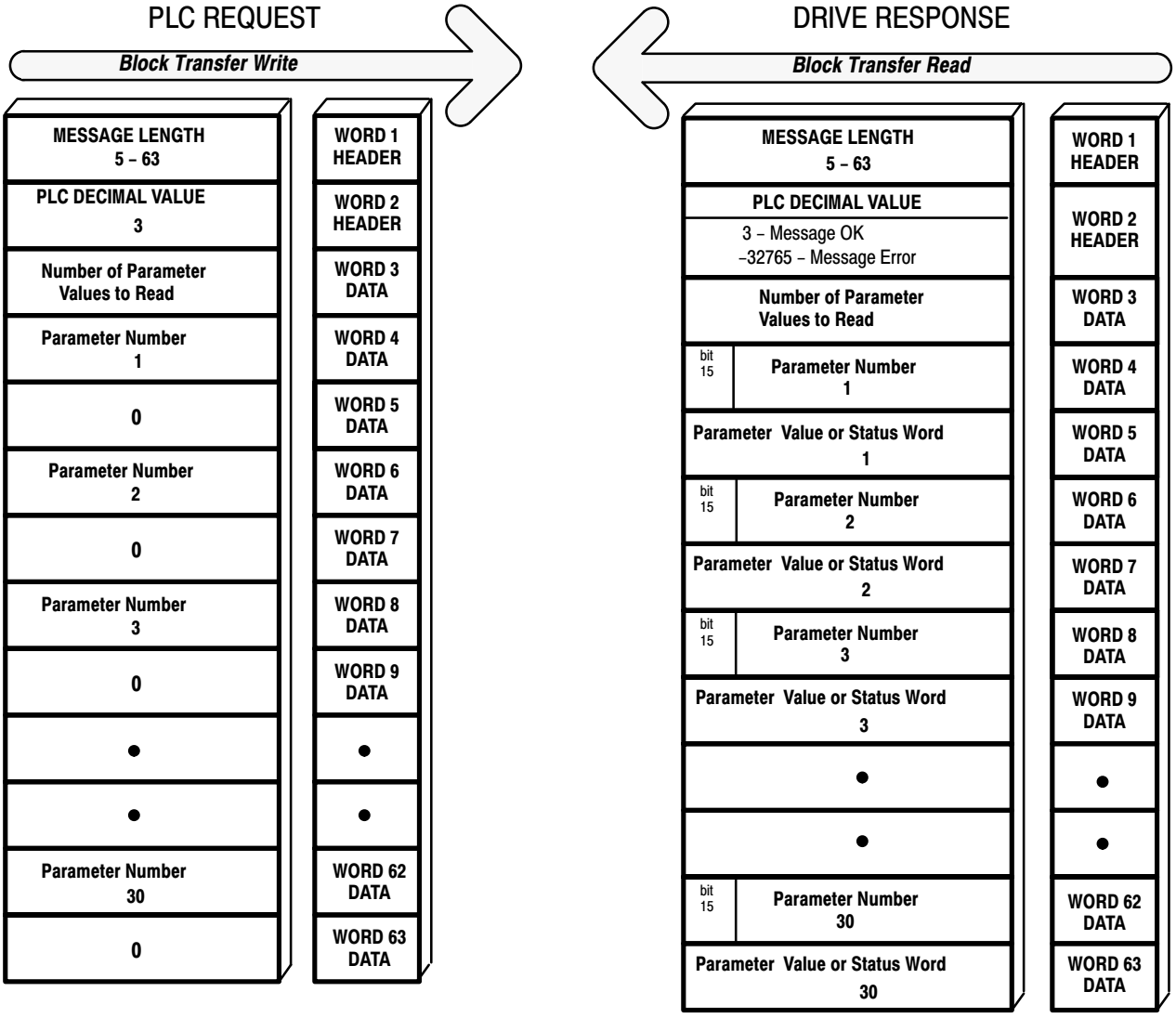
Data Format –

		0	1	2	3	4	5	6	7	8	9
BTW Datafile	N10:10	4	1	60*	10*						
BTR Datafile	N10:90	64	1	60*	10*	0*	0*	0*	0*	0*	100*
	N10:100	0*	50*	4096*	60*	4096*	1*	6*	0*	1000*	0*
	N10:110	0*	0*	0*	0*	1000*	1000*	400*	400*	400*	0*
	N10:120	6144*	2*	4710*	1*	1*	0*	0*	0*	0*	2*
	N10:130	64*	0*	0*	15*	1024*	0*	0*	5811*	0*	18*
	N10:140	0*	0*	0*	3597*	0*	12808*	6*	0*	0*	17952*
	N10:150	0*	0*	0*	0*						

* EXAMPLE ONLY – These values vary depending on parameters and products

Scattered Parameter Value Read

Message Description – This function reads a scattered list of parameters.
PLC Block Transfer Instruction Data –
BTW Instruction Length: 5–63 words
BTR Instruction Length: 5–63 words
Message Structure –



Message Operation – The Scattered Parameter Value Read function specified in the BTW will read a pre-defined group of parameter values, in any order, from the device. The number of parameters to be read is defined in Word 3 of the BTW Datafile. The parameters to be read and their order is defined starting with Word 4. An unused word is left between each parameter request, so the BTR can respond with the parameter value, as shown.

If an error has occurred in reading any of the parameters, word 2 of the BTR message will return a value of –32765, the BTR message Word for the number of that parameter will have bit 15 set, and the BTR message word for the value of that parameter will return a status word instead of the Parameter Value. Refer to Table 5.A for more information on Status Word.

Example: In this example, 8 parameters were read from a 1336 PLUS drive, as defined in Word 3 of the BTW Datafile. The parameter numbers requested were 5, 7, 8, 20, 18, 17, 19 and 36. The BTR response returned the values of these parameters into the BTR Data file. These values are in Drive Units.

Data Format –

		0	1	2	3	4	5	6	7	8	9
BTW Datafile	N10:10	19	3	8*	5*	0	7*	0	8*	0	20*
	N10:20	0	18*	0*	17*	0	19*	0	36*	0	
BTR Datafile	N10:90	19	3	8*	5*	6*	7*	1000*	8*	1000*	20*
	N10:100	4096*	18*	4096*	17*	51*	19*	60*	36*	6144*	

* EXAMPLE ONLY – These values vary depending on parameters and products

Parameter Read Full

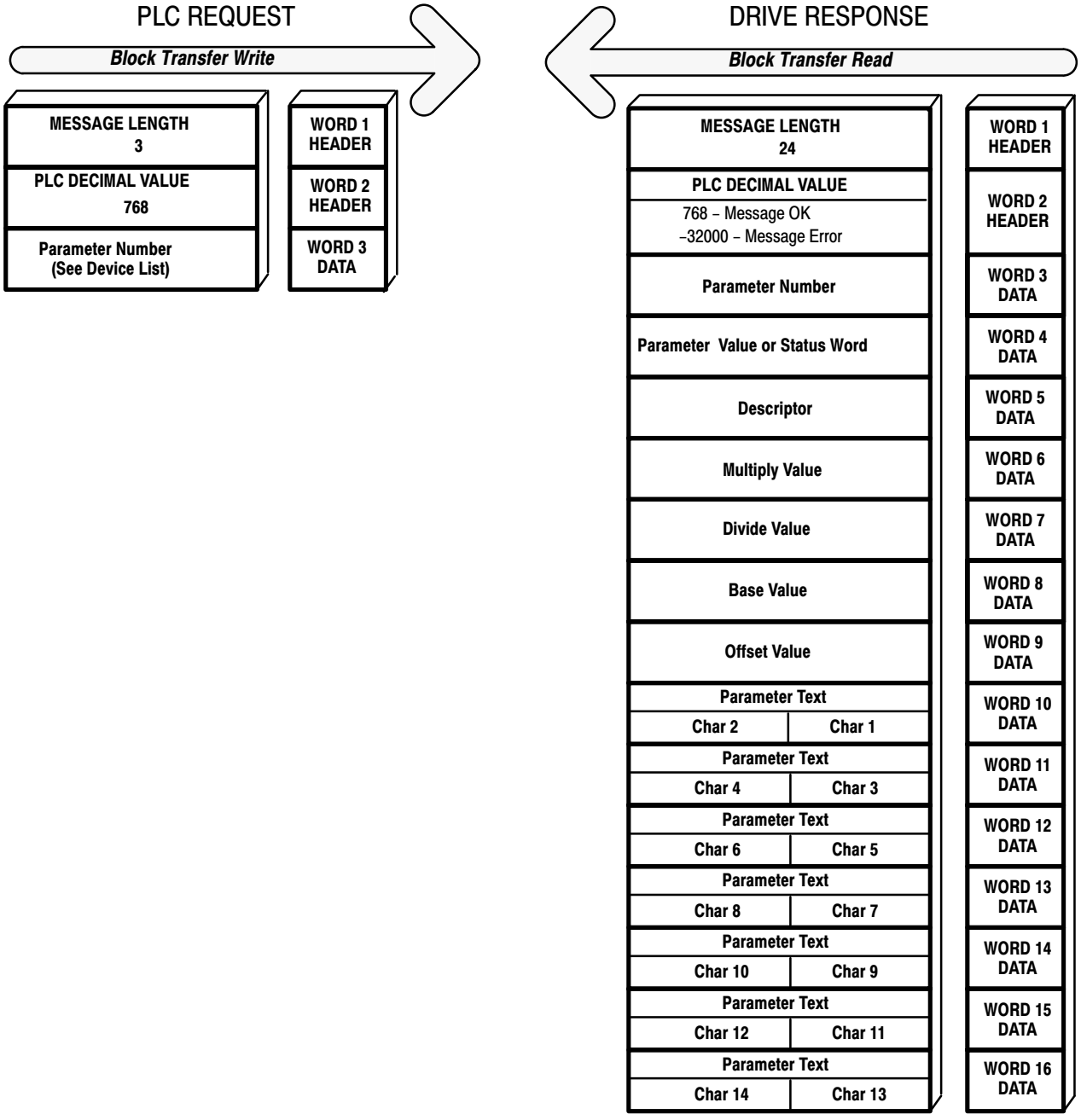
Message Description – This message request provides the requesting Remote I/O source with all known attributes for the parameters requested. This information includes the parameter's current value, descriptor, multiply and divide value, base value, offset value, text string, group element ref. min value, max value, default value, and unit text string.

PLC Block Transfer Instruction Data –

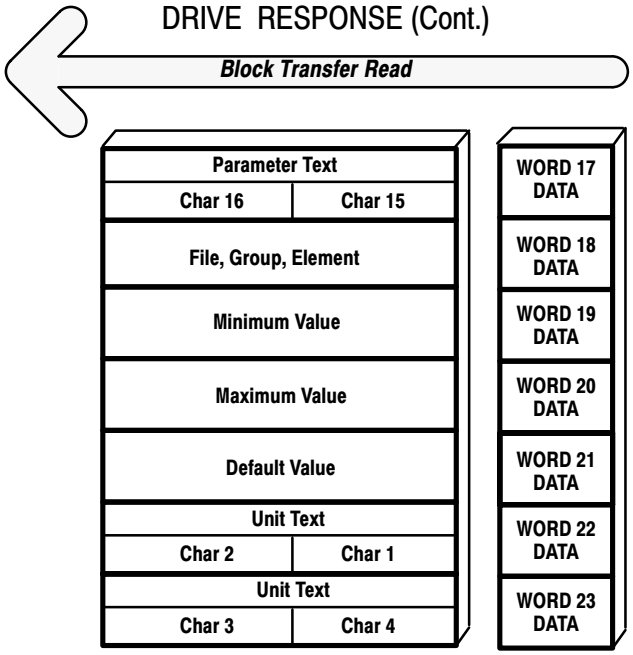
BTW Instruction Length: 3 words

BTR Instruction Length: 23 words

Message Structure –



Parameter Read Full (Cont.)



Message Operation: The Parameter Read Full function specified in the BTW will retrieve the attributes of the parameter requested. The attributes for each parameter include the data, minimum and maximum values and the parameter text. The response message will return this information, beginning with Data Word 4. If an error has occured in reading any of the values, the response will return a Status Word in Word 4. Please refer to Table 5.A for a description of Status Word codes. The parameter text will be returned with each data word containing 2 ASCII characters per word. This data will return with the first and second characters in opposite order. Please study the following example to become familiar with this.

Example: In this example a Parameter Read Full was performed through Block Transfer on a 1336 PLUS. N10:10 shows the header message for the BTW. The Data is returned in the BTR data file, starting with Word 4, for Parameter 20. Word 4 shows the present value in Drive units. Word 5 through Word 9 provide scaling information, used to convert Drive units to engineering units for the Human Interface Module (HIM). Word 10 through Word 17 provide the parameter name. This example shows the response message N10:90 through N10:112 in both binary and ASCII. Note the ASCII information beginning with N10:99. The parameter name characters return in reverse order for each Word. N10:99 has the ASCII value of (aM). To read this, invert the Word to read (Ma). The next word (ix), inverted gives you (xi). These words along with the following two words, form the word Maximum. The parameter Name "Maximum Voltage" can be seen in Word 10 through Word 17 of the response message. In addition, Word 23, is also is returned in this format. This Word provides the units the parameter is defined in. In this example it is vlts. Word 18 contains the file, group and element which are used to reference the parameter.
Words 19–21 contain the minimum, maximum and default values of this parameter.

Data Format –

		0	1	2	3	4	5	6	7	8	9
BTW DataFile	N10:10	3	768	20*							
BTR DataFile	N10:90	24	768	20*	4096*	355*	1*	4096*	460*	0*	24909*
	N10:100	27000*	30061*	8301*	28502*	29804*	26465*	8293*	1794*	1024*	4915*
	N10:110	4096*	27734*	29556*							
BTR DataFile	**N10:90#**	\00\18	\03\00	\00\14	\10\00	\01 c	\00\01	\10\00	\01\CC	\00\00	a M
	N10:100#	i x	u m	m	o V	t l	g a	e	07 02	04 00	\13 0
	N10:110	\10\00	l V	s t							

* EXAMPLE ONLY – These values vary depending on parameters and products
 # ASCII Display values

Parameter Value Write

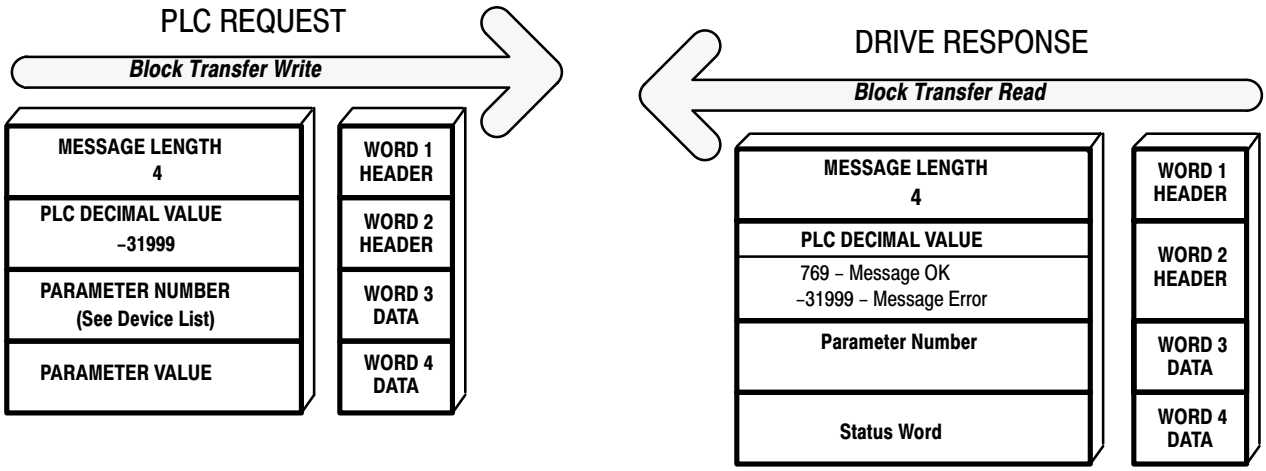
Message Description – This message sent by the Remote I/O Adapter, will write a 16 bit parameter data value to the parameter number selected.

PLC Block Transfer Instruction Data –

BTW Instruction Length: 4 words

BTR Instruction Length: 4 words

Message Structure –



Message Operation – The parameter Value Write function specified in the BTW will send a new value (specified in word 4 of the BTW Header Message) to the parameter specified in the BTW Header Word 3. The value must be in device units. Units for each parameter are listed in the device manual.

If an error has occurred, Word 2 of the response will return a value of –31999, and Word 4 will contain a status code. Refer to Table 5.A for a description of Status Word codes.

Example: In this example a value of 4096 was sent to Parameter 20. 4096 is in Drive Units and indicates a value of 100% Drive Rated Volts, as defined in P147, " Drive Rated Volts".

Data Format –

		0	1	2	3	4	5	6	7	8	9
BTW DATA File	N10:0	4	–31999	20*	4096*						
BTR DATA File	N10:90	4	769	20*	0						

* EXAMPLE ONLY – These values vary depending on parameters and products

Continuous Parameter Value Write

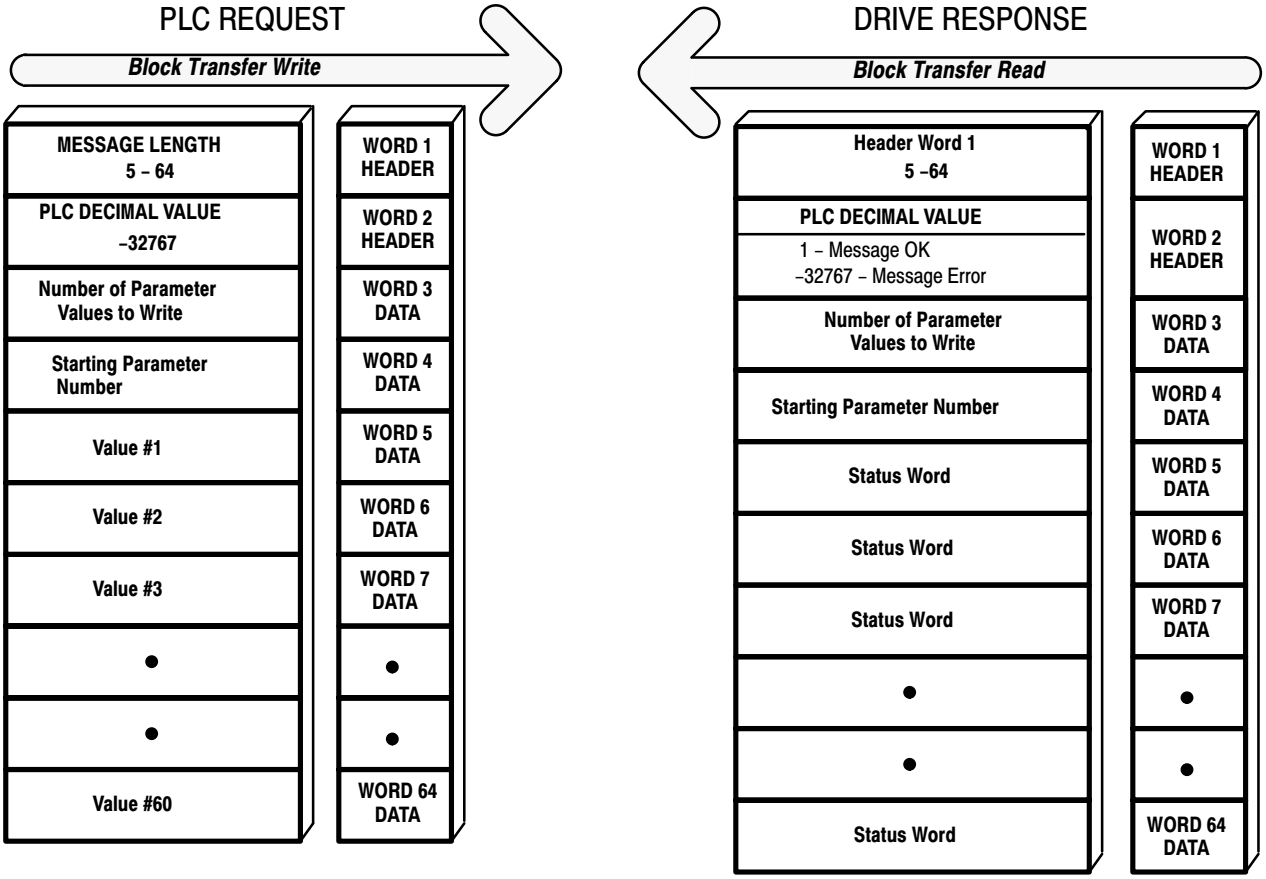
Message Description – This function writes to a continuous list of parameters beginning with the starting parameter number.

PLC Block Transfer Instruction Data –

BTW Instruction Length: 5–64 words

BTR Instruction Length: 5–64 words

Message Structure –



Message Operation – The Continuous Parameter Value Write function specified in the BTW will write data values to a consecutive group of parameters, beginning with the starting parameter number defined in Word 4 of the BTW message. The number of parameters to be written to is defined in Word 3 of the BTW message. If an error has occurred in writing to any of the parameters, Word 2 of the BTR message will return a value of –32767 and the BTR Message for the Status Word of that parameter will be non–zero. If no error has occurred, Word 2 of the BTR Message will return a value of 1 and each of the BTR Message Status Words will return a value of 0. Refer to Table 5.A for a description of Status Word codes.

Example: In this example, eight 1336 PLUS parameter values were written to, starting with Parameter 10. The eight parameter values are in Device Units. Since all of the parameter values were accepted, values of 0 were returned in the BTR Status words.

Data Format –

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:0	12	–32767	8*	10*	1*	1*	1*	1*	1*	101*
	N10:20	1*	51*								
BTR Data File	N10:90	12	1	8*	10*	0*	0*	0*	0*	0*	0*
	N10:100	0*	0*								

* EXAMPLE ONLY – These values vary depending on parameters and products

Scattered Parameter Value Write

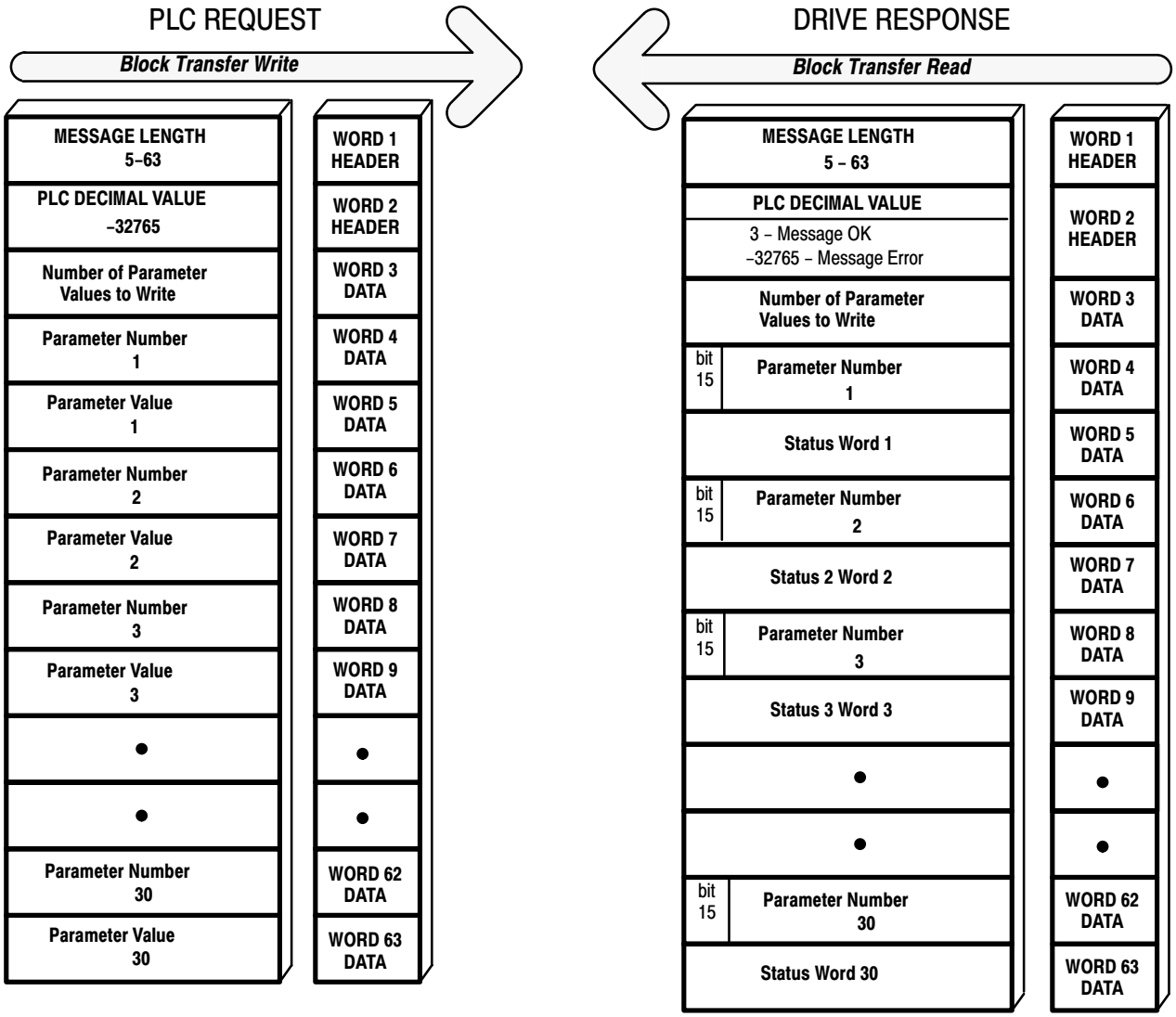
Message Description – This function writes to a scattered list of parameters and returns the status of each parameter in its value location. If any of the states are other than OK, the parameter number will be negative.

PLC Block Transfer Instruction Data –

BTW Instruction Length: 5–63 words

BTR Instruction Length: 5–63 words

Message Structure –



Message Operation – The Scattered Parameter Value Write function specified in the BTW will write data values to a predefined group of device parameters in any order. The number of parameters to be written to is defined in Word 3 of the BTW Data file. The parameters to be written to, and their order is defined starting with Word 4. If an error has occurred in writing to any of the parameters, Word 2 of the BTR message will return a value of –32765, the BTR message Word for that parameter's number will have bit 15 set, and the BTR message Word for that parameter's status word will be non-zero. If no error has occurred, Word 2 of the BTR message will return a value of 3, each of the BTR message parameter numbers will be the same as in the BTW message, and each of the BTR message status words will return a value of 0. Refer to Table 5.A for a description of Status Word codes.

Example: In this example, six parameters were written to in a 1336 PLUS drive. WORD3 of the BTW message (N10:12) defines the number of parameter values that will be transferred. Each parameter number followed by its value, are listed in the message beginning with WORD4. The values are entered in device units. The BTR response (N10:90) returns the status of each parameter write. If the BTW was successful, a zero will be returned. If an error has occurred, the response will return a Status Word Code for the error.

Data Format –

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:0	15	–32765	6*	90*	1*	150*	4*	30*	20*	31*
	N10:20	10*	10*	2*	12*	5*					
BTR Data File	N10:90	15	3	6*	90*	0*	150*	0*	30*	0*	31*
	N10:100	0*	10*	0*	12*	0*					

* EXAMPLE ONLY – These values vary depending on parameters and products

Fault Clear/ Reset

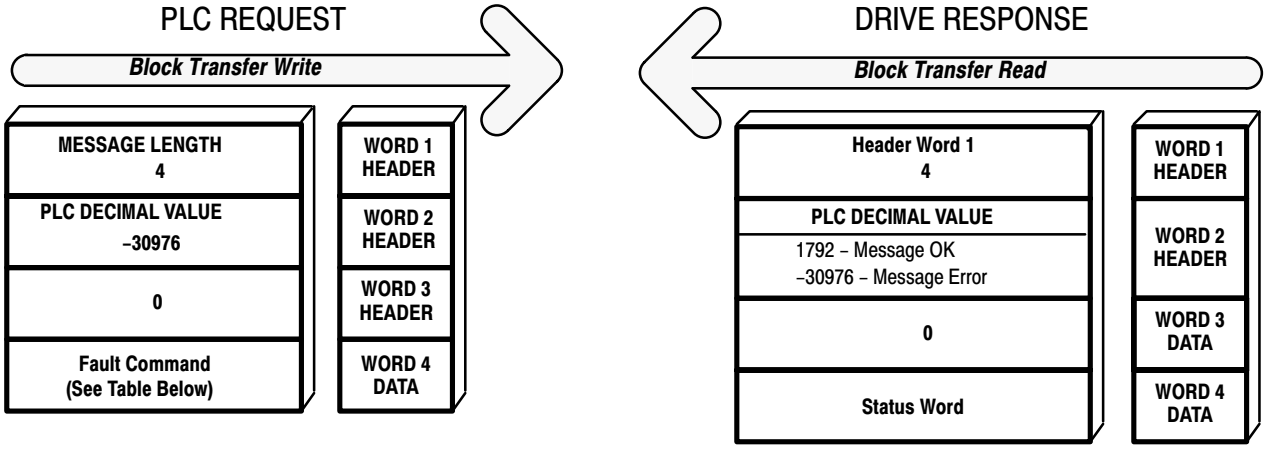
Message Description – This message will activate the fault functions shown below in the Message Request.

PLC Block Transfer Instruction Data –

BTW Instruction Length: 4 words

BTR Instruction Length: 4 words

Message Structure –



Message Request –

Value	EE Command
00	Not Used
01	Clear Fault
02	Clear Fault Queue
03	Drive Reset (1336 FORCE Only)

Message Operation – The fault Clear/Reset function specified in the BTW will send a fault handling request to the device. A clear fault request will clear the last fault that occurred. A Clear Fault Queue will clear the entire fault buffer. Certain devices may store more than one fault. A Drive reset is used with the 1336 FORCE Drive product only. This function will reset the drive: the fault queue will be cleared and parameter information stored in EEPROM will be written to RAM.

Data Format –

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:0	4	–30976	0	1,2,3						
BTR Data File	N90:0	4	1792	0	0*						

* EXAMPLE ONLY – These values vary depending on parameters and products

Fault Queue Size

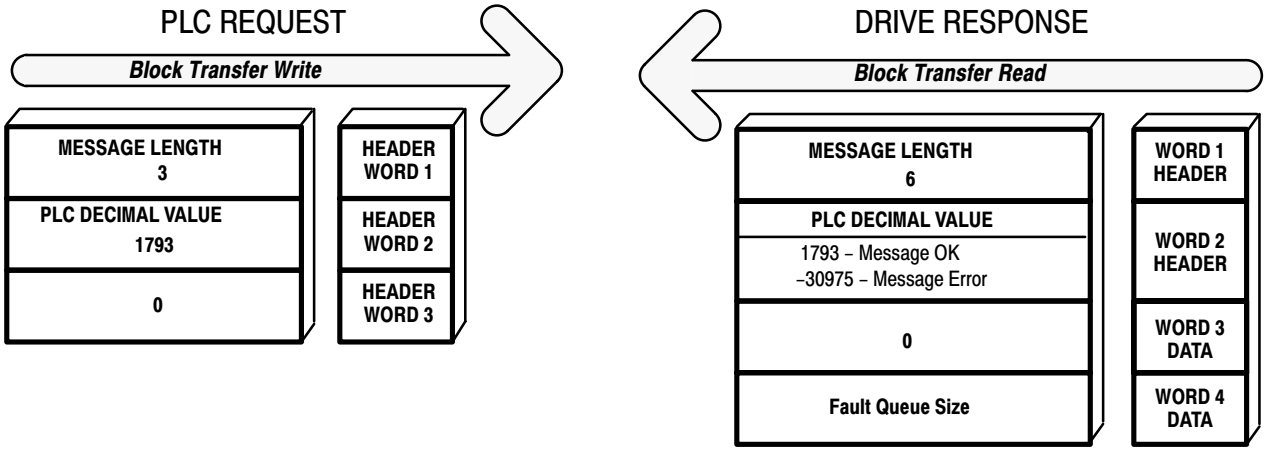
Message Description – This function will obtain the number of fault entries allowed in the fault queue.

PLC Block Transfer Instruction Data –

BTW Instruction Length: 3 words

BTR Instruction Length: 4 words

Message Structure –



Message Operation – This function will read back the size of the fault queue available in the product. Each product may have a different number of fault queue entries available for storage. If an error has occurred, Word 2 of the response will return a value of –30975.

Example: In the example shown here a 1336 PLUS was used. This product has a fault queue of 4 storage locations available to store faults. This value is seen in Word 4 of the response header message.

Data Format –

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:0	3	1793	0							
BTR Data File	N10:90	6	1793	0	4*						

* EXAMPLE ONLY – These values vary depending on parameters and products

Trip Fault Queue Number

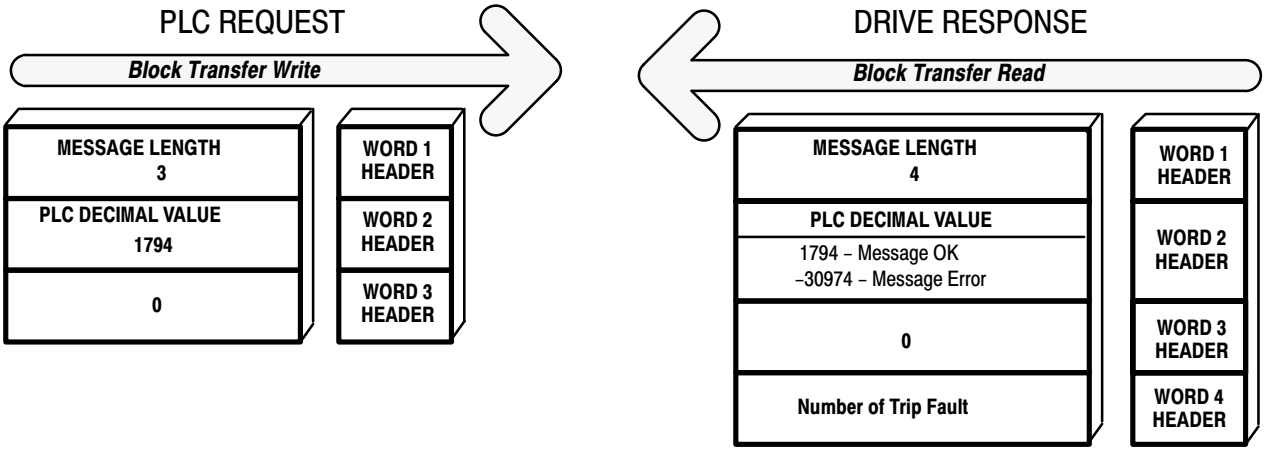
Message Description – Provides the Fault Queue Number of the fault that caused the device to trip.

PLC Block Transfer Instruction Data –

BTW Instruction Length: 3 words

BTR Instruction Length: 4 words

Message Structure –



Message Operation – The trip fault queue number function will provide the number of the entry in the fault queue that tripped the device. The BTR response contains that number in Word 4. The Fault Queue Number will equal 0 when the device is not faulted. If an error has occurred in the BT, Word 2 of the response will be negative.

Example: In this example, the device has stored a fault in the first entry of the Fault Queue that caused the drive to trip. Word 4 of the BTR indicates the entry number.

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:0	3	1794	0							
BTR Data File	N10:90	6	1794	0	1*						

* EXAMPLE ONLY – These values vary depending on parameters and products

Fault Queue Entry Read Full

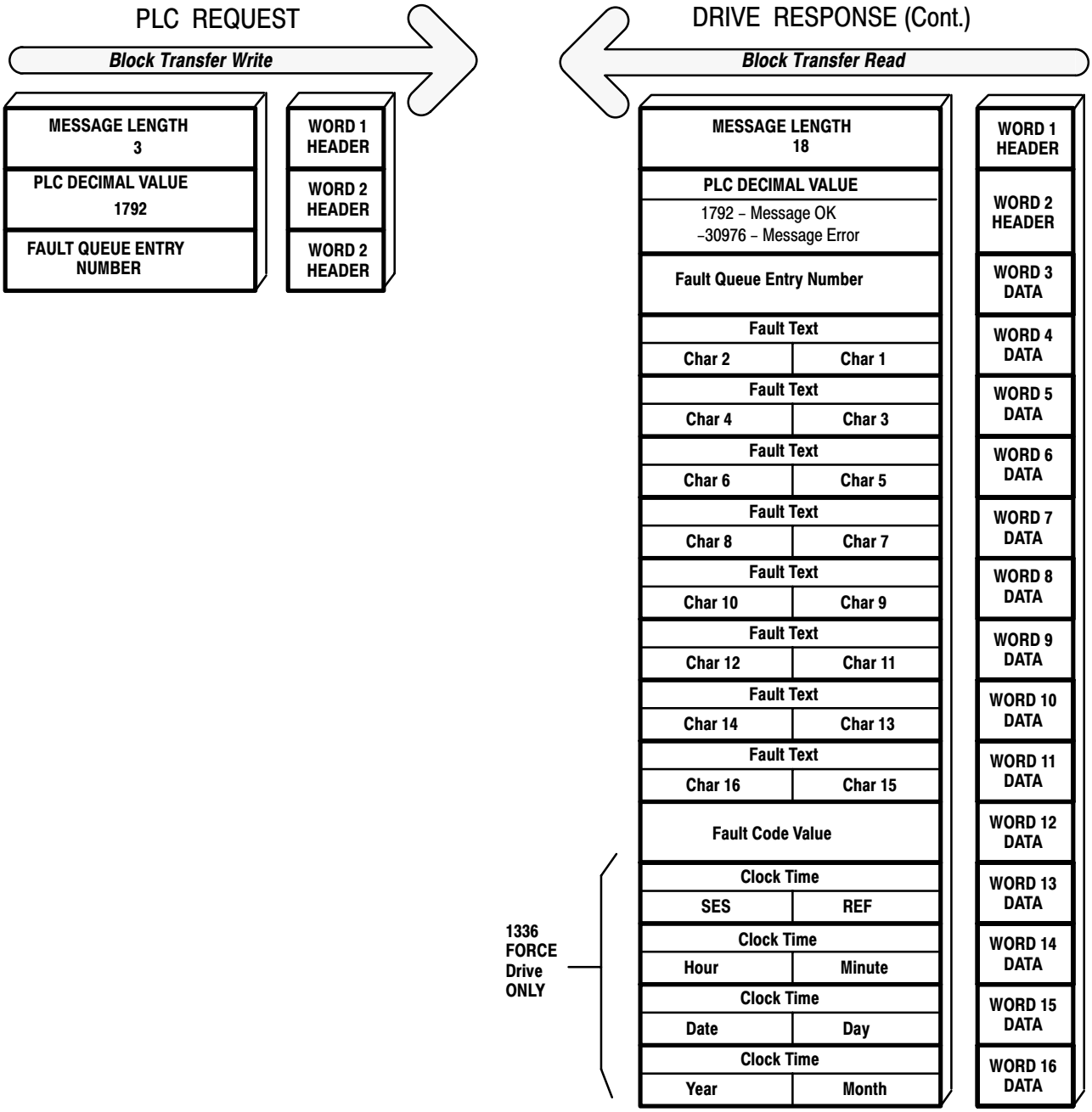
Message Description – This function reads the contents of the fault queue entry specified. A message is returned which includes the fault text and fault code associated with the specified fault queue entry. The 1336 FORCE also returns the time stamp associated with the fault.

PLC Block Transfer Instruction Data –

BTW Instruction Length: 3 words

BTR Instruction Length: 12 or 16 words

Message Structure –



Message Operation – The Fault Queue Entry Read function specified in the BTW will read the contents of the fault queue specified in Word 3 of the BTW Message. The response will return the fault text which can be as ASCII text. The text will have every 2 characters in reverse order. In addition, the 1336 FORCE will return a time stamp, indicating the day and time the fault occurred. If an error has occurred, word 2 of the response will return a negative value. Refer to Table 5.A for a description of status codes.

Example: In this example, Fault Queue Entry #3 was retrieved from a 1336 PLUS Drive. The BTR response returned the ASCII text “Drive Reset Flt”, with each character reversed. The fault code for this example is 22.

Data Format –

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:0	3	1792	3*							
BTR Data File	N10:90	18	1792	3*	29252*	30313*	8293*	25938*	25971*	8308*	27718*
	N10:100	8308*	22*								
	N10:90#	\00\12	\07\00	\03\00	r D	v i	e	e R	e s	t	l F
	N10:100#	t	\00\16								

* EXAMPLE ONLY – These values vary depending on parameters and products
 # ASCII Display values

Product ID Number Read

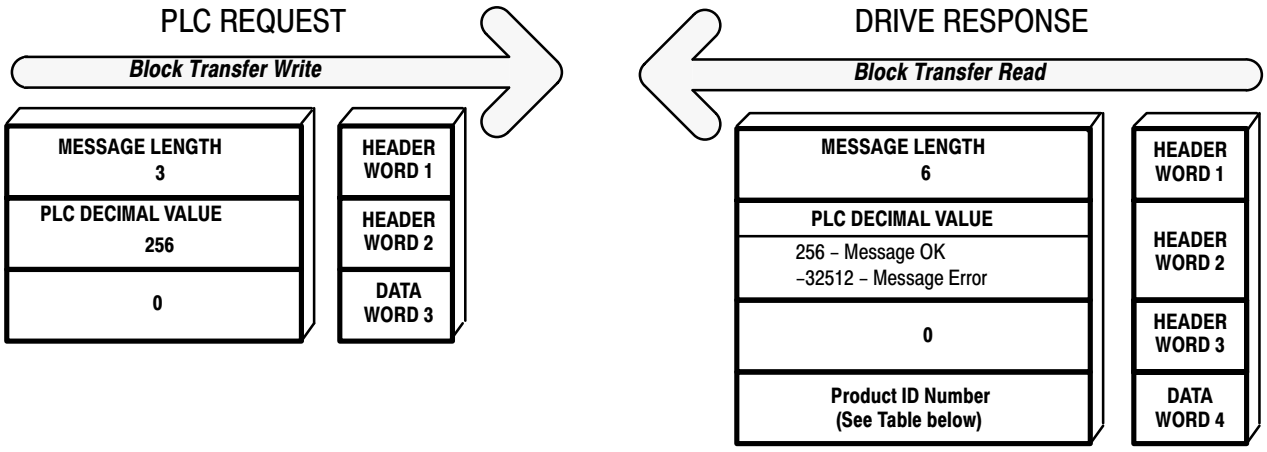
Message Description – This function returns the product ID of the device to which the Remote I/O Adapter is connected.

PLC Block Transfer Instruction Data –

BTW Instruction Length: 3 words

BTR Instruction Length: 4 words

Message Structure –



Message Response –

Product ID Number	Description
2	1336F (PLUS Fractional)
3	1336F (PLUS)
4	1336G(FIBERS Fractional)
5	1336G(FIBERS)
16	1336T (FORCE)
17	1395
18	1394
19	1557
20	SMP
21	SMC Dialog Plus
22	1304
23	1305

Message Operation – The Product ID Number Read function will, through the BTR response message WORD 4, indicate the type of device the Remote I/O Module is connected to. This value is defined in the message response chart shown above. If an error has occurred, word 2 of the response will return a negative value of –32512. Refer to Table 5.A for a description of status codes.

Example: In this example, the Product ID Number Read was requested through a BTW. The BTR response contained a value of 3 in Word 4 of its message response, indicating a connection to a 1336 PLUS.

Data Format –

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:0	3	256	0							
BTR Data File	N10:90	6	256	0	3*						

* EXAMPLE ONLY – These values vary depending on parameters and products

Block Transfer Status Word

Header Word 2 of the drive response will contain a negative value (Bit 15 = 1) when a block transfer operation is unsuccessful.
In most cases a Status Word is also returned and will indicate the reason for the block transfer failure. The location of the Status Word is typically header word 4 in the drive response, but will vary depending on the message. Refer to Table 5.A for an explanation of the Status Word codes.

Table 5.A
Status Word Codes

Value	Description
0	No Error
1	Service Failed due to an internal reason and the drive could not perform the request (i.e. some messages are read only or write only).
2	Service not supported
3	Invalid value in Block Transfer request header word 2
4	Invalid value in Block Transfer request header word 3
5	Invalid value in Block Transfer request header word 2
6	Data value out of range
7	Drive State Conflict. The drive is in an incorrect state to perform the function. (i.e. the drive cannot be running in order to perform certain functions).

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✓ **WHAT LEVEL OF EXPERIENCE DO YOU HAVE WITH EACH OF THE FOLLOWING PRODUCTS?**

	NONE	LITTLE	MODERATE	EXTENSIVE
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AC / DC DRIVES	❑	❑	❑	❑
PERSONAL COMPUTERS	❑	❑	❑	❑
NC / CNC CONTROLS	❑	❑	❑	❑
DATA COMMUNICATIONS / LAN	❑	❑	❑	❑

✓ **RATE THE OVERALL QUALITY OF THIS MANUAL BY CIRCLING YOUR RESPONSE BELOW.** **(1) = POOR** **(5) = EXCELLENT**

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EASE OF USE	1	2	3	4	5
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