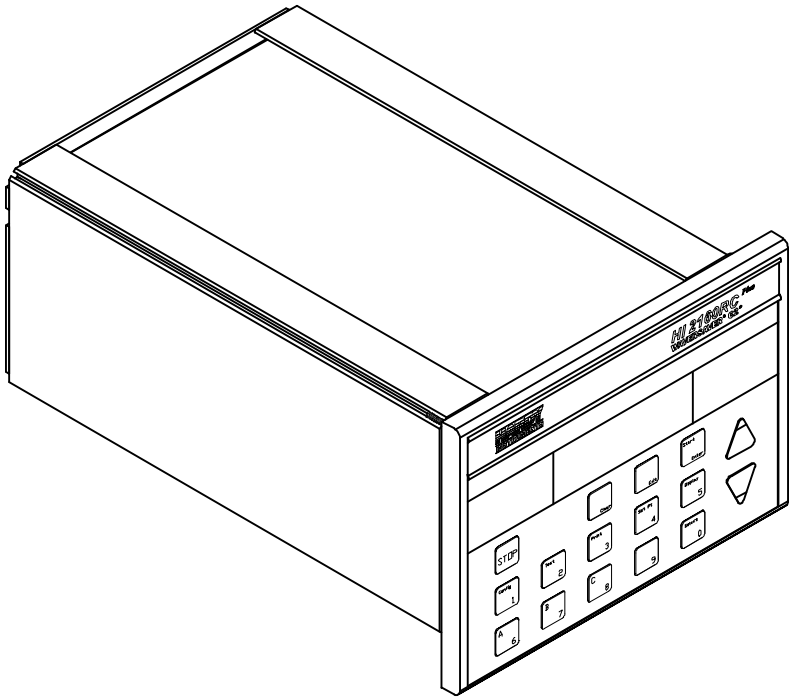
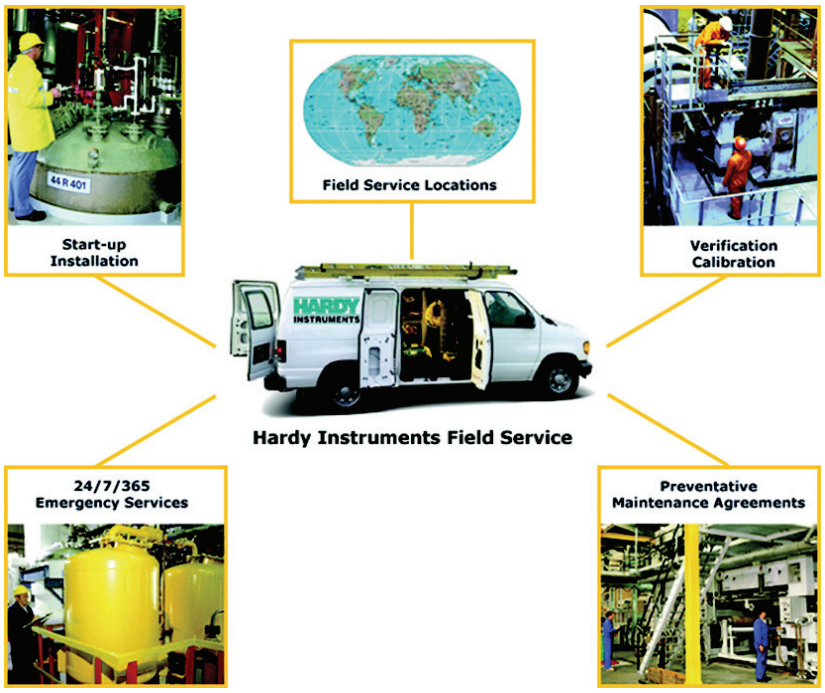
Profibus Interface Option

HI 2160RC^{PLUS} Rate Controller

Operation and Installation Manual





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CHAPTER 1 - OVERVIEW

About Chapter 1

This manual provides the user with a description of the operating procedures, specifications, installation, and setup for the Hardy Instruments, PROFIBUS Interface Option. The Profibus Interface Option - B4 is designed to be used with the Hardy Instruments, HI 2160RC^{PLUS} Rate Controller. To get the maximum service life from the PROFIBUS Interface Card users should use the instrument in accordance with the recommended practices implied or contained in this manual. The operator should read and understand all cautions, warnings, and safety procedures referenced or explicitly stated in the manual, to ensure the safe operation of this product. Hardy Instruments appreciates your business. Should you experience any problems, please contact our Customer Service Department at:

Phone: (858) 278-2900 FAX: (858) 278-6700

Description

The PROFIBUS Interface Option B4 is a Profibus-DP high speed interface card using the Siemens SPC3 chip set. The PROFIBUS Interface Option is an intelligent slave (Passive Station) to a scanning PROFIBUS compatible Master Device (Active Station) such as a Programmable Logic Controller (PLC) or Personal Computer (PC). The PROFIBUS Interface Option supports PROFIBUS-DP (Decentralized Periphery). The user can access data exchanged between the Master and the HI 2160RC^{PLUS}, for use in PLC ladder logic, chart or other programs. The PROFIBUS Interface Option enables the PROFIBUS Master to use all configuration, rate weighing, scale calibration, and rate calibration functions contained in the Hardy HI 2160RC. The HI 2160RC allows the programmable logic controller to monitor weight, rate, relay and alarm status information for one or more rate controllers. In a fully automated process, the programmable logic controller can download all setup parameters, including tuning and control, auto refill, and rate tolerances, as well as control the operation and notify the operator of any out-of-tolerance conditions. The PROFIBUS Interface can also be used to provide operational control from a remote location. Using a touch screen or similar device, the operator can select desired feed rates, and start and stop the process. The system can be monitored for out-of-tolerance conditions and operation is resumed when these conditions are corrected. The PROFIBUS Interface Option is designed to allow the user to select commands and summaries via two data transfer options: (Selectable Transfers) or (Block Transfers) which are a set of pre-defined data blocks. The Write commands (outputs) are used to send commands from the Master to the Rate Controller.

The Read, Data Summaries (inputs) are used to return Rate and scale status data to the Master. Because the PROFIBUS Interface Option data is already in integer values, time wasting conversion steps are eliminated. This reduces the time it takes to incorporate the PROFIBUS Interface Option into the Master's ladder logic or chart code. The

PROFIBUS Interface Option uses transmission medium (2 or 4 wire cable) characteristic of serial fieldbus applications.

Applications

A PROFIBUS Interface Option enables bi-directional communications between a Master and Slave for Rate, set point, status and calibration data. The PROFIBUS Interface Option is used for the following applications:

- Batching/Blending
- Filling/Dispensing
- Rate Controlling

Function

The PROFIBUS Interface Option is used as an intelligent slave to a PROFIBUS compatible scanning programmable logic controller or PC. The interface permits the host programmable logic controller or PC to access, via operator selectable transfers or block transfers, all configuration and weighing parameters of the HI 2160RC. In addition the interface allows scale calibration.

PROFIBUS-DP Capabilities

Parameters

The Hardy PROFIBUS interface Option supports the PROFIBUS Watch dog communication control parameter. The PROFIBUS Interface Card uses the Watchdog control to detect failures of the assigned DPM1 (DP-Master - Class 1) or the bus. The DPM1 is the central controller in PROFIBUS-DP. If the Interface Card recognizes no successful data transfer with the Master within a control interval, it switches its outputs autonomously to the fail-safe state until successful communication is resumed.

Configuration

Configuration data contains the range of input and output areas and the information about the data consistency (byte or word length).
The default configuration for Hardy Instruments PROFIBUS Interface is 16 words or 32 bytes.

- For the 32 byte I/O the identifier bytes have the following format:

  Number of Configuration bytes: 2

  Config byte 177 (hexadecimal)
  Config byte 277 (hexadecimal)

- The maximum number of bytes of I/O can be achieved by setting:

  Number of Config bytes: 4

  Config byte 17D (Hex)
  Config byte 27D (Hex)

Config byte 37D (Hex)
Config byte 47D (Hex)

For 112 bytes of input and 112 bytes of output.

NOTE: *See DIN Standard 19245, Chapter 3 - Setup for a description of the config data.*

Data Exchange

The PROFIBUS Interface Option can exchange the Input (Read) and Output (Write) data between devices. The PROFIBUS inputs are either selectable or block reads. PROFIBUS outputs are either selectable or block writes. The PROFIBUS Interface Option supports the standard 16 word or 32 byte format for transfers, but can be configured to any buffer size that is less than or equal to 112 bytes.

WARNING **PRE-DEFINED BLOCKS ARE UP TO 32 BYTES IN LENGTH. IF LESS THAN 32 BYTES ARE DESIRED FOR BUS TRAFFIC CONSIDERATIONS, THEN SELECTABLE TRANSFERS SHOULD BE USED.**

NOTE: *Two bytes equal one word.*

Diagnostics

The PROFIBUS Interface Option has built in diagnostics capability. Errors in write commands result in individual Diagnostic bits being set. The PROFIBUS Interface Option will also set the NACK (not acknowledge) Diagnostic bit.

Baud Rate Auto-Detect

The PROFIBUS Interface has an automatic baud rate detection capability which eliminates the necessity for board settings. The PROFIBUS network can support up to 12 Mbaud transfer rates. The Auto - Detect function finds the baud rate that all components of the system must operate at, which in most cases is determined by the component in the network with the slowest baud rate. The Baud rate is set by the Master PLC or PC.

Multiple Nodes

Depending on the PLC, the PROFIBUS network is configurable to include several nodes (HI 2160RC is one node) up to a maximum of 126.

GSD File

A PROFIBUS GSD file (HRDY2160.GSD) is included on the floppy diskette to assist in setting up the PROFIBUS Interface Card on the network. Various PLC's require the GSD file in order to setup the HI 2160RC Rate Controller on the PROFIBUS network. Please refer to your PLC O&M manual for instructions.

Type File

Six Type files are included on the floppy diskette. The type files are also referred to as the Device Data Base (DDB) Files. (See DIN Standard 19245, Part 3, Paragraph 13, Page 197) They are used to configure some of the Siemens PLCs. Refer to the specific Siemens PLC manual for instructions.

- Description for the use of the type files:

Window COM: Copy the attached typefile HI2160ax.200 in the directory s:\COMWINx0\TYPEDAT5x. After starting WIN COM you can select your device in the family "Others".

- DOS Com V4.x: Copy the attached files depending on your selected language with the DOS Com under the directory of the Com.

  HI2160TE.200 - English Version
  HI2160TD.200 - German Version
  HI2160TF.200 - French Version
  HI2160TI.200 - Italian Version
  HI2160TS.200 - Spanish Version

Performance Characteristics

Environmental Requirements

Temperature:	Operating - 10 to 50 C (14 to 122 F) Storage - 20 to 85 C (-4 to 185 F)
Humidity:	0 to 80% Relative Humidity (Non-condensing)

Baud Rate 9,600 baud to 12 Mbaud - (Auto-Selectable)

Process Control Standards Reference Process Fieldbus (PROFIBUS) - DIN 19 245

Reference Data Protocols Master manuals will reference data either in bytes or words using the different protocols that are particular to a Master or series of Masters. For example:

1. The Siemens 505 Series of PLCs uses the Motorola protocol and expresses reference data in bytes.
2. The Siemens S5 and S7 PLC series and the Allen-Bradley PLC5 series use an Intel protocol and express reference data in words.
3. The PROFIBUS manual references both bytes and words.

   This means that the Least Significant Byte (LSB) and the Most Significant Byte (MSB) locations vary. It is important to note that two (2) bytes equals one (1) word. (See the charts below)

Siemens TI 505 or others using (Motorola) Protocol (Bytes															
One Word (Expressed in Bytes)															
Least Significant Byte (LSB)								Most Significant Byte (MSB)							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Siemens S5, S7 & Allen Bradley PLC5 series or others using (Intel) Protocol (Bytes															
One Word (Expressed in Bytes)															
Least Significant Byte (LSB)								Most Significant Byte (MSB)							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

TABLE 1-1: REFERENCE DATA PROTOCOLS

CHAPTER 2 - INSTALLATION

About Chapter 2

All information contained in Chapter 2 pertains to unpacking, cabling, interconnecting and installing the -B4 PROFIBUS Interface Card. Alternatives to any specifications contained in this section are not recommended. It is very important that the operator and maintenance personnel be familiar with the procedures contained in this chapter, before installing or operating the PROFIBUS interface card.

Unpacking

1. Inspect the packing for damage of any kind, before signing for or opening the package.
2. Report any damage to the carrier company immediately.
3. Check to see that everything in the package matches the bill of lading. You should normally have:

   a. Purchased with a new Rate Controller

   - 1 - HI 2160RC-B4 Rate Controller + PROFIBUS Interface Option.
   - 1 - HI 2160RC^{PLUS} Operation &Installation Manual
   - 1 - PROFIBUS Operation & Installation Manual
   - 1 - 3.5" Floppy diskette with the GSD File and Type Files.

   b. Purchased separately to retrofit an HI 2160RC^{PLUS}:

   - 1 - HI-2160XX-B4 PROFIBUS Interface (PCB)
   - 1 - EPROM firmware package if the existing Rate controller is not fitted with the current firmware.
   - 4 - #4 Phillips pan head, SEM Machine Screws.
   - 1 - PROFIBUS Operation & Installation Manual
   - 1 - 3.5" Floppy diskette with the GSD File and Type Files.

4. Record the model number and serial number of the Rate controller or interface card and EPROM version. Store in a convenient, secure location for reference when buying parts or firmware upgrades.

Installing the PROFIBUS Interface Option Card

Step 1. Disconnect all power cords from the HI 2160RC^{PLUS} Rate Controller.

WARNING

NEVER INSTALL OR REMOVE THE PROFIBUS INTERFACE CARD WITH THE POWER CORD CONNECTED.

Step 2. Accessing the printed circuit boards.

- Wall Mount Installation (NEMA 4x Enclosure)

  Open the front panel of the NEMA enclosure.
  A/D converter PCB and Power/Relay PCB are fastened to the rear panel.

- Panel Mount and Remote Installations.

  Remove the two (2) phillips head machine screws that fasten the chassis to the HI 2160RC^{PLUS} cover. (See Fig. 2-1)

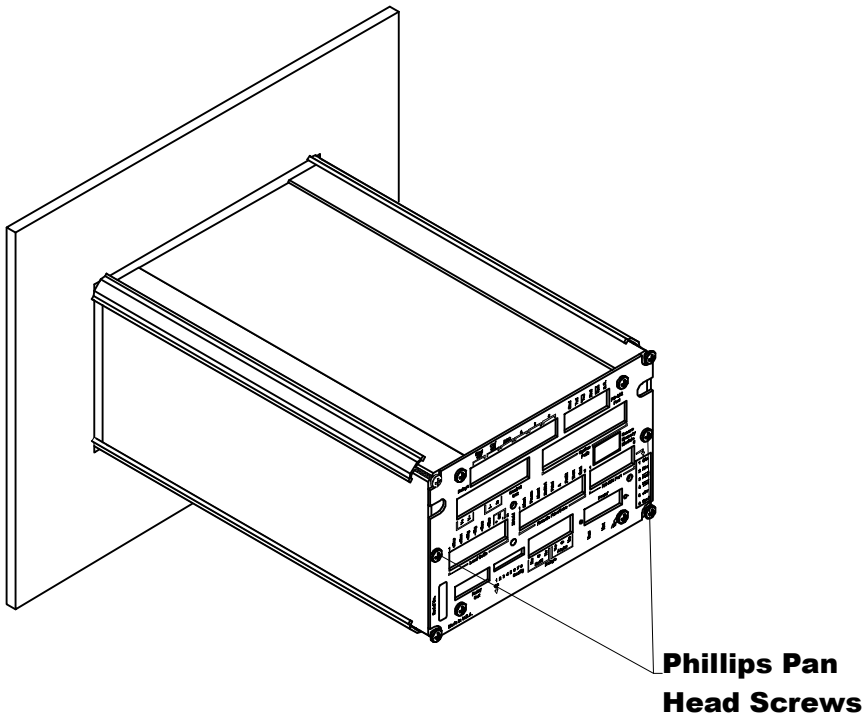


FIG. 2-1 HI 2160RC^{PLUS} BACK PANEL

Step 3. Pull the chassis completely out of the cover.
Step 4. Place the chassis on an anti-static pad.
Step 5. Put on an anti-static wristlet and connect it to the anti-static pad.
Step 6. Analog to Digital PCB is clearly visible and there are eight (8) standoffs mounted on the board. (See Fig. 2-2)
Step 7. Remove the PROFIBUS Interface Card from the anti-static bag.

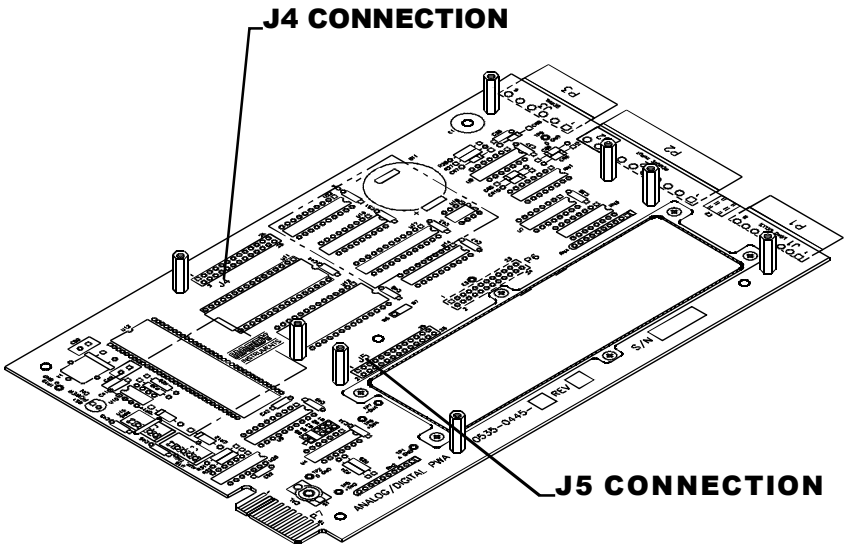


FIG. 2-2 ANALOG/DIGITAL PCB WITH STANDOFFS

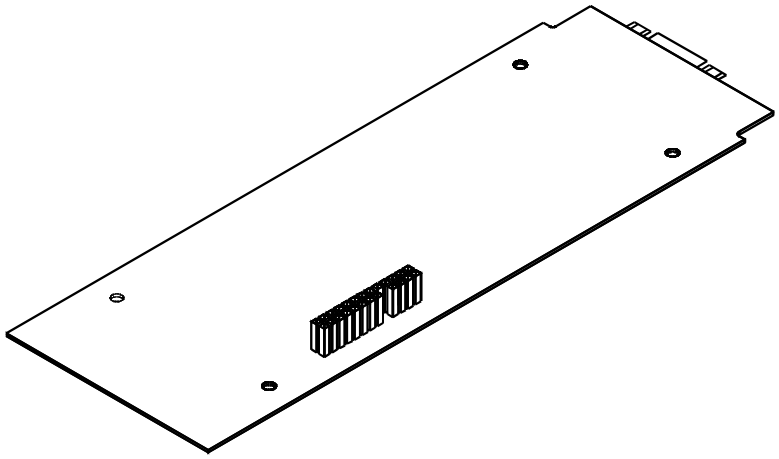


FIG. 2-3 PROFIBUS INTERFACE CARD/PIN CONNECTORS

Step 8. On the solder side of the PROFIBUS Interface Card, the side opposite the components, there is a pin connector. (See Fig. 2-3)

Step 9. With the pin connector side down, carefully plug the PROFIBUS Interface Card into either connector J4 or J5 (See Fig. 2-2) whichever is available. These connectors also refer to option 1 or option 2 on the rear panel. Option 1 uses connector J5. Option 2 uses connector J4. (See Fig. 2-4)

WARNING

MAKE SURE THAT ALL THE PINS ARE PLUGGED INTO THE J4 OR J5 CONNECTOR. FAILURE TO PROPERLY INSTALL THE PROFIBUS INTERFACE CARD CAN RESULT IN PERSONAL INJURY OR PROPERTY DAMAGE.

Step 10. Though holes on the PROFIBUS Interface Card should line up with the threaded holes in the standoffs. A little adjustment is sometimes necessary to line them up. (See Fig. 2-4)

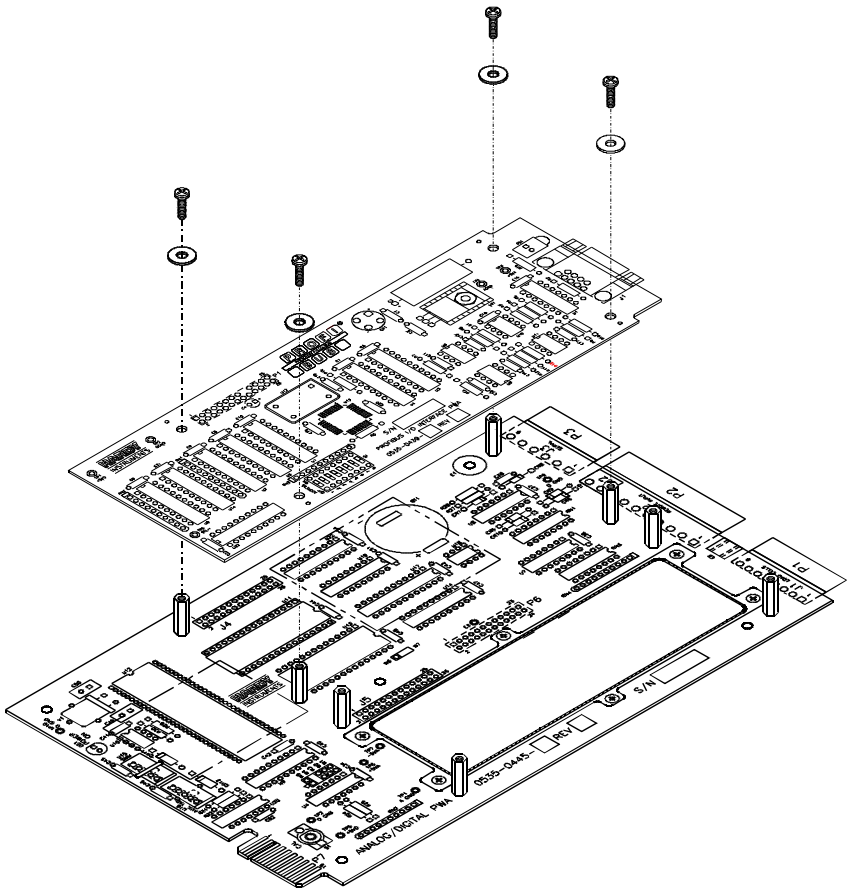


FIG. 2-4 PROFIBUS INTERFACE CARD INSTALLATION

Step 11. Place the washers over the holes on the component side of the PROFIBUS Interface Card and install the four (4) phillips pan head SEM screws. (See Fig. 2-4)

Step 12. Slide the chassis back into the HI 2160RC^{PLUS} cover.

Step 13. Replace the two (2) phillips pan head SEM screws that fasten the chassis to the HI 2160RC^{PLUS} cover.

Connecting the Network Cable to the PROFIBUS Interface Card.

Step 1. The 9-pin female connector is located on the rear panel of the chassis. If the PROFIBUS Interface Card is used in position J4, it will be in the slot on the right marked "Option Slot".

Step 2. If the PROFIBUS interface card is used with the Quad Option Expansion Box should be in the slot on the left of the rear plate of the rate controller marked "Control Out". (See Fig. 2-5).

Step 3. Plug the Siemens cable assembly and bus connector into the 9-pin female connector on the rear panel of the chassis. (See Fig. 2-5)

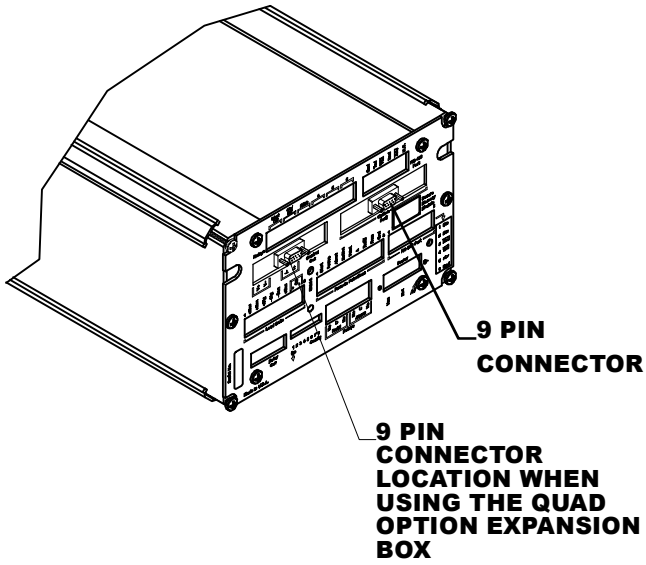


FIG. 2-5 PROFIBUS 9-PIN CONNECTOR

NOTE: *If the Rate Controller is the last node on the bus, the terminating resistor must be ON.*

NOTE: *It is highly recommended that the Siemens cable and bus connector listed be used. Check with your closest Siemens Electronics dealer for pricing and availability.*

Cable and Connector Requirements

- Siemens Bus Connector - (SINEC L2) Prt. # 6ES7-972-0BA20-OXAO
- Siemens Cable LWF, CMX 75C (shielded) - (SINEC L2) Prt. #6XV1-830-OAH10

Cable Pin Definitions

- Pin 1 - Ground (outer braided shield)
- Pin 3 - Signal "B"(Red)
- Pin 8 - Signal "A"(Green)

Communication Rate/Cable Lengths/ Connectors

Shielded twisted pair two wire cable is required for the PROFIBUS Interface Connection. The characteristic impedance of the cable should be in the range between 135 and 165 Ohms (3 to 20 MHZ), the cable capacity (conductor-conductor) should be <30 pF/M and the conductor area should be 0,34 mm2. The 9 pin din connector on the option board is used for all PROFIBUS connections.

Transmission Speed	Without Repeater 32 Nodes	With 1 Repeater 64 Nodes	With 2 Repeaters 92 Nodes	With 3 Repeaters 122 Nodes
9.6 k	1200 m	2400 m	3600 m	4800 m
19.2 k	1200 m	2400 m	3600 m	4800 m
93.75 k	1200 m	2400 m	3600 m	4800 m
1875 k	600 m	1200 m	1800 m	2400 m
500 K	400 m	800 m	1200 m	1600 m

Transmission Speed	Without Repeater 32 Nodes	With 1 Repeater 64 Nodes	With 2 Repeaters 92 Nodes	With 3 Repeaters 122 Nodes
1.5 M	200 m	400 m	600 m	800 m
3, 6, 12 M	100 m	200 m	300 m	400 m

CHAPTER 3 - SETUP

About Chapter 3

Chapter 3 consists of all the procedures to setup the Profibus Interface Option. To make sure that the interface option works properly, programmers and maintenance personnel should be familiar with this chapter before setting up or operating the system.

Panel, Wall and Remote Setup Procedures

Step 1. Press the 1/Config button. (See Fig. 3-1) The first option appears.

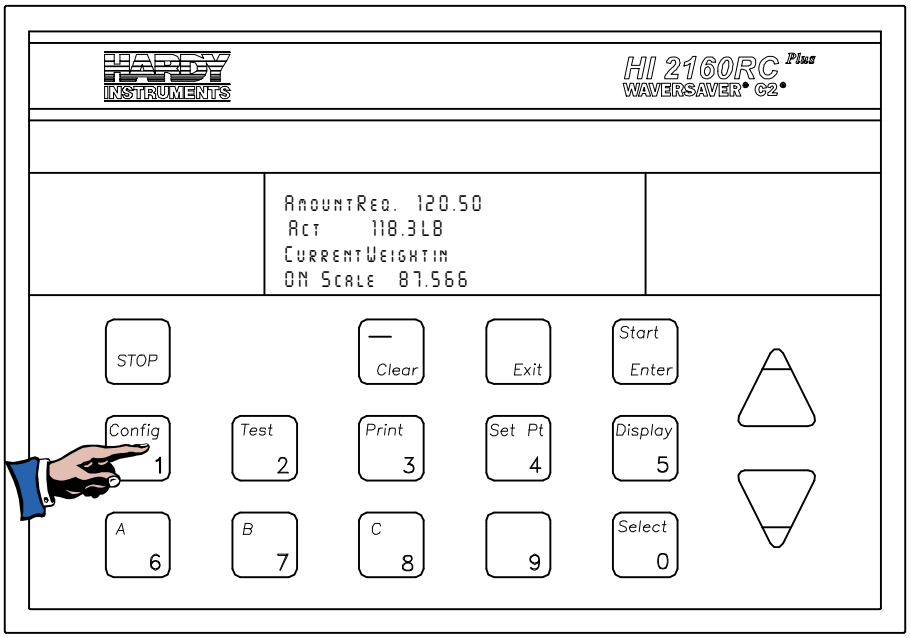


FIG. 3-1 CONFIGURATION BUTTON

Step 2. Press the up ( ) arrow button until Profibus I/O appears on the display. (See Fig. 3-2)

Step 3. Press the "Start/Enter" button. The Profibus I/O menu appears displaying the current node station address. (See Fig. 3-3)

Step 4. Press the Clear button. The display should now show three "0's". (See Fig. 3-4)

Step 5. Use the keypad to enter a node station address (the valid address range is 1-125). The station address must be a unique number for each node on the bus.

Step 6. Press the "Enter" button to set the node station address. (See Fig. 3-3)

NOTE: *The PROFIBUS node address number is displayed in decimal on the rate controller.*

NOTE: *The Test/Clr button must be used to clear the values on the display. If numbers are added without clearing the display, they are put to the right of the existing number. This means that the node address is entered incorrectly.*

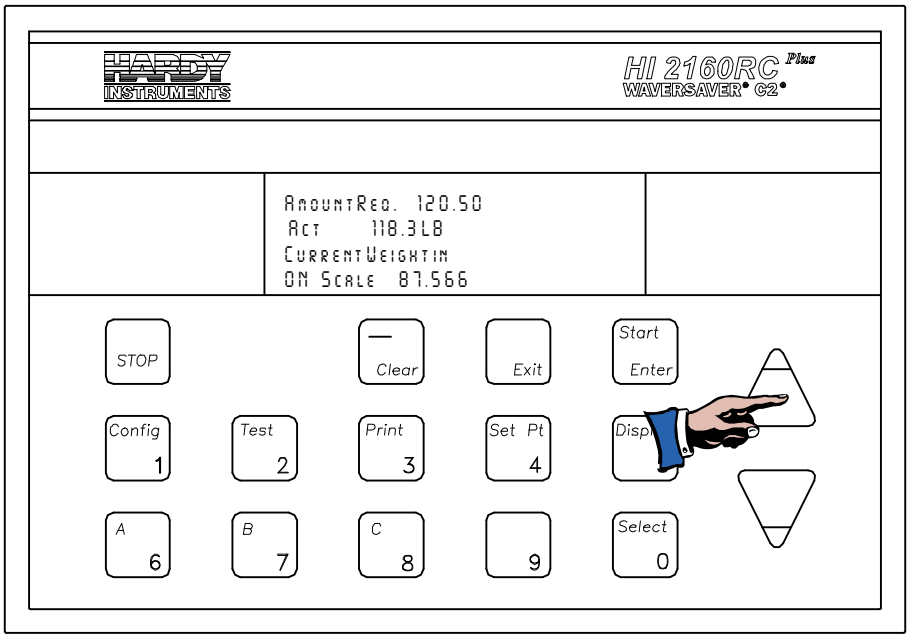


FIG. 3-2 PRESSING THE UP ARROW

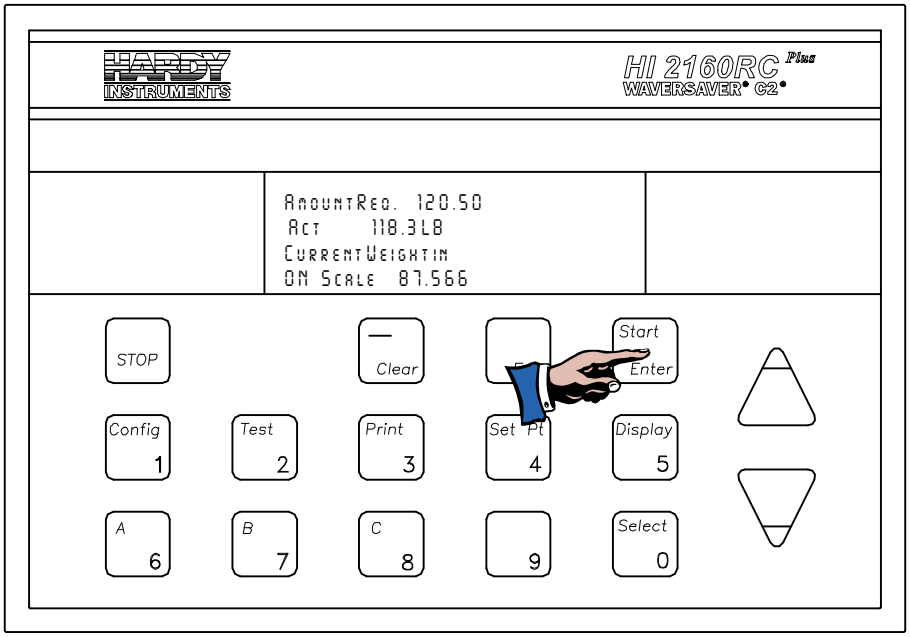


FIG. 3-3 PRESSING START/ENTER BUTTON

Step 7. Use the keypad to enter the new number.
Step 8. Press the "Enter" button to set the address.
Step 9. Exit the Config Menu by pressing the "Exit" button. (See Fig. 3-4)

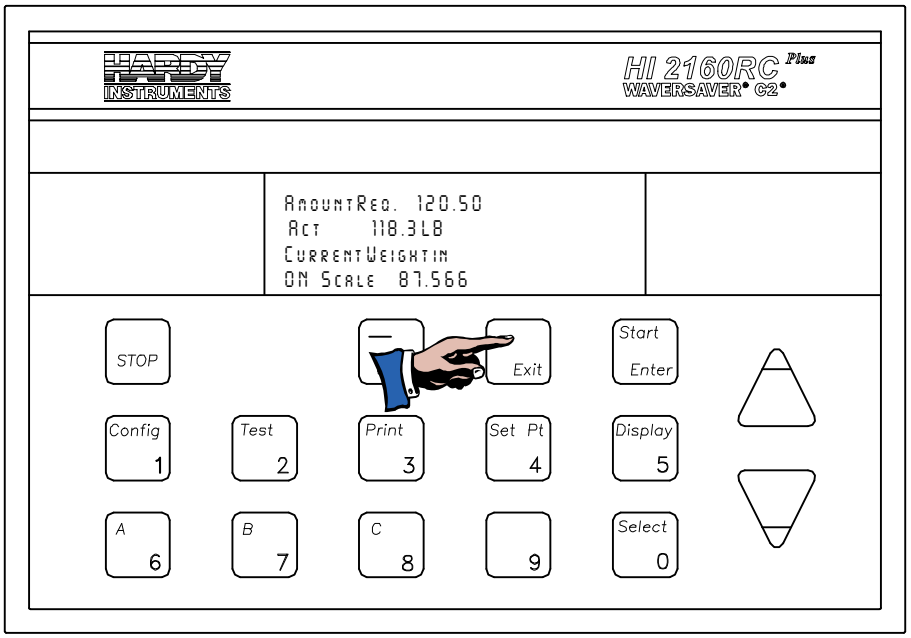


FIG. 3-4 PRESS THE EXIT BUTTON

NOTE: *It may be necessary to perform a manual or auto configuration of the Programmable Logic Controller (PLC) in addition to powering down and powering up the instrument to activate the new menu selections. Check in your PLC manual to determine if this is necessary.*

NOTE: *The PROFIBUS Station Address cannot be changed through the PROFIBUS Network.*

CHAPTER 4 - BLOCK READS

About Chapter 4

All information contained in Chapter 4 pertains to Block Read Commands for the PROFIBUS Interface Option. It is very important that programmers and users be familiar with this chapter before operating the PROFIBUS Interface Option.

Transfer Commands

Overview of Transfer Commands

1. Profibus Interface Card maximum buffer size: 112 byte buffer
2. Siemens PLC

    a. TI 505 Series PLCs

    - Requires the Field Interface Module (FIM) to communicate over Profibus.
    - Can continually exchange up to 32 words or 64 bytes for both PLC input and output with each slave device.

    b. S5 Series PLCs

    - Requires IM 308C Module to communicate over Profibus.
    - Can continually exchange up to 244 bytes for PLC input and output with each slave device.

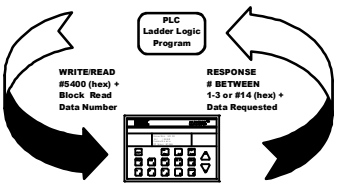
    c. S7 Series PLC

    - PROFIBUS ready, does not require additional modules.
    - Can Continually exchange up to 244 bytes for PLC input and output with each slave device.

3. Allen-Bradley PLC5 Series

    a. Requires Profibus DP module to communicate over Profibus.
    b. Can continually exchange up to 244 bytes for both PLC Input and Output with each slave device.

Overview of Block Transfer Commands



- It is important to keep in mind that the amount of bytes that can be transferred is determined by the Master PLC not the Profibus interface option.
- When using the HI 2160RC^{PLUS} PROFIBUS interface, the user can select the Block Read Data Summaries and Block Write Commands as required. However, the amount of bytes that can be transferred is dependent on the data transfer capability of the Master being used.
- The ladder logic program provides the Master with the ability to read and write rate data by referencing the Profibus address, the byte numbers and number of bytes.

NOTE: *The decimal point is not included in values transferred. The decimal position is a separate parameter.*

Detailed Command Set For Block Reads

NOTE: *We recommend that front panel functions be controlled through the PROFIBUS network and that the front panel control be disabled or locked out. (See the HI 2160RC^{PLUS} Operation and Installation Manual for lockout instructions)*

- The Block Read data to be input to the Master is always initiated by a Block Write Command designating the block number that the HI 2160RC^{PLUS} Rate Controller will send to the Master.

NOTE: *If your Master Device does not have built in PROFIBUS diagnostic capability set up the Response/Error "90" diagnostics first, (See section 4.4) before proceeding. The write "90" must be set before entering a block write command so that the verification process can determine if the first block write command sent is valid or not.*

- The rate controller receives the block number command from the Master, verifies that the block number is correct, processes the rate data and prepares a response byte (an error code response number) to the Master's command.

NOTE: *Changes to Block Writes/Charts should be made in program mode.*

NOTE: *To prevent errors and erroneous data from being sent to the HI 2160RC^{PLUS} Rate Controller, in run mode, follow the procedures below:*

1.Set the Block Number to "0".
2.Write the new parameter to the output buffer.
3.Change the Block Number from "0" to the new number.

Response/Error Code Setup

- The Master's Profibus diagnostics capability determines if the error code information is automatically displayed on the Master Screen. The error code number indicates if the write command is valid. (See Chapter 8)
    - If the Profibus diagnostics are built into the Master, an error code response number is automatically displayed.

NOTE: *The first 6 bytes of the diagnostic information is reserved for the master station address and the manufacturer's ID. Bytes 7-15 are used by the HI 2160RC^{PLUS} PROFIBUS interface option to provide automatic response/error codes.*

    - If the PROFIBUS diagnostics are not built in to the Master - a write number "90" must be performed to get the error code response.

NOTE: *All write commands require a 50 millisecond response delay.*

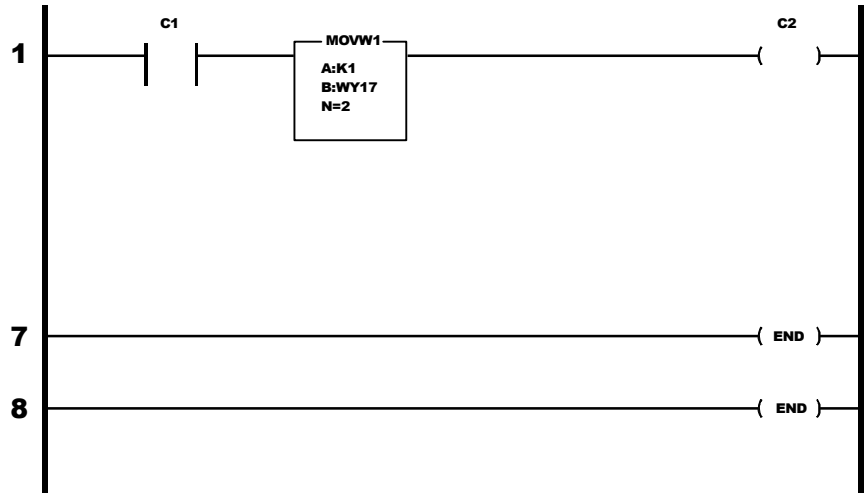
NOTE: *The write "90" command is used for Block Transfers only, for Selectable Transfers a write "0" command is used.*

- Write "90" procedures to retrieve an error code response number. For the Error Code List, See Chapter 8.
    - Enter the following information to output to the rate controller:

      K1: Contains Hex 5000 (Selects Block Write #50: Selects Read Summary Data)
      K2: Contains Hex 5A00 (Selects Block "90" error code:)
      C1: When C1 is turned on.

    - MOVW1: Downloads the information in K1 & K2 into WY17-WY18 (Rate Controller)
    - Data is read to: WX1-WX2:

      WX1: Contains Hex 5A00 (Block Read Summary Data #90)
      WX2: Contains Error Code (Error code number from the Error Code Table, See Chapter 8)



Block Read Command Setup

Step 1. Use the Block Write Command 80 (50 hex) to select the Block Read Number(s).

Step 2. If no Block number is selected, the Profibus Interface Option will return a Default Block Number, which is Block Read Data number 10 (A hex): Rate and Weight Parameters.

Block Write Command Number 80: Select Block Read Data Byte Definitions:
Block Write Number 80 (Hex 50) Select Read Type Block Read Value 0 Enter Block Number

Block Read Example

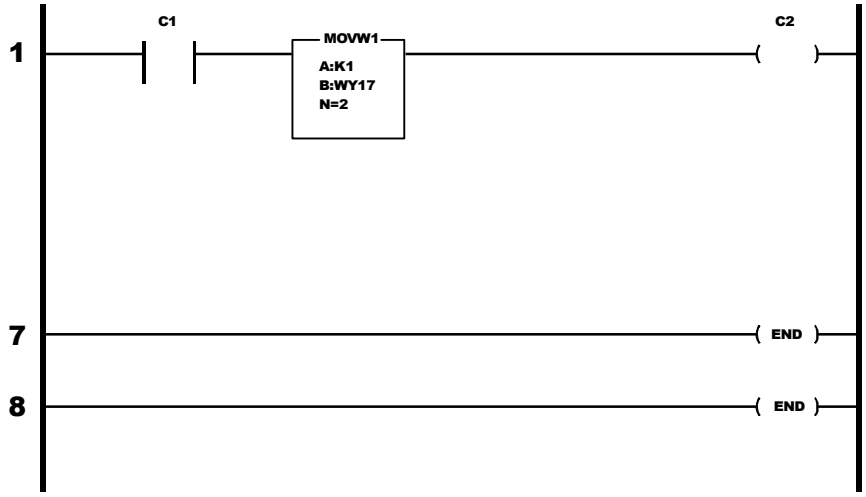
- The following example is a setup to read the Tuning and Control Data from the HI 2160RC^{PLUS} Rate Controller.

    - Move Word 1 (MOVW1) selects the Block to Read, in this case 2-Tuning and Control Data. Block 2 has 10 words, therefore the data is transferred to WX1 through WX10.

      K1: Contains hex 5000 (Block 80: Select Read Summary Data)
      K2: Contains hex 0200 (Block 2: Tuning and Control Data - The block number to read)

- C1:When C1 is turned on, Block Read 2 information is read to WX1-WX10.
- MOVW1: Downloads the information in K1 and K2 into WY17 and WY18 (rate controller)

    - Data is read to WX1 - WX10



Block Read Commands

Block Read Data Number 1: Scale Calibration Parameters					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Read Number 1 (Hex 1)	LSB	0.5	0	1	0
Reserved for Future Use	MSB	0.5		1	1
Mass Units Selected 0 = OZS 1 = TNS 2 = KGS 3 = GRM 4 = LBS 5 = GLS 6 = LTR 7 = MLT	LSB bit 0 bit 1 bit 2 bit 3 bit 4 bit 5 bit 6 bit 7	0.5	1		2
Time Units Selected A value of 0 to 2 (0 = SEC, 1 = MIN, 2 = HR	MSB	0.5		1	3
Decimal Point for Rate and Weight A binary value from 0 to 4 indicating the number of places to the right of the decimal.	LSB	0.5	2	1	4
Decimal Point for Batch Amount A binary value from 0 to 4 indicating the number of places to the right of the decimal. The value must be ≤ the decimal point value for rate and weight.	MSB	0.5		1	5
Decimal Point for Totalized Weight A binary value from 0 to 4 indicating the number of places to the right of the decimal. The value must be ≤ to the decimal point value for rate and weight.	LSB	0.5	3	1	6
Number of C2 Load Cells	MSB	0.5		1	7
Display Graduation Size (“Count by”): A value of 1,2,5,10,20,50, 100,200 or 500		1	4	2	8
Span Weight Value (Test Weight for Calibration): A 20 bit number in proper integer format or C2 Reference Point if Calibrated in C2		2	5	4	10
Sticker Value		2	7	4	14
Total Words/Bytes		9		18	

NOTE: *After changing any of these parameters, new calibration and rate calibration actions must be performed to implement changes.*

Block Read Data Number 2: Scale Calibration Parameters					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Read Number 2 (Hex 2)	LSB	0.5	0		0
Enable Bits	MSB	0.5		1	1
Rate Exception Control (REC) Shutoff: (0 = NO, 1 = YES)	bit 0				
Reserved for future use	bit 1				
Reserved for future use	bit 2				
Reserved for future use	bit 3				
Reserved for future use	bit 4				
Reserved for future use	bit 5				
Reserved for future use	bit 6				
Reserved for future use	bit 7				
Rate-of-change Timebase Evaluation Period - a value of 0 to 15 from the list below: 0 = 1 second 5 = 6 seconds 10 = 20 seconds 1 = 2 seconds 6 = 8 seconds 11 = 30 seconds 2 = 3 seconds 7 = 10 seconds 12 = 40 seconds 3 = 4 seconds 8 = 12 seconds 13 = 50 seconds 4 = 5 seconds 9 = 15 seconds 14 = 60 seconds 15 = 120 seconds		1	1	2	2
Integration Constant: A binary value		1	2	2	4
Proportional Constant: A binary value		1	3	2	6
Derivative Constant: A binary value		1	4	2	8
Control Output Low Limit: A percentage of full scale output from 0% - 99%	LSB	0.5	5	1	10
Control Output High Limit: A percentage of full scale output from 1% - 100%	MSB	0.5		1	11
Number of Readings Averaged: A value from 1 - 200		1	6	2	12
Rate Exception Level (REC): A value from 0.0 - 10.0		1	7	2	14
Rate Exception Time (REC time): A value from 0 - 999		1	8	2	16
Preact Correction: A value from 0 - 000		1	9	2	18
Total Words/Bytes		10		20	

NOTE: *Preact does not function in Batch Mode.*

Block Read Data Number 3: Auto Refill					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Read Number 3 (Hex 3)	LSB	0.5	0	1	0
Auto Refill Enable Bits	MSB	0.5		1	1
Enable Auto Refill: (0 = NO, 1 = YES)	bit 0				
Initial Fill: (0 = NO, 1 = YES)	bit 1				
Reserved for future use	bit 2				
Reserved for future use	bit 3				
Reserved for future use	bit 4				
Reserved for future use	bit 5				
Reserved for future use	bit 6				
Reserved for future use	bit 7				
Start Refill Weight: A binary weight value		2	1	4	2
Stop Refill Weight: A binary weight value		2	3	4	6
Low Refill Shutoff Weight: A binary weight value		2	5	4	10
High Refill Shutoff Weight: A binary weight value		2	7	4	14
Refill Correction FActor: A value from -10.0 to +10.0		1	9	2	18
Total Words/Bytes		10		20	

Block Read Data Number 4: Rate Tolerances					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Read Number 4 (Hex 4)		0.5	0	1	0
Reserved for future use		0.5		1	1
Low Rate Alarm Value: A binary rate delta value		2	1	4	2
High Rate Alarm Value: A binary rate delta value		2	3	4	6
Low Rate Shutoff Value: A binary rate value		2	5	4	10
High Rate Shutoff Value: A binary rate value		2	7	4	14
Alarm Time: A binary value of seconds 0 - 999		1	9	2	18
Shutoff Control Output: A binary value representing 0% - 100%		1	10	2	20
Total Words/Bytes		11		22	

Block Read Data Number 5: Auto Refill					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Read Number 5 (Hex 5)	LSB	0.5	0	1	0
	MSB	0.5		1	1
Option Slot #1 Transmitting Rate-of-Change	bit 0				
Option Slot #1 Transmitting Current Gross Weight	bit 1				
Option Slot #1 Transmitting Current Batch Amount	bit 2				
Option Slot #1 Transmitting Current Totalized Weight	bit 3				
Option Slot #2 Transmitting Rate-of-Change	bit 4				
Option Slot #2 Transmitting Current Gross Weight	bit 5				
Option Slot #2 Transmitting Batch Amount	bit 6				
Option Slot 32 Transmitting Current Totalized Weight	bit 7				
Zero Calibration Value for Option Slot #1: A binary value		2	1	4	2
Span Calibration Value for Option Slot #1: A binary value		2	3	4	6
Zero Calibration Value for Option Slot #2: A binary value		2	5	4	10
Span Calibration Value for Option Slot #2: A binary value		2	7	4	14
Total Words/Bytes		9		18	

Block Read Data Number 6: Optional Analog Outputs Slots 3 & 4					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Read Number 6 (Hex 6)	LSB	0.5	0	1	0
	MSB	0.5			
Option Slot #3 Transmitting Rate-of-Change	bit 0				
Option Slot #3 Transmitting Current Gross Weight	bit 1				
Option Slot #3 Transmitting Current Batch Amount	bit 2				
Option Slot #3 Transmitting Current Totalized Weight	bit 3				
Option Slot #4 Transmitting Rate-of-Change	bit 4				
Option Slot #4 Transmitting Current Gross Weight	bit 5				
Option Slot #4 Transmitting Current Batch Amount	bit 6				
Option Slot #4 Transmitting Current Totalized Weight	bit 7				
Zero Calibration Value for Option Slot #3: A binary value		2	1	4	2
Span Calibration Value for Option Slot #3: A binary value		2	3	4	6
Zero Calibration Value for Option Slot #4: A binary value		2	5	4	10
Span Calibration Value for Option Slot #4: A binary value		2	7	4	14
Total Words/Bytes		9		18	

Block Read Data Number 7: Remote Setpoint Input					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Read Number 7 (Hex 7)	LSB	0.5	0	1	0
Reserved for future use	MSB	0.5		1	1
Low Setpoint Input Value: A binary rate value		2	1	4	2
High Setpoint Input Value: A binary rate value		2	3	4	6
Number of Averages of Remote Input: A value from 1 - 20		1	5	2	10
Low Input Control Threshold: A binary rate value		2	6	4	12
High Input Control Threshold: A binary rate value		2	8	4	16
Total Words/Bytes		10		20	

Block Read Data Number 8: Rate Calibration					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Read Number 8 (Hex 8)	LSB	0.5	0	1	0
Reserved for future use	MSB	0.5		1	1
Rate Calibration Low Percentage: A binary value representing from 0.0% - 99.9%		1	1	2	2
Rate Calibration High Percentage: A binary value representing from 0.0% - 99.9%		1	2	2	4
Actual Rate-of-Change at Low Percentage: A binary rate value		2	3	4	6
Actual Rate-of-Change at High Percentage: A binary rate value		2	5	4	10
Pause Time: < 999		1	7	2	14
Prime Time: < 999		1	8	2	16
Feed Time: ≥ 30 < 999		1	9	2	18
Total Words/Bytes		10		20	

Block Read Data Number 9: Status Parameters					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Read Number 9 (Hex 9)	LSB	0.5	0	1	0
Setpoint Mode	MSB	0.5		1	1
1 - Rate Setpoint, Batch					
2 - Manual, Batch					
3 - Rate, Continuous					
4 - Manual, Continuous					
5 - Remote Batch					
6 - Remote, Continuous					
			1		
Alarm Status:	LSB	0.5		1	2
No Alarm	bit 0				
Low Rate Alarm	bit 1				
High Rate Alarm	bit 2				
Low Shutoff Alarm	bit 3				
High Shutoff Alarm	bit 4				
Batch tolerance Alarm	bit 5				
Refill Low Shutoff Alarm	bit 6				
Refill High Shutoff Alarm	bit 7				
Reserved for future use	MSB	0.5		1	3
			2		
External Dipswitch Status:	LSB	0.5		1	4
Enable Multi-Drop (#1)	bit 0				
Disable Screen Print (#2)	bit 1				
Disable Batch Report (#3)	bit 2				
Enable Continuous Scale Weight output to the Serial Port (#4)	bit 3				
Ignore Incoming Checksum (#5)	bit 4				
Off = 1 SEC., On = 1/20 SEC Transmission (36)	bit 5				
Off = Gross Weight, On = Counts (#7)	bit 6				
Reserved for future use	bit 7				
Internal Dipswitch Status:	MSB	0.5		1	5
Display Remote Input Instead of Rate (Dipswitch #1)	bit 0				
Reserved for future use (Toggle between averaged and raw rate display (Dipswitch #2)	bit 1				
Reserved for future use (Dipswitch #3)	bit 2				
Reserved for future use (Dipswitch #4)	bit 3				
Reserved for future use (Dipswitch #5)	bit 4				
Reserved for future use (Dipswitch #6)	bit 5				
Reserved for future use (Dipswitch #7)	bit 6				
Reserved for future use (Dipswitch #8)	bit 7				
			3		
Relay Output Status:	LSB	0.5		1	6
Reserved for future use	bit 0				
Reserved for future use	bit 1				
Batch Complete	bit 2				
In Rate Exception Control (REC) Mode	bit 3				
Ingredient On/Off	bit 4				
Shutoff Output	bit 5				
Alarm Output	bit 6				
Refill Output	bit 7				
Remote Function Status:	MSB	0.5		1	7
Force Refill (Pin 7)	bit 0				
Read Remote Setpoint (Pin 8)	bit 1				
Print Screen to Standard Serial Port (Pin 5)	bit 2				
Reserved for future use (Pin 6)	bit 3				
Abort Input (Pin 3)	bit 4				
Clear total Input	bit 5				
Start Input (Pin 1)	bit 6				
Pause Input (Pin 2)	bit 7				
Total Words/Bytes		4		8	

Block Read Data Number 10: Weight and Rate Parameters					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Read Number 10 (Hex A)	LSB	0.5	0	1	0
Reserved for future use	MSB	0.5		1	1
Gross Weight: A binary value		2	1	4	2
Rate-of-Change (Heavily Averaged)		2	3	4	6
Rate-of-Change (Lightly Averaged)		2	5	4	10
Rate-of-Change Setpoint		2	7	4	14
Accumulated Batch Weight		2	9	4	18
Totalized Weight		2	11	4	22
Batch Amount Setpoint		2	13	4	26
Percent Control Output		2	15	2	30
Total Words/Bytes		16		32	

Block Read Data Number 11: Diagnostics					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Read Number 11 (Hex B)	LSB	0.5	0	1	0
Reserved for future use	MSB	0.5		1	1
Analog to Digital Converter Counts at Zero Weight Calibration: A binary value		2	1	4	2
Analog to Digital Converter Counts at Span Weight Calibration: A binary value		2	3	4	6
Counts per Display Graduation: A binary value		2	5	4	10
Current Analog to Digital Converter Counts: A binary value		2	7	4	14
WAVERSAVER® Jumper Settings: A value from 0 - 4		1	9	2	18
Total Words/Bytes		10			

Block Read Data Number 12: Save/Restore Location					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Read Number 12 (Hex C)	LSB	0.5	0	1	0
Reserved for future use	MSB	0.5		1	1
Save Location: A value from 1 - 12	LSB	0.5	1	1	2
Restore Location: A value from 1 - 12	MSB	0.5		1	3
Total Words/Bytes		2		4	

Block Read Data Number 20: Rate Calibration					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Read Number 20 (Hex 14)	LSB	0.5	0	1	0]
First Parameter Selected		Varies	Varies	Varies	Varies
Second Parameter Selected		Varies	Varies	Varies	Varies
:					
:					
Last Parameter Selected		Varies	Varies	Varies	Varies
Total Words/Bytes		Varies	Varies	Varies	Varies

CHAPTER 5 - BLOCK WRITES

About Chapter 5

All information contained in Chapter 5 pertains to Block Write Commands for the Profibus Interface Option. It is very important that programmers and users be familiar with this chapter before operating the PROFIBUS Interface Option.

Overview of Transfer Commands

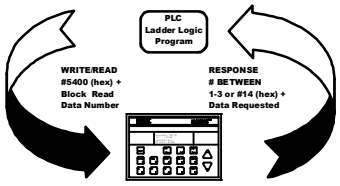
- Profibus Interface Card maximum buffer size: 112 byte buffer
- Siemens PLC
    - TI 505 Series PLC

      Requires the Field Interface Module (FIM) to communicate over Profibus.
      Can continually exchange up to 32 words or 64 bytes for both Master input and output with each slave device.
    - S5 Series PLC

      Requires IM 308C Module to communicate over Profibus.
      Can continually exchange up to 244 bytes for Master input and output with each slave device.
    - S7 Series PLC

      Profibus ready, does not require additional modules.
      Can Continually exchange up to 244 bytes for Master input and output with each slave device.
- Allen-Bradley PLC5 Series
    - Requires Profibus DP module to communicate over Profibus.
    - Can continually exchange up to 244 bytes for both Master Input and Output with each slave device.

Overview of Block Transfer Commands



- It is important to keep in mind that the amount of bytes that can be transferred is determined by the Master not the Profibus interface option.
- When using the HI 2160RC^{PLUS} PROFIBUS interface, the user can select the Block Read Data and Block Write Commands as required. However, the amount of bytes that can be transferred is dependent on the data transfer capability of the Master being used.
- The ladder logic program provides the Master with the ability to read and write weight data by referencing the PROFIBUS address, the byte numbers and number of bytes.

NOTE: *The rate controller will not accept write commands until calibration is sealed. Press "Enter" at ENDCAL to seal the calibration. (See HI 2160RC^{PLUS} Operation and Installation Manual, for calibration instructions)*

Detailed Command Set for Block Transfer (Writes)

NOTE: *We recommend that front panel functions be controlled through the PROFIBUS network and that the front panel control not be used during communications.*

- All write commands are initiated by the Master using a ladder logic program to send a block number to the HI 2160RC^{PLUS} Weight Controller.

NOTE: *If your Master Device does not have built in PROFIBUS diagnostic capability set up the Response/Error "90" diagnostics first, (See section 4) before proceeding. The write "90" must be set before entering a block write command so that the verification process can determine if the first block write command sent is valid or not.*

- The weight controller receives a block number command, verifies that the block number is correct, processes the weight data and prepares a response byte (an error code response number) to the Masters command.

NOTE: *Changes to Block Writes/Charts should be made in program mode.*

NOTE: *When making changes to block writes in run mode, follow the procedures below:*

1.Set the Block Number to "0".
2.Write the new parameter to the output buffer.
3.Change the Block Number from "0" to the new number.

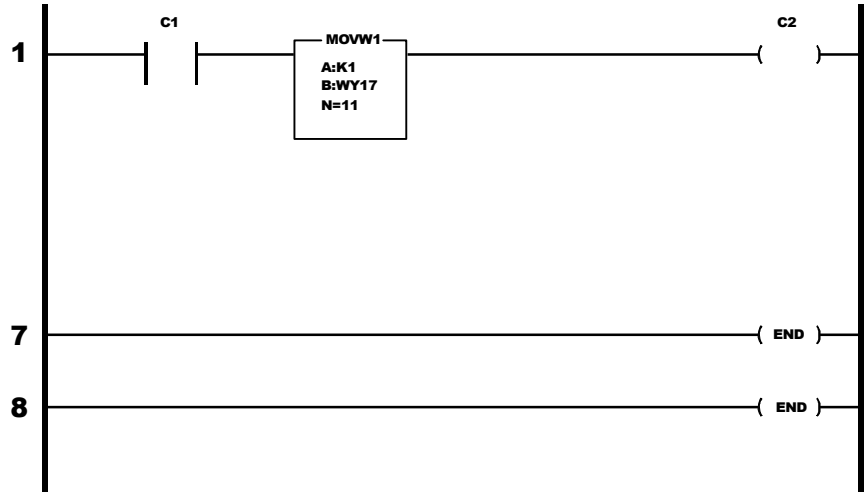
Block Write Example

- The following example is a setup to download Rate Tolerance Data using Block Write Command 54 (36 hex): Rate Tolerances
- Here are the example values:
    - When C1 is activated the Move Word 1 (MOVW1) downloads the information to the rate controller using WY17 through WY28.

      K1: Contains hex 3600 (Selects Block 54)
      K2: Contains Double 30, Low Rate Alarm
      K4: Contains Double 10, High Rate Alarm
      K6: Contains Double 500 Sets Low Rate Shutoff Value
      K8: Contains Double 25,000 Sets High Rate Shutoff Value
      K10: Contains Integer 60 Sets Alarm Time
      K11: Contains Integer 5 Sets Shutoff Control Output

      C1: Starts the program

      MOVW1: Downloads the information in K1-K11 into WY17-WY27 (rate controller)



Block Write Command Numbers

Block Write Command Number 60: Scale Calibration Action					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Write Number 60 (Hex 3C)	LSB	0.5	0	2	0
Calibration Initiation	MSB	0.5			1
Setting then clearing this bit tells the instrument that current weight is an empty scale	bit 0				
Setting then clearing this bit tells the instrument that current weight is Span Weight	bit 1				
Setting then clearing this bit stores critical data in the Secure Memory Module	bit 2				
Setting then clearing this bit restores critical data in the Secure Memory Module	bit 3				
Reserved for future use	bit 4				
Reserved for future use	bit 5				
Reserved for future use	bit 6				
Reserved for future use	bit 7				
Total Words/Bytes		1		2	

Block Write Command Number 51: Scale Calibration Parameters					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Write Number 51 (Hex 33)	LSB	1	0	0	0
Span or Reference Point Value 0 = Span Weight Used Value 1 = C2 Reference Point Used	MSB				1
Mass Units Selected A value of 0 - 7 0 = OZS 1 = TNS 2 = KGS 3 = GRM 4 = LBS 5 = BLS 6 = LTR 7 = MLT	LSB	1	1	1	2
Time Units Selected A value from 0 - 2 (0 = SEC, 1 = MON, 2 = HR)	MSB			1	3
Decimal Point for Rate and Weight A binary value from 0 - 4 indicating the number of places to the right of the decimal	LSB	1	2	1	4
Decimal Point for Batch Amount A binary value from 0 - 4 indicating the number of places to the right of the decimal (Must be ≤ rate/weight decimal point)	MSB			1	5
Decimal Point for Totalized Weight A binary value from 0 - 4 indicating the number of places to the right of the decimal (Must be ≤ rate/weight decimal point)	LSB	1	3	1	6
Load Sensor Count (C2 only) Verification (See Note Below)	MSB				7
Display Graduation Size (“Count by”): A value of 1,2,5,10,20,50, 100, 200 or 500		1	4	2	8
Span Weight Value (Test Weight for Calibration or reference point for C2, depending on the value of byte 1 for block write). For selectable blocks, load cell count must precede C2 Reference Point): A 20 bit number in proper integer format		2	5	4	10
Sticker Value		2	7	4	14
Total Words/Bytes		9		18	

Block Write Command Number 52: Tuning and Control					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Write Number 52 (Hex 34)	LSB	0.5	0	1	0
Enable Bits:	MSB	0.5		1	1
Rate Exception Control (REC) Shutoff: (0 = No, 1 = Yes)	bit 0				
Reserved for future use	bit 1				
Reserved for future use	bit 2				
Reserved for future use	bit 3				
Reserved for future use	bit 4				
Reserved for future use	bit 5				
Reserved for future use	bit 6				
Reserved for future use	bit 7				
Rate-of-Change Timebase Evaluation Period - a value of 0 - 15 from the list below: 0 = 1 second, 5 = 6 seconds, 10 = 20 seconds 1 = 2 seconds, 6 = 8 seconds, 11 = 30 seconds 2 = 3 seconds, 7 = 10 seconds, 12 = 40 seconds 3 = 4 seconds, 8 = 12 seconds, 13 = 50 seconds 4 = 5 seconds, 9 = 15 seconds, 14 = 60 seconds 15 = 120 seconds		1	1	2	2
Integration Constant: A value of 1 - 32767		1	2	2	4
Proportional Constant: A value of 1 - 32767		1	3	2	6
Derivative Constant: A value of 1 - 32767		1	4	2	8
Control Output Low Limit A percentage of full scale output from 0% - 99%	LSB	0.5	5	1	10
Control Output High Limit A percentage of full scale output from 1% - 100% > Control output low limit	MSB	0.5		1	11
Number of Readings Averaged: A value from 1 - 200		1	6	2	12
Rate Exception Level (REC): A value from 0.0 - 10.0		1	7	2	14
Rate Exception Time (REC time): A value in seconds 0 - 999		1	8	2	16
Correction FActor for REC Control: A value from 0 - 999		1	9	2	18
Total Words/Bytes		10		20	

Block Write Command Number 53: Auto Refill					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Write Number 53 (Hex 35)	LSB	0.5	0	1	0
Auto Refill Enable Bits: Enable Auto Refill: (0 = No, 1 = Yes) Initial Fill: (0 = No, 1 = Yes) Reserved for future use Reserved for future use Reserved for future use Reserved for future use Reserved for future use Reserved for future use	MSB bit 0 bit 1 bit 2 bit 3 bit 4 bit 5 bit 6 bit 7	0.5		1	1
Start Refill Weight: A binary weight value		2	1	4	2
Stop Refill Weight: A binary weight value		2	3	4	6
Low Refill Shutoff Weight: A weight value < the start refill weight value		2	5	4	10
High Refill Shutoff Weight: A weight value > the stop refill weight value		2	7	4	14
Refill Correction Factor: A value from -10.0 to +10.0		1	9	2	18
Total Words/Bytes		10		20	

Block Write Command Number 54: Rate Tolerances					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Write Number 54 (Hex 36)	LSB	0.5	0	1	0
Reserved for future use	MSB	0.5		1	1
Low Rate Alarm Value: A binary rate delta value (0.000 - 999.999)		2	1	4	2
High Rate Alarm Value: A binary rate delta value (0.000 - 999.999)		2	3	4	6
Low Rate Shutoff Value: A binary rate value (0.000 - 999.999)		2	5	4	10
High Rate Shutoff Value: A binary rate value (0.000 - 999.999)		2	7	4	14
Alarm Time: A binary rate value (0 - 999)		1	9	2	18
Shutoff Control Output: A binary value representing 0% to 100%		1	10	2	20
Total Words/Bytes		11		22	

Block Write Command Number 55: Optional Analog Outputs Slots 1 & 2					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Write Number 55 (Hex 37)	LSB	0.5	0	1	0
Type of Parameter Being Transferred (Appropriate bits set to indicate what parameter is being transmitted from each of the three optional analog output cards:	MSB	0.5		1	1
Option Slot #1 Transmitting Rate-of-Change	bit 0				
Option Slot #1 Transmitting Current Gross Weight	bit 1				
Option Slot #1 Transmitting Current Batch Amount	bit 2				
Option Slot #1 Transmitting Current Totalized Weight	bit 3				
Option Slot #2 Transmitting Rate-of-Change	bit 4				
Option Slot #2 Transmitting Current Gross Weight	bit 5				
Option Slot #2 Transmitting Current Batch Amount	bit 6				
Option Slot #2 Transmitting Current Totalized Weight	bit 7				
Zero Calibration Value for Card #1: A binary value		2	1	4	2
Span Calibration Value for Card #1: A binary value		2	3	4	6
Zero Calibration Value for Card #2: A binary value		2	5	4	10
Span Calibration Value for Card #2: A binary value		2	7	4	14
Total Words/Bytes		9		18	

NOTE: *Valid data must be entered for both cards, even if only one is installed. This can be avoided by using Operator Selectable Writes. (See Chapter 7)*

Block Write Command Number 56: Optional Analog Outputs Slots 3 & 4					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Write Number 56 (Hex 38)	LSB	0.5	0	1	0
Type of Parameter Being Transferred (Appropriate bits set to indicate what parameter is being transmitted from each of the three optional analog output cards:	MSB	0.5		1	1
Option Slot #3 Transmitting Rate-of-Change	bit 0				
Option Slot #3 Transmitting Current Gross Weight	bit 1				
Option Slot #3 Transmitting Current Batch Amount	bit 2				
Option Slot #3 Transmitting Current Totalized Weight	bit 3				
Option Slot #4 Transmitting Rate-of-Change	bit 4				
Option Slot #4 Transmitting Current Gross Weight	bit 5				
Option Slot #4 Transmitting Current Batch Amount	bit 6				
Option Slot #4 Transmitting Current Totalized Weight	bit 7				
Zero Calibration Value for Card #3: A binary value		2	1	4	2
Span Calibration Value for Card #3: A binary value		2	3	4	6
Zero Calibration Value for Card #4: A binary value		2	5	4	10
Span Calibration Value for Card #4: A binary value		2	7	4	14
Total Words/Bytes		9		18	

NOTE: *Valid data must be entered for both cards, even if only one is installed. This can be avoided by using Operator Selectable Writes. (See Chapter 7)*

Block Write Command Number 57: Remote Setpoint Input					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Write Number 57 (Hex 39)	LSB	0.5	0	1	0
Reserved for future use	MSB	0.5		1	1
Low Setpoint Input Value: A binary rate value		2	1	4	2
High Setpoint Input Value: A binary rate value		2	3	4	6
Number of Averages of Remote Input: A value from 1 to 20		1	5	2	10
Low Input Control threshold: A binary rate value in Mass Units/ Minute		2	6	4	12
High Input Control threshold: A binary rate value in Mass Units/ Minute		2	8	4	16
total Words/Bytes		10		20	

Block Write Command Number 58: Rate Calibration					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Write Number 58 (Hex 3A)	LSB	0.5	0	1	0
Reserved for future use	MSB	0.5		1	1
Rate Calibration Low Percentage: A binary value representing from 0.00% - 99.9%		1	1	2	2
Rate Calibration High Percentage: A binary value representing from 0.00% - 99.9%]		1	2	2	4
Actual Rate-of-Change at Low Percentage: A binary rate value		2	3	4	6
Actual Rate-of-Change at High Percentage: A binary rate value		2	5	4	10
Pause Time: < 999		1	7	2	14
Prime Time: < 999		1	8	2	16
Feed Time: ≥ 30 < 999		1	9	2	18
Total Words/Bytes		10		20	

CAUTION **BLOCK 59 WRITE MUST BE WITHIN RATE CALIBRATION VALUES OR THE UNIT MAY NEED TO BE RESET.**

Block Write Command Number 59: Status, Force functions, Weight and Rate Parameters					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Write Number 59 (Hex 3B)	LSB	0.5	0	1	0
Reserved for future use	MSB	0.5		1	1
Setpoint Mode: 1 - Rate Setpoint, Batch 2 - Manual, Batch 3 - Rate, Continuous 4 - Manual Continuous 5 - Remote, Batch 6 - Remote, Continuous	LSB	0.5	1	1	2
Force Relay Outputs: Reserved for future use Reserved for future use Reserved for future use (Batch Complete) In Rate Exception Control (REC) Mode Ingredient On/Off Shutoff Output Alarm Output Reserved for future use (Refill)	MSB bit 0 bit 1 bit 2 bit 3 bit 4 bit 5 bit 6 bit 7	0.5		1	3
Force Remote Functions: Force Refills * Write Remote Setpoint Print Screen to Standard Serial Port Clear Alarm Abort Clear Total Start Pause	LSB bit 0 bit 1 bit 2 bit 3 bit 4 bit 5 bit 6 bit 7	0.5	2	1	4
Reserved for future use		0.5		1	5
Rate-of-Change Setpoint (Within High and Low Calibration Limits)	MSB	2	3	4	6
Batch Amount Setpoint: > 0 <99999		2	5	4	10
Manual Percent Control Output: 1 - 999		1	7	2	14
Total Words/Bytes		8		16	

NOTE: ** Do not force a refill while in hold mode.*

Block Write Command Number 62: Save/Restore Location					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Write Number 62 (Hex 3E)	LSB	0.5	0	1	0
Reserved for future use	MSB	0.5		1	1
Save Location (1-12)	LSB	0.5	1	1	2
Restore Location (1 - 12)	MSB	0.5		1	3
Total Words/Bytes		2		4	

Block Write Command Number 80: Select Write Data					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Write Number 80 (Hex 50)		1	0	1	0
Select Write Type	Value			1	1
Block Write (Defaults to block #10 Weight and Rate Parameters)	0				
Selectable Write	1				
Enter block number (only one) of Selectable Parameter number* (Repeat for all selected parameter number)					
FF (End)					
* Note: Be sure to go over the byte limit of the Master					
Note: Parameter #200 (C8 Hex) is an empty byte. This can be used for word alignment.					

Block Write Command Number 81: Select Write Data					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Write Number 81 (Hex 51)	LSB	0.5	0	1	0
First Parameter Selected	MSB	0.5	1	1	1
Second Parameter Selected	LSB	0.5	:	1	2
:	:	0.5	:	:	:
:	:	0.5	:	:	:
:	:	0.5	:	:	:
Last Parameter Selected	Varies	0.5	Varies	1	Varies
FF(End)	Varies	0.5	Varies	1	Varies
Note: Be sure not to over the byte limit of the Master					
Note: Parameter #200 (C8 Hex) is an empty byte. This can be used for word alignment					

Block Write Command Number 82: Write Data Using Selectable Definition from Block 81					
Byte Definitions	Byte Pos.	# Words	Start Word	# Bytes	Start Byte
Block Write Number 82 (Hex 52)	LSB	0.5	0	1	0
Data for First Parameter	MSB	Varies	Varies	Varies	Varies
Data for Second Parameter	Varies	Varies	Varies	Varies	Varies
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
Data for Last Parameter	Varies	Varies	Varies	Varies	Varies

CHAPTER 6 - SELECTABLE READS

About Chapter 6

All information contained in Chapter 6 pertains to Selectable Read Commands for the PROFIBUS Interface Option. It is very important that programmers and users be familiar with this chapter before operating the PROFIBUS Interface Option.

Overview of Transfer Commands

1. Profibus Interface Card maximum buffer size: 112 byte buffer
2. Siemens PLC

    a. TI 505 Series PLCs

    - Requires the Field Interface Module (FIM) to communicate over PROFIBUS.
    - Can continually exchange up to 32 words or 64 bytes for both PLC input and output with each slave device.

    b. S5 Series PLCs

    - Requires IM 308C Module to communicate over PROFIBUS.
    - Can continually exchange up to 244 bytes for PLC input and output with each slave device.

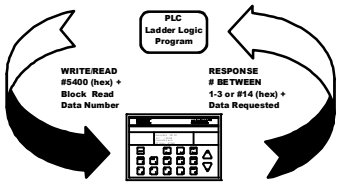
    c. S7 Series PLC

    - Profibus ready, does not require additional modules.
    - Can Continually exchange up to 244 bytes for PLC input and output with each slave device.

3. Allen-Bradley PLC5 Series

    - Requires PROFIBUS DP module to communicate over Profibus.
    - Can continually exchange up to 244 bytes for both PLC Input and Output with each slave device.

Overview of Selectable Transfer Commands



- It is important to keep in mind that the amount of bytes that can be transferred is determined by the Master PLC not the Profibus interface option.
- When using the HI 2160RC Profibus interface, the user can select the Read Data Summaries and Write Commands they require. However, the amount of bytes that can be transferred is dependent on the data transfer capability of the Master being used.
- By sending the proper commands to the HI 2160RC Rate Controller, the Master can specify which weight rate parameters and/or status bits should be provided.

- The ladder logic program provides the Master with the ability to read and write weight and rate data by referencing the Profibus address, the parameter numbers and number of bytes.

NOTE: *The decimal point is not included in values transferred. The decimal position is a separate parameter.*

Detailed Data Set for Selectable Read(s)

- The Selectable Read data to be input to the Master is always initiated by a Block Write Command designating the parameter number that the HI 2160RC^{PLUS} Rate Controller will send to the Master.

NOTE: *If your Master Device does not have built in Profibus diagnostic capability set up the Response/Error "0" diagnostics first, (See Chapter 4) before proceeding. The write "0" must be set before entering a block write command so that the verification process can determine if the first block write command sent is valid or not.*

- The rate controller receives the parameter number command from the Master, verifies that the parameter number is correct, processes the weight and rate data and prepares a response byte (an error code response number) to the Master's command.

NOTE: *Changes to Block Writes/Charts should be made in program mode.*

NOTE: *To prevent errors and erroneous data from being sent to the HI 2160RC^{PLUS} Rate Controller in run mode, follow the procedures below:*

1.Set the Block Number to "0".
2.Write the new parameter to the output buffer.
3.Change the Block Number from "0" to the new number.

Selectable Read Command Setup Procedures

- Selectable Read Data use Block Write Number 80 (50 hex). Block Read number 20 (14 hex) is returned as an input to the PLC.
- Block write number 80 allows the user to select the read data summaries desired, and they are returned in Operator Selectable Read block 20.

Block Write Command Number 80: Select Block Read Data Byte Definitions:
Block Write Number 80 (Hex 50) Select Read Type Selectable Read Value 1 Enter parameter number (repeat parameter numbers but do not exceed word/ byte limit of the PLC) FF (End)

Operator Selectable Read Data Number 20 Byte Definitions:
Operator Selectable Read Data Number 20 (14 Hex) Unused Byte 00 Reads operator selectable commands setup in Block Write Number 80 (Hex)

WARNING

FULL WORD VARIABLES MUST BEGIN ON WORD BOUNDARIES, WHEN TRANSFERRING OPERATOR SELECTABLE COMMANDS OR DATA. A PARAMETER NUMBER OF 200 (HEX C8) INDICATES TO SKIP A BYTE. SEE EXAMPLE BELOW.

- To do a selectable read in the 2160 is a two step process:

  1. Tell the rate controller which parameters you want to read by using Block Write #80 (50 Hex).
  2. Do a Block Read #20 (14 Hex).

- When you list the parameters, you actually define a new block as Block Read #20 (14 Hex). Then you can treat it like any other Block Read.

NOTE: *If the unit is powered down and powered up, you will need to re-define the Selectable Block Read again before using it.*

- Example Output from the PLC. In this example indicator status 2 is desired. Indicator status 1, is used so that Tare Value starts at a word boundary:

Byte	Hex#	Description
Byte 0	50	Block Write Number
Byte 1	01	Selectable Read
Byte 2	38	Alarm Status
Byte 3	C8	Skip Byte Indicator
Byte 4	3D	Gross Weight
Byte 5	FF	END

- Example Input to the PLC, indicates the data returned to the PLC from the output above.

Byte	Hex#	Description
Byte 0	14	Block Read Number
Byte 1	00	Unused Byte
Byte 2	21	Alarm Status Value, indicates low rate alarm and batch tolerance alarm
Byte 3	00	Skipped Byte used as place holder
Byte 4-7	00	Gross Weight Value

Byte	Hex#	Description
	00	Indicates Gross Weight = 100 (hex)
	10	
	00	

NOTE: *For outputs from the PLC "00" cannot be used to align word boundaries, because it returns two bytes.*

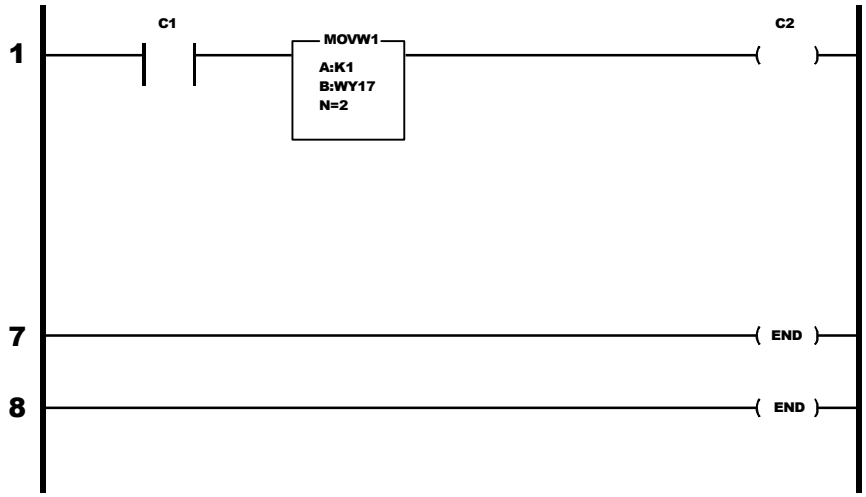
Selectable Read Example

The following example is to setup read Gross Weight, parameter #3D. The values are Hex Values

1. Place a zero (0) in WY17 - To prevent misinterpretation of parameters entered.
2. Place 3DFF in WY18 - # parameter for gross weight and FF ends parameter list.
3. Place 5001 in WY17 - Tells unit to do selectable read of parameters listed.
4. Place zero (0) in WY17 - To prevent misinterpretation of parameters entered.
5. Place 1400 in WY18 - Parameter for Block Read #14.
6. Place 5000 in WY17 - Tells unit to do Block Read.

Unit should return:

WX1 will contain 1400 as Block Read Number.
WX2 & WX3 will contain Gross Weight (Parameter 3D).



Selectable Read Data

Scale Calibration Parameters

Scale Calibration Parameters	# Words	# Bytes	Parameter #	Hex Number
Mass Units Selected 0 = OZS bit 0 1 = TNS bit 1 2 = KGS bit 2 3 = GRM bit 3 4 = LBS bit 4 5 = GLS bit 5 6 = LTR bit 6 7 = MLT bit 7	0.5	1	1	1
Time Units Selected A value of 0 to 2 (0 = SEC, 1 = MIN, 2 = HR)	0.5	1	2	2
Decimal Point for Rate and Weight A binary value from 0 to 4 indicating the number of places to the right of the decimal.	0.5	1	3	3
Decimal Point for Batch Amount A binary value from 0 to 4 indicating the number of places to the right of the decimal. The value must be ≤ the decimal point value for rate and weight.	0.5	1	4	4
Decimal Point for Totalized Weight A binary value from 0 to 4 indicating the number of places to the right of the decimal. The value must be ≤ to the decimal point value for rate and weight. Number of C2 load cells.	0.5	1	5	5
C2 Loadcells	0.5	1	6	6
Display Graduation Size (“Count by”): A value of 1, 2, 5, 10, 20, 50, 100, 200 or 500	1	2	7	7
Span Weight Value (Test Weight for Calibration): A 20 bit number in proper integer format or C2 Reference Point if calibrated in C2	2	4	8	8
Sticker Value	2	4	9	9

Tuning and Control

Tuning and Control	# Words	# Bytes	Parameter #	Hex Number
Enable Bits Rate Exception Control (REC) Shutoff: (0 = No, 1 = Yes) bit 0 Reserved for future use bit 1 Reserved for future use bit 2 Reserved for future use bit 3 Reserved for future use bit 4 Reserved for future use bit 5 Reserved for future use bit 6 Reserved for future use bit 7	0.5	1	10	A
Rate-of-Change Timebase Evaluation Period = A value of 0-15 from list below: 0 = 1 second 5 = 6 seconds 10 = 20 seconds 1 = 2 seconds 6 = 8 seconds 11 = 30 seconds 2 = 3 seconds 7 = 10 seconds 12 = 40 seconds 3 = 4 seconds 8 = 12 seconds 13 = 50 seconds 4 = 5 seconds 9 = 15 seconds 14 = 60 seconds 15 = 120 seconds	1	2	11	B
Integration Constant: A binary value	1	2	12	C
Proportional Constant: A binary value	1	2	13	D
Derivative Constant: A binary value	1	2	14	E
Control Output Low Limit: A percentage of full scale output from 0% - 99%	0.5	1	15	F
Control Output High Limit: A percentage of full scale output from 0% - 99%	0.5	1	16	10
Number of Readings Averaged: A value from 1 - 200	1	2	17	11
Rate Exception Level (REC): A value from 0.0 - 10.0	1	2	18	12
Rate Exception Time (REC time): A value from 0 - 999	1	2	19	13
Preact Correction: A value from 0 - 999	1	2	20	14

NOTE: *The Preact does not function in batch mode.*

Auto Refill

Auto Refill	# Words	# Bytes	Parameter #	Hex Number
Auto Refill Enable Bits Enable Auto Refill: (0 = No, 1 = Yes) Initial Fill: (0 = No, 1 = Yes) Reserved for future use Reserved for future use Reserved for future use Reserved for future use Reserved for future use Reserved for future use	0.5	1	21	15
Start Refill Weight: A binary weight value	2	4	22	16
Stop Refill Weight: A binary weight value	2	4	23	17
Low Refill Shutoff Weight: A binary weight value	2	4	24	18
High Refill Shutoff Weight: A binary weight value	2	4	25	19
Refill Correction Factor: A value from -10.0 to +10.0	1	2	26	1A

Rate Tolerances

Rate Tolerances	# Words	# Bytes	Parameter #	Hex Number
Low Rate Alarm Value: A binary rate delta value	2	4	27	16
High Rate Alarm Value: A binary rate delta value	2	4	28	1C
Low Rate Shutoff Value: A binary rate value	2	4	29	1D
High Rate Shutoff Value: A binary rate value	2	4	30	1E
Alarm time: A binary value of seconds 0 - 999	1	2	31	1F
Shutoff Control Output: A binary value representing 0% - 100%	1	2	32	20

Optional Analog Outputs Slots 1 & 2

Optional Analog Outputs Slots 1 & 2		# Words	# Bytes	Parameter #	Hex Number
Option Slot #1 Transmitting Rate-of-Change	bit 0	1	2	33	21
Option Slot #1 Transmitting Current Gross Weight	bit 1				
Option Slot #1 Transmitting Current Batch Weight	bit 2				
Option Slot #1 Transmitting Current Totalized Weight	bit 3				
Option Slot #2 Transmitting Rate-of-Change	bit 4				
Option Slot #2 Transmitting Current Gross Weight	bit 5				
Option Slot #2 Transmitting Current Batch Weight	bit 6				
Option Slot #2 Transmitting Current Totalized Weight	bit 7				
Zero Calibration Value for Option Slot #1: A binary value		2	4	34	22
Span Calibration Value for Option Slot #1: A binary value		2	4	35	23
Zero Calibration Value for Option Slot #2: A binary value		2	4	36	24
Span Calibration Value for Option Slot #2: A binary value		2	4	37	25

Optional Analog Outputs Slots 3 & 4

Optional Analog Outputs Slots 3 & 4		# Words	# Bytes	Parameter #	Hex Number
Option Slot #3 Transmitting Rate-of-Change	bit 0	1	2	38	26
Option Slot #3 Transmitting Current Gross Weight	bit 1				
Option Slot #3 Transmitting Current Batch Weight	bit 2				
Option Slot #3 Transmitting Current Totalized Weight	bit 3				
Option Slot #4 Transmitting Rate-of-Change	bit 4				
Option Slot #4 Transmitting Current Gross Weight	bit 5				
Option Slot #4 Transmitting Current Batch Weight	bit 6				
Option Slot #4 Transmitting Current Totalized Weight	bit 7				
Zero Calibration Value for Option Slot #3: A binary value		2	4	39	27
Span Calibration Value for Option Slot #3: A binary value		2	4	40	28
Zero Calibration Value for Option Slot #4: A binary value		2	4	41	29
Span Calibration Value for Option Slot #4: A binary value		2	4	42	2A

Remote Setpoint Input

Remote Setpoint Input	# Words	# Bytes	Parameter #	Hex Number
Low Setpoint Input Value: A binary rate value	2	4	43	26
High Setpoint Input Value: A binary rate value	2	4	44	2C
Number of Averages of Remote Input: A value from 1 - 20	1	2	45	2D
Low Input Control Threshold: A binary rate value	2	4	46	2E
High Input Control Threshold: A binary rate value	2	4	47	2F

Rate Calibration

Rate Calibration	# Words	# Bytes	Parameter #	Hex Number
Rate Calibration Low Percentage: A binary value representing from 0.0% to 99.9%	1	2	48	30
Rate Calibration High Percentage: A binary value representing from 0.0% to 99.9%	1	2	49	31
Actual Rate-of-Change at Low Percentage: A binary rate value	2	4	50	32
Actual Rate-of-Change at High Percentage: A binary rate value	2	4	51	33
Pause Time: < 999	1	2	52	34
Prime Time: < 999	1	2	53	35
Feed Time: ≥ 30 < 999	1	2	54	36

Status Parameters

Status Parameters		# Words	# Bytes	Parameter #	Hex Number
Setpoint Mode 1 - Rate Setpoint, Batch 2 - Manual, Batch 3 - Rate, Continuous 4 - Manual, Continuous 5 - Remote Batch 6 - Remote, Continuous		0.5	1	55	37
Alarm Status 1 - Low Rate Alarm 2 - High Rate Alarm 3 - Low Shutoff Alarm 4 - High Shutoff Alarm 5 - Batch Tolerance Alarm 6 - Refill Low Shutoff Alarm 7 - Refill High Shutoff Alarm		0.5	1	56	38
Reserved for future use					
External Dipswitch Status Enable Multi-Drop (#1) Disable Screen Print (#2) Disable Batch Report (#3) Enable contINuous Scale Output to the Serial Port (#4) Ignore Incoming Checksum (#5) Off = 1 SEC, On = 1/20 SEC Transmission (#6) Off = Gross Weight, On = Counts (#7) Reserved for future use		0.5	1	57	39
Internal Dipswitch Status		0.5	1	58	3A
Display Remote Input Instead of Rate (Dipswitch #1)	bit 0				
Reserved for future use (Toggle between averaged and raw rate display (Dipswitch #2)	bit 1				
Reserved for future use (Dipswitch #3)	bit 2				
Reserved for future use(Dipswitch #4)	bit 3				
Reserved for future use(Dipswitch #5)	bit 4				
Reserved for future use(Dipswitch #6)	bit 5				
Reserved for future use(Dipswitch #7)	bit 6				
Reserved for future use(Dipswitch #8)	bit 7				
Relay Output Status		0.5	1	59	3B
Reserved for future use	bit 0				
Reserved for future use	bit 1				
Batch Complete	bit 2				
In Rate Exception Control (REC) Mode	bit 3				
Ingredient On/Off	bit 4				
Shutoff Output	bit 5				
Alarm Output	bit 6				
Refill Output	bit 7				
Remote Function Status		0.5		60	3C
Force Refill (Pin 7)	bit 0				
Read Remote Setpoint (Pin 8)	bit 1				
Print Screen to Standard Serial Port (Pin 5)	bit 2				
Reserved for future use (Pin 6)	bit 3				
Abort Input (Pin 3)	bit 4				
Clear total Input (Pin 4)	bit 5				
Start Input (Pin 1)	bit 6				
Pause Input (Pin 2)	bit 7				

Weight and Rate Parameters

Weight and Rate Parameters	# Words	# Bytes	Parameter #	Hex Number
Gross Weight: A binary value	2	4	61	3D
Rate-of-Change (Heavily Averaged)	2	4	62	3E
Rate-of-Change (Lightly Averaged)	2	4	63	3F
Rate-of-Change Setpoint	2	4	64	40
Accumulated Batch Weight	2	4	65	41
Totalized Weight	2	4	66	42
Batch Amount Setpoint	2	4	67	43
Percent Control Output	1	2	68	44

Diagnostics

Diagnostics	# Words	# Bytes	Parameter #	Hex Number
Analog to Digital Converter Counts at Zero Weight Calibration: A binary value	2	4	69	45
Analog to Digital Converter Counts at Span Weight Calibration: A binary value	2	4	70	46
Counts per Display Graduation: A binary value	2	4	71	47
Current Analog to Digital Converter Counts: A binary value	2	4	72	48
WAVERSAVER Jumper Setting: A value from 0 - 4	1	2	73	49

Save/Restore Location

Save/Restore Location	# Words	# Bytes	Parameter #	Hex Number
Restore Location	0.5	1	74	4A
Save Location	0.5	1	75	4B

Skip Byte

Skip Byte	# Words	# Bytes	Parameter #	Hex Number
Indicates that a blank byte (0 value) will be inserted as a place holder	0.5	1	200	C8

Error Code

Error Code	# Words	# Bytes	Parameter #	Hex Number
Error Code from last write command	0.5	1	0	0

CHAPTER 7 - SELECTABLE WRITES

About Chapter 7

All information contained in Chapter 7 pertains to Selectable Write Commands for the Profibus Interface Option. It is very important that programmers and users be familiar with this chapter before operating the Profibus Interface Option.

Transfer Commands

Overview of Transfer Commands

1. Profibus Interface Card maximum buffer size:112 byte buffer
2. Siemens PLC

    a. TI 505 Series PLCs

    - Requires the Field Interface Module (FIM) to communicate over Profibus.
    - Can continually exchange up to 32 words or 64 bytes for both PLC input and output with each slave device.

    b. S5 Series PLCs

    - Requires IM 308C Module to communicate over Profibus.
    - Can continually exchange up to 244 bytes for PLC input and output with each slave device.

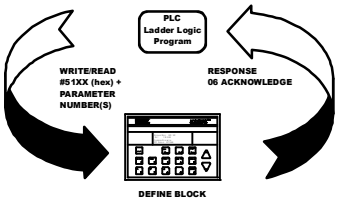
    c. S7 Series PLC

    - Profibus ready, does not require additional modules.
    - Can Continually exchange up to 244 bytes for PLC input and output with each slave device.

3. Allen-Bradley PLC5 Series

    a. Requires Profibus DP module to communicate over Profibus.
    b. Can continually exchange up to 244 bytes for both PLC Input and Output with each slave device.

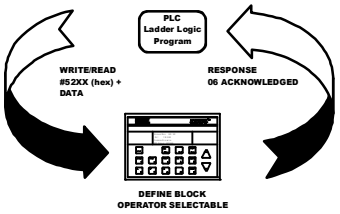
Overview of Selectable Transfer Commands



- It is important to keep in mind that the amount of bytes that can be transferred is determined by the Master not the Profibus Interface Option.
- When using the HI 2160RC^{PLUS} PROFIBUS Interface, the user can select the Read Data Summaries and Write Commands they require. However, the amount of bytes that can be transferred is dependent on the data transfer capability of the Master being used.
- By sending the proper commands to the HI 2160RC^{PLUS} Rate Controller, the Master can specify which weighing parameters and/or status bits should be provided.

- The ladder logic program provides the Master with the ability to read and write weight data by referencing the PROFIBUS address, the parameter numbers and number of bytes.

NOTE: *The decimal point is not included in values transferred. The decimal position is a separate parameter.*



Detailed Command Set for Selectable Writes

NOTE: *We recommend that front panel functions be controlled through the Profibus network and that the front panel control not be used during communications.*

- All write commands are initiated by the Master using a ladder logic program to send the desired parameter number(s) to the HI 2160RC Rate Controller via the Profibus Interface Card. The rate controller receives a parameter number command, verifies that the parameter number is correct, processes the rate data and prepares a response byte (an error code response number) to the PLCs command.

NOTE: *If your Master Device does not have built in Profibus diagnostic capability set up the Response/Error "0" diagnostics first, (See Chapter 4) before proceeding. The write "0" must be set before entering a selectable write command so that the verification process can determine if the first selectable write command sent is valid or not.*

NOTE: *The write "0" should be the first command written, to ensure that the error codes are displayed on the Master screen.*

Selectable Write Command Setup Procedures

- Use Block Write Number 81 - Personalized Selection of Write Commands to define the selectable block
- This block allows the user to select as many write commands up to the byte limit of the PLC.
- Use Block Write Number 82 - Personalized Write to transfer the data for the block defined in the previous block write #81.

Block Write Command Number 81: Personalized Selection of Write Commands Byte Definitions:
Block Write Number 81 (Hex 51) Enter Parameter Number (Repeat for all Write Commands, but do not exceed PLC word/byte limit) FF(End)

Block Write Command Number 82: Data for Pre-defined Selectable Write Byte Definitions:
Block Write Number 82 (Hex 52) (For all data defined in the last Block Write #81)

WARNING

FULL WORD VARIABLES MUST BEGIN ON WORD BOUNDARIES, WHEN TRANSFERRING OPERATOR SELECTABLE COMMANDS OR DATA. A PARAMETER NUMBER OF 200 (C8 HEX) INDICATES TO SKIP A BYTE) SEE EXAMPLE BELOW

Example Output from the Master:

Byte	Hex#	Description
Byte 0	51	Block Write Number
Byte 1	C8	Skip Byte
Byte 2	0C	Integration Constant
Byte 3	0D	Proportional Constant
Byte 4	0E	Derivative Constant
Byte 5	FF	End of Block

Followed By:

Byte	Hex#	Description
Byte 0	52	Block Write Number
Byte 1	00	Skipped Byte for Word Alignment
Byte 2	00	
Byte 3	40	Integration Constant Hex 40
Byte 4	00	
Byte 5	80	Proportional Constant Hex 80
Byte 6	00	
Byte 7	20	Derivative Constant Hex 20

Operator Selectable Write Example

- The following example is a setup to download the number of averages.

NOTE: *Any legal number of averages value can be entered into K memory.*

- When C1 is activated the Move Word (MOVW1) downloads the information to the rate controller using WY17 through WY31.

  K1:Contains hex 51C8 (Selects Block Write #81 and skips a byte).
  K2:11FF - (parameter #17 - Number of Averages and ends list of parameters)

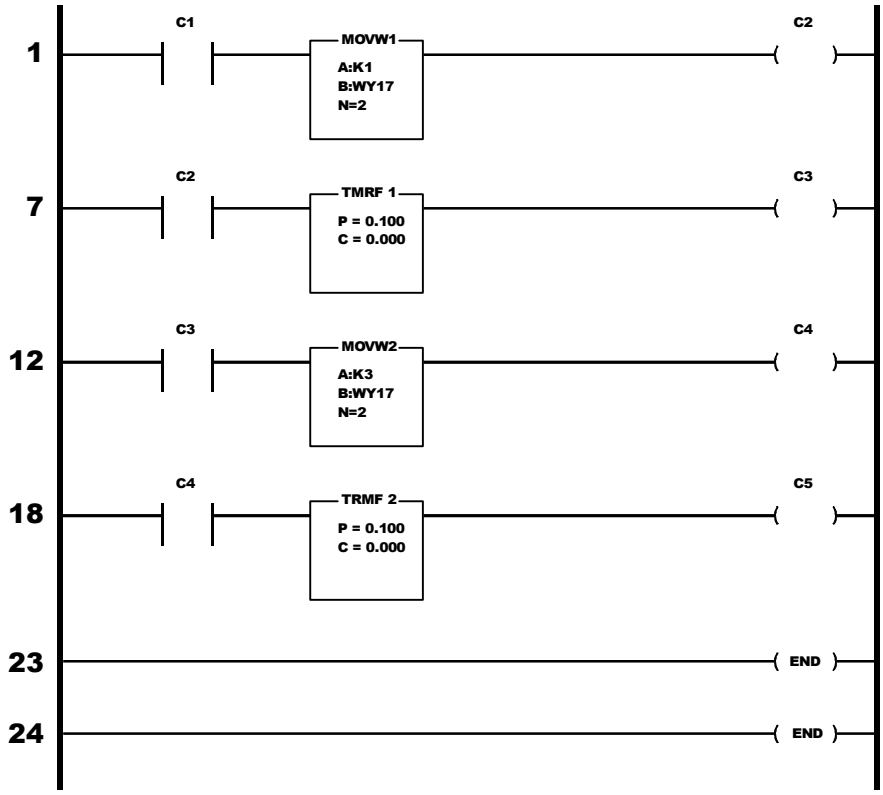
K3:Contains hex 5200 (Selectable Block Write #82)
K4:Contains number of averages to be sent

- C1: Starts the program

  MOVW1:Downloads the Selectable Write definition information in K1-K2 into WY17-WY18 (rate controller)
  MOVW2:Downloads the Selectable Write data in K3-K4 into WY17- WY18 (rate controller)

- C1:Program runs when C1 is enabled

  MOVW1:Transfers data from K1 & K2 into Wy17 & WY18
  TMRF1:100 millisecond delay to allow the HI 2160RC to complete one full scan
  MOVW2:Transfers data from K3 & K4 into WY17 & WY18
  TMRF2:100 millisecond delay to allow the HI 2160RC^{PLUS} to complete one full scan.



Selectable Write Commands

Scale Calibration Parameters

Scale Calibration Parameters	# Words	# Bytes	Parameter #	Hex Number
Mass Units Selected 0 = OZS 1 = TNS 2 = KGS 3 = GRM 4 = LBS 5 = GLS 6 = LTR 7 = MLT	0.5	1	1	1
Time Units Selected A value of 0 to 2 (0 = SEC, 1 = MIN, 2 = HR)	0.5	1	2	2
Decimal Point for Rate and Weight A binary value from 0 to 4 indicating the number of places to the right of the decimal.	0.5	1	3	3
Decimal Point for Batch Amount A binary value from 0 to 4 indicating the number of places to the right of the decimal. The value must be ≤ the decimal point value for rate and weight.	0.5	1	4	4
Decimal Point for Totalized Weight A binary value from 0 to 4 indicating the number of places to the right of the decimal. The value must be ≤ to the decimal point value for rate and weight.	0.5	1	5	5
Load Sensor Count (C2 Only) Verification (See Note Below)	0.5	1	6	6
Display Graduation Size (“Count by”): A value of 1, 2, 5, 10, 20, 50, 100, 200 or 500	1	2	7	7
Span Weight Value (Test Weight for Calibration or Reference point for C2): A 20 bit number in proper integer format	2	4	8	8
Sticker Value	2	4	9	9

NOTE: *For selectable write, you must have parameter #6 before parameter #8*

Tuning and Control

Tuning and Control	# Words	# Bytes	Parameter #	Hex Number
Enable Bits Rate Exception Control (REC) Shutoff: (0 = No, 1 = Yes) bit 0 Reserved for future use bit 1 Reserved for future use bit 2 Reserved for future use bit 3 Reserved for future use bit 4 Reserved for future use bit 5 Reserved for future use bit 6 Reserved for future use bit 7	0.5	1	10	A
Rate-of-Change Timebase Evaluation Period = A value of 0-15 from list below: 0 = 1 second 5 = 6 seconds 10 = 20 seconds 1 = 2 seconds 6 = 8 seconds 11 = 30 seconds 2 = 3 seconds 7 = 10 seconds 12 = 40 seconds 3 = 4 seconds 8 = 12 seconds 13 = 50 seconds 4 = 5 seconds 9 = 15 seconds 14 = 60 seconds 15 = 120 seconds	1	2	11	B
Integration Constant: A binary value	1	2	12	C
Proportional Constant: A binary value	1	2	13	D
Derivative Constant: A binary value	1	2	14	E
Control Output Low Limit: A percentage of full scale output from 0% - 99%	0.5	1	15	F
Control Output High Limit: A percentage of full scale output from 0% - 99%	0.5	1	16	10
Number of Readings Averaged: A value from 1 - 200	1	2	17	11
Rate Exception Level (REC): A value from 0.0 - 10.0	1	2	18	12
Rate Exception Time (REC time): A value from 0 - 999	1	2	19	13
Preact Correction: A value from 0 - 999	1	2	20	14

Auto Refill

Auto Refill	# Words	# Bytes	Parameter #	Hex Number
Auto Refill Enable Bits Enable Auto Refill: (0 = No, 1 = Yes) Initial Fill: (0 = No, 1 = Yes) Reserved for future use Reserved for future use Reserved for future use Reserved for future use Reserved for future use Reserved for future use	0.5	1	21	15
Start Refill Weight: A binary weight value	2	4	22	16
Stop Refill Weight: A binary weight value	2	4	23	17
Low Refill Shutoff Weight: A weight value < start refill weight value	2	4	24	18
High Refill Shutoff Weight: A weight value > stop refill weight value	2	4	25	19
Refill Correction Factor: A value from -10.0 to +10.0	1	2	26	1A

Rate Tolerances

Rate Tolerances	# Words	# Bytes	Parameter #	Hex Number
Low Rate Alarm Value: A binary rate delta value (0.000 - 999.999)	2	4	27	16
High Rate Alarm Value: A binary rate delta value (0.000 - 999.999)	2	4	28	1C
Low Rate Shutoff Value: A binary rate value (0.000 - 999.999)	2	4	29	1D
High Rate Shutoff Value: A binary rate value (0.000 - 999.999)	2	4	30	1E
Alarm time: A binary value of seconds (0 - 999)	1	2	31	1F
Shutoff Control Output: A binary value representing 0% to 100%	1	2	32	20

Optional Analog Outputs Slots 1 & 2

Optional Analog Outputs Slots 1 & 2	# Words	# Bytes	Parameter #	Hex Number
Type of Parameter being transferred (Appropriate bits set to indicate what parameter is being transmitted from each of the three optional analog output cards: Option Slot #1 Transmitting Rate-of-Change bit 0 Option Slot #1 Transmitting Current Gross Weight bit 1 Option Slot #1 Transmitting Current Batch Weight bit 2 Option Slot #1 Transmitting Current Totalized Weight bit 3 Option Slot #2 Transmitting Rate-of-Change bit 4 Option Slot #2 Transmitting Current Gross Weight bit 5 Option Slot #2 Transmitting Current Batch Weight bit 6 Option Slot #2 Transmitting Current Totalized Weight bit 7	0.5	1	33	21
Zero Calibration Value for Option Slot #1: A binary value	2	4	34	22
Span Calibration Value for Option Slot #1: A binary value	2	4	35	23
Zero Calibration Value for Option Slot #2: A binary value	2	4	36	24
Span Calibration Value for Option Slot #2: A binary value	2	4	37	25

Optional Analog Outputs Slots 3 & 4

Optional Analog Outputs Slots 3 & 4	# Words	# Bytes	Parameter #	Hex Number
Type of Parameter being transferred (Appropriate bits set to indicate what parameter is being transmitted from each of the three optional analog output cards: Option Slot #3 Transmitting Rate-of-Change bit 0 Option Slot #3 Transmitting Current Gross Weight bit 1 Option Slot #3 Transmitting Current Batch Weight bit 2 Option Slot #3 Transmitting Current Totalized Weight bit 3 Option Slot #4 Transmitting Rate-of-Change bit 4 Option Slot #4 Transmitting Current Gross Weight bit 5 Option Slot #4 Transmitting Current Batch Weight bit 6 Option Slot #4 Transmitting Current Totalized Weight bit 7	0.5	1	38	26
Zero Calibration Value for Option Slot #3: A binary value	2	4	39	27
Span Calibration Value for Option Slot #3: A binary value	2	4	40	28
Zero Calibration Value for Option Slot #4: A binary value	2	4	41	29
Span Calibration Value for Option Slot #4: A binary value	2	4	42	2A

Remote Setpoint Input

Remote Setpoint Input	# Words	# Bytes	Parameter #	Hex Number
Low Setpoint Input Value: A binary rate value	2	4	43	26
High Setpoint Input Value: A binary rate value	2	4	44	2C
Number of Averages of Remote Input: A value from 1 - 20	1	2	45	2D
Low Input Control Threshold: A binary rate value in Mass Units/ Minute	2	4	46	2E
High Input Control Threshold: A binary rate value in Mass Units/ Minute	2	4	47	2F

Rate Calibration

Rate Calibration	# Words	# Bytes	Parameter #	Hex Number
Rate Calibration Low Percentage: A binary value representing from 0.0% to 99.9%	1	2	48	30
Rate Calibration High Percentage: A binary value representing from 0.0% to 99.9%	1	2	49	31
Actual Rate-of-Change at Low Percentage: A binary rate value	2	4	50	32
Actual Rate-of-Change at High Percentage: A binary rate value	2	4	51	33
Pause Time: < 999	1	2	52	34
Prime Time: < 999	1	2	53	35
Feed Time: ≥ 30 < 999	1	2	54	36

Status, Force Functions, Weight and Rate Parameters

Status Parameters		# Words	# Bytes	Parameter #	Hex Number
Setpoint Mode* 1 - Rate Setpoint, Batch 2 - Manual, Batch 3 - Rate, Continuous 4 - Manual, Continuous 5 - Remote Batch 6 - Remote, Continuous		0.5	1	55	37
Force Relay Outputs		05	1	69	45
Reserved for future use	bit 0				
Reserved for future use	bit 1				
Reserved for future use (Batch Complete)	bit 2				
In Rate Exception Control (REC) Mode	bit 3				
Ingredient On/Off	bit 4				
Shutoff Output	bit 5				
Alarm Output	bit 6				
Reserved for future use (Refill)	bit 7				
Force Functions		0.5	1	60	3C
Force Refill**	bit 0				
Write Remote Setpoint	bit 1				
Print Screen to Standard Serial Point	bit 2				
Clear Alarm	bit 3				
Abort	bit 4				
Clear Total	bit 5				
Start	bit 6				
Pause	bit 7				
Rate-of-Change Setpoint (Within High and Low Calibration Limits)***		2	4	64	40
Batch Amount Setpoint: > 0 <999999		2	4	67	43
Manual Percent Control Output: 1 - 999		1	2	68	44

NOTE: **For selectable, must precede Parameter #64, 67, and/or 68*

NOTE: ***Do not force a refill while in hold mode.*

NOTE: ****Selectable 15, 16, 48, 49, 50, and 51 are used to determine minimum rate and maximum rate. To be correct, if used in same selectable block as Rate-of-change Setpoint they must be listed before ROC Setpoint.*

Save/Restore Location

Save/Restore Location	# Words	# Bytes	Parameter #	Hex Number
Restore Location	0.5	1	74	4A
Save Location	0.5	1	75	4B

Skip Byte Parameter

Skip Byte Parameter	# Words	# Bytes	Parameter #	Hex Number
Indicates that a blank byte (0 value) will be inserted as a place holder	0.5	1	200	C8

Block Write Command Number 80: Select Read Data

Block Write Command Number 80: Select Read Data		# Words	# Bytes	Parameter #	Hex Number
Block Write Number 80 (Hex 50)		0.5	1		
Select Write Type	Value				
Block Write (Defaults to block #10 Weight and Rate Parameters)	0				
Selectable Write	1				
Enter block number (only one) or selectable parameter number.* (Repeat for all selected parameter number) FF(End)					
* Note: Be sure not to go over the byte limit of the Master					
Note: Parameter #200 (C8 Hex) is an empty byte. This can be used for word alignment					

Block Write Command Number 81: Select Write Data

Block Write Command Number 81: Select Write Data		# Words	# Bytes	Parameter #	Hex Number
Block Write Number 81 (Hex 51)	LSB	0.5	1	200	C8
First Parameter Selected	MSB				
Second Parameter Selected	LSB				
:	:				
:	:				
:	:				
:	:				
Last Parameter Selected	Varies				
FF (End)	Varies				
Note: Be sure not to go over the byte limit of the master.					
Note: Parameter #200 (C8 Hex) is an empty byte. This can be used for word alignment.					

Block Write Command Number 82: Write Data Using Selectable Definition from Block 81

Block Write Command Number 82: Write Data Using Selectable Definition from Block 81		# Words	# Bytes	Parameter #	Hex Number
Block Read Number 82 (Hex 52)	LSB	0.5	1	200	C8
Data for First Parameter	MSB	Varies	1		
Data for Second Parameter	Varies	Varies	1		
:	:	:	1		
:	:	:	1		
:	:	:	1		
Data for Last Parameter	Varies	Varies	1		

CHAPTER 8 - TROUBLESHOOTING PROCEDURES

About Chapter 8

Chapter Eight consists of all the procedures for troubleshooting the electrical, mechanical and software of the PROFIBUS Interface Card in the event of a malfunction. All the information pertains to the diagnosis and repair of malfunctioning components.

Disassembly and Reassembly Notes and Cautions

- Always Disconnect the power cord before disassembling.
- Make sure that any disassembly is done in a clean, well ventilated, properly controlled static environment.
- Always make sure that the assemblies and sub-assemblies are well supported and insulated when doing any repairs on the Profibus Interface Card or the HI 2160RC Rate Controller.
- Place small fasteners, connectors and electrical parts in closed containers so as not to lose parts during reassembly.
- Read all the disassembly instructions before any disassembly begins. Be sure that you are familiar with the procedures. If any of the instructions for disassembly are unclear, contact **Hardy Instruments, Service Center for additional information and assistance.**
- Do not disconnect any electrical plug, connector or terminal unless an identification tag is present or one is attached. Always note where the connector or plug was attached to the electrical component or wiring harness.
- Always install complete hardware groups (Screws, Washers, Lock Washers, Spacers, Etc.) back to the original point of removal.
- Always replace broken or damaged modules or hardware immediately!
- Always check to be sure that no loose parts are sitting on printed circuit boards or electrical connectors or wires when disassembling or reassembling.
- Always protect printed circuit boards from electrostatic discharge (ESD). Always use approved ESD wrist straps and anti-static pads when working on the Profibus Interface Card.
- Always perform a final inspection after completing any reassembly to be sure that all fasteners are tight, all connectors are secure and there are no loose parts on the Profibus Interface Card or other PCB Cards in the HI 2160^{PLUS}RC.
- Always follow proper safety procedures when working on or around the Profibus Interface Card.

Trouble Shooting Guide

LED Does Not Come ON (See Fig. 8-1)

TROUBLE	PROBABLE CAUSE	REMEDY
LED does not come on.	No Power to the board.	Check power cord to see if it is plugged in or broken. Check power source to see if there is power to the outlet.

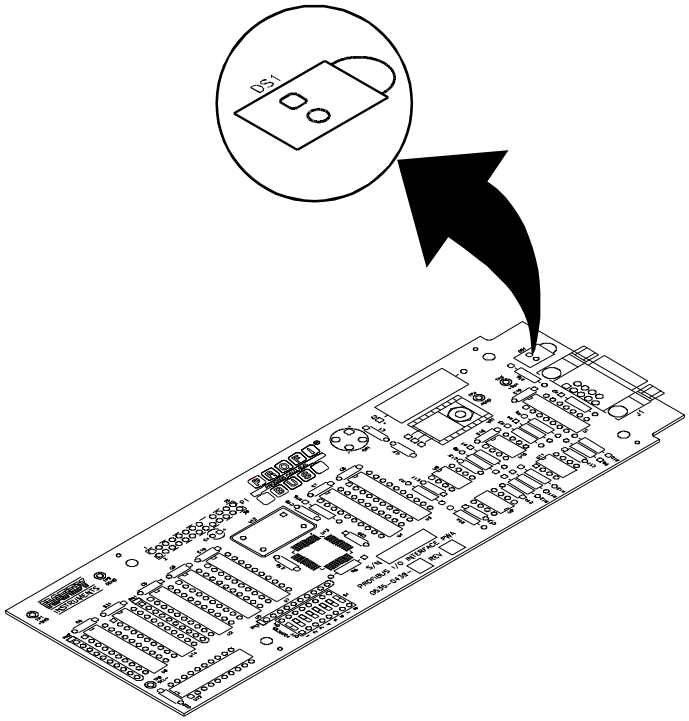


FIG. 8-1 PROFIBUS CARD INDICATOR LED

Self Test

The PROFIBUS I/O card will run a self test every time the HI 2160RC^{PLUS} boots up. The test results will not automatically appear on the screen. The information is displayed by accessing the Profibus I/O screen.

Accessing the Profibus I/O Display

Step 1. Press the Config. button.
Step 2. Press the down arrow until the Profibus I/O line appears on the display.
Step 3. Press the Start/Enter button.
Step 4. The error messages will now display. The following are the hardware test failures.
Step 5. For software test results see Status Indicators.

TROUBLE	PROBABLE CAUSE	REMEDY
PROFIBUS card not found.	Profibus PCB is plugged in incorrectly.	Remove the Profibus PCB and reinstall the card. Make sure that the pins are not bend or in the wrong slots on the connector.
Profi Fail Loopbk Message	Profibus PCB has failed.	Replace the Profibus Interface Card.
Profi Fail MemTest Message System failed the RAM test.	SPC-3 (Profibus) chip has failed. Note: The system passed the loop back test but failed the ram test.	Replace the Profibus Interface Card. Contact Hardy Instruments, Customer Service Department for Instructions.

Response/Error Code Setup (See Chapter 4)

List of Response/ Error Codes

Item #	Diagnostic Byte	Diagnostic Bit	Decimal Number	Hex Number	Description
1-8	7	N/A	N/A	N/A	Length of extended diagnostic data
1	8	1	06	06	Acknowledge good data received
2		2	21	15	Negative Acknowledge (NACK) - illegal command
3		3	01	01	Mass units out of range
4		4	02	02	Time units out of range
5		5	03	03	Decimal Point value out of range
6		6	04	04	Not a valid gradient value
7		7	05	05	Span weight must be positive and ≤ 99999
8		8	07	07	C2 Sensor count did not match number of cells
9	9	1	08	08	Invalid Timebase
10		2	09	09	K factor out of range
11		3	10	A	Control output error
12		4	11	B	Average out of range
13		5	12	C	REC level out of range
14		6	14	E	Attempt to disable REC with Auto-Refill enabled
15		7	15	F	REC time out of range
16		8	16	10	Preact correction out of range
17	10	1	17	11	C2 Refpnt < 0 or greater than scale capacity
18		2	18	12	Sticker value out of range

Item #	Diagnostic Byte	Diagnostic Bit	Decimal Number	Hex Number	Description
19		3	30	1E	Rate exception not enabled
20		4	32	20	Refill parameters out of range
21		5	34	22	Refill shutoff high setpoint out of range
22		6	35	23	Refill correction factor out of range
23		7	40	28	Rate alarm low setpoint out of range
24		8	41	29	Rate alarm high setpoint out of range
25	11	1	42	2A	Shutoff parameters out of range
26		2	44	2C	Alarm time out of range
27		3	45	2D	Shutoff percentage out of range
28		4	50	32	Analog output card not found
29		5	51	33	Negative values not allowed
30		6	52	34	Output 1 zero value out of range
31		7	53	35	Output 2 zero value out of range
32		8	54	36	Output 3 zero value out of range
33	12	1	55	37	Output 4 zero value out of range
34		2	56	38	Output 1 span value out of range
35		3	57	39	Output 2 span value out of range
36		4	58	3A	Output 3 span value out of range
37		5	59	3B	Output 4 span value out of range
38		6	65	41	Remote setpoint low ≥ setpoint high
39		7	66	42	Remote setpoint high out of range
40		8	67	43	Low closed loop limit ≥high closed loop limit
41	13	1	68	44	High closed loop limit out of range (after being converted to Mass/minute)
42		2	69	45	Average out of range
43		3	70	46	Negative values not accepted
44		4	71	47	Pause time out of range
45		5	72	48	Prime time out of range
46		6	73	49	Low rate calibration percentage ≥ high percentage
47		7	74	4A	High rate calibration percentage out of range
48		8	75	4B	Low rate calibration value ≥ high value
49	14	1	76	4C	High rate calibration value out of range
50		2	77	4D	Negative values not accepted
51		3	78	4E	Feedtime out of range
52		4	80	50	Invalid ROC setpoint
53		5	81	51	Invalid setpoint mode

Item #	Diagnostic Byte	Diagnostic Bit	Decimal Number	Hex Number	Description
54		6	83	53	Negative batch amount error
55		7	84	54	Output percentage value out of range
56		8	89	59	System must be off to run Auto Rate Cal
57	15	1	90	5A	Scale in motion
58		2	91	5B	Range between zero and span too small
59		3	92	5C	Attempt to set scale capacity at point that would exceed 30mV max input
60		4	93	5D	No C2 load sensors found
61		5	94	5E	Load sensor capacities or sensitivities do not match
62		6	95	5F	C2 checksum fails
63		7	96	60	Too many decimal points for the C2 value
64		8	97	61	Invalid selectable parameter

NOTE: *Writes are not allowed while scale is in calibration mode.*

NOTE: *The first 6 bytes of the diagnostic information is reserved for the master station address and the manufacturer's ID. Bytes 7-12 are used by the HI 2160RC^{PLUS}-B4 Profibus interface option to provide automatic response/error codes.*

Clearing The Profibus Diagnostic Error/Code Associated Bit(s)

- A separate bit is reserved for each response/error code. When a response/error occurs, an associated bit will be set to 1. This bit will remain set to 1 until it is cleared.
- Clearing the error/code associated bit procedures.
    - Operator Selectable Transfer, rerun the Write “0” command.
    - Block Transfer, rerun the Write “90” command.

NOTE: *Sending another command with valid parameters will correct the error. However, to clear the response/error code bits you must rerun the write “0” or “90” command, which clears the response/error code bits. Otherwise the error bit will always reflect the previous error.*

- To check if the associated bit(s) have been cleared. Read the response/error bits to see if they are zero. If they are not then the associated bit(s) have not been cleared. Verify to determine if the write “0” or “90” command was correct.

Profibus Status Indicators

Profibus Interface Card LED

- The Profibus Interface Card is fitted with a “Green LED” (See Fig 8-1) with the following indicators:
    - A solid green light = On Line/There is communication between the PLC/PC and the Profibus Interface Card.

- A flashing green light = Off Line/There is no communication between the PLC/PC and the Profibus Interface Card.

Software Test Passed

This display means that the hardware and software have passed the self test and the rate controller is operational. (See Fig. 8-2)

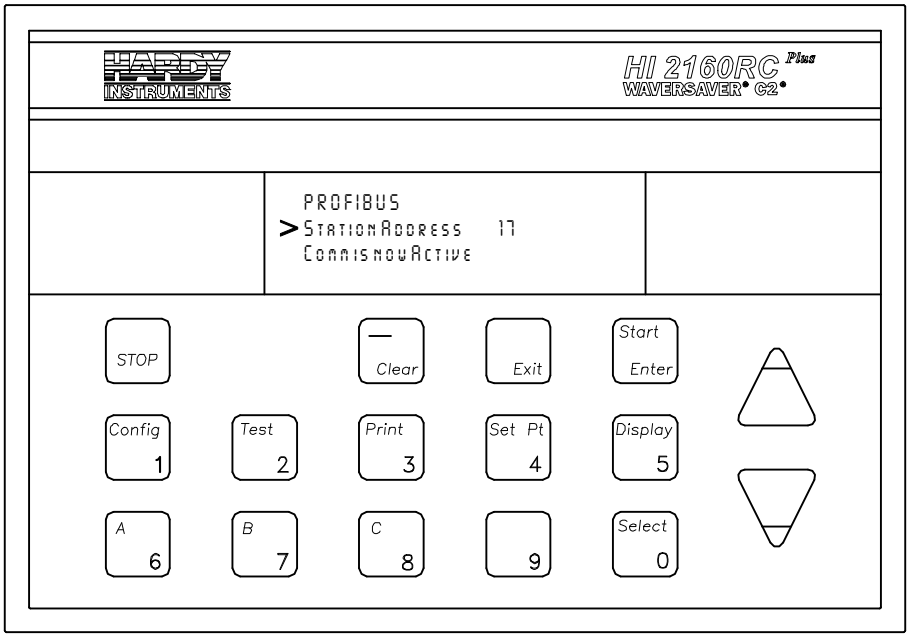


FIG. 8-2 SYSTEM IS READY TO COMMUNICATE

System Inactive

This display indicates that the rate controller has not passed the hardware test. There is a cable disconnected or broken, or the board is not seated properly. (See Fig. 8-3)

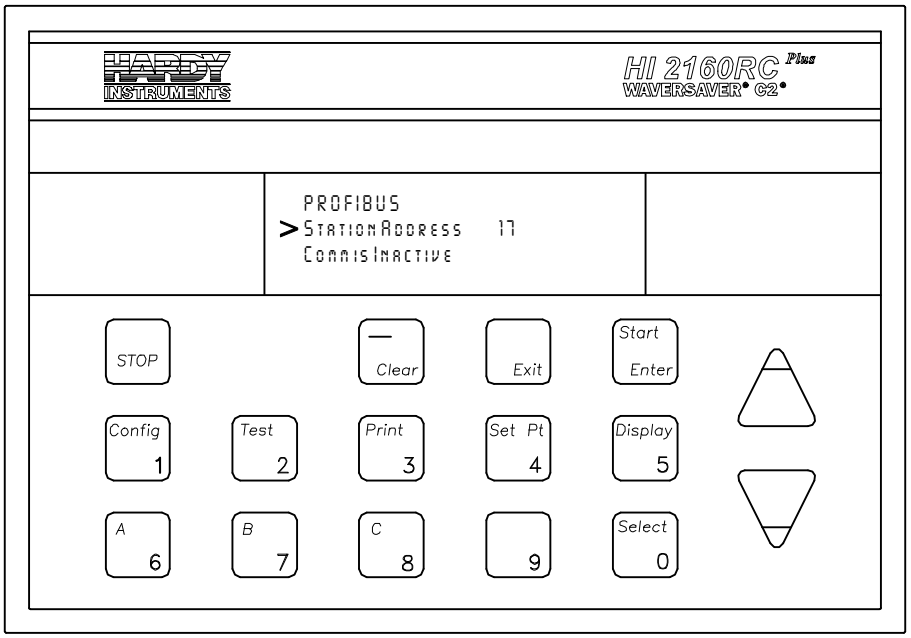


FIG. 8-3 SYSTEM IS NOT READY TO COMMUNICATE

Address is not Correct

This display means that the system passed all the tests but the address is incorrect. The system is ready to communicate but will not until the correct address is entered. (See Fig. 8-4)

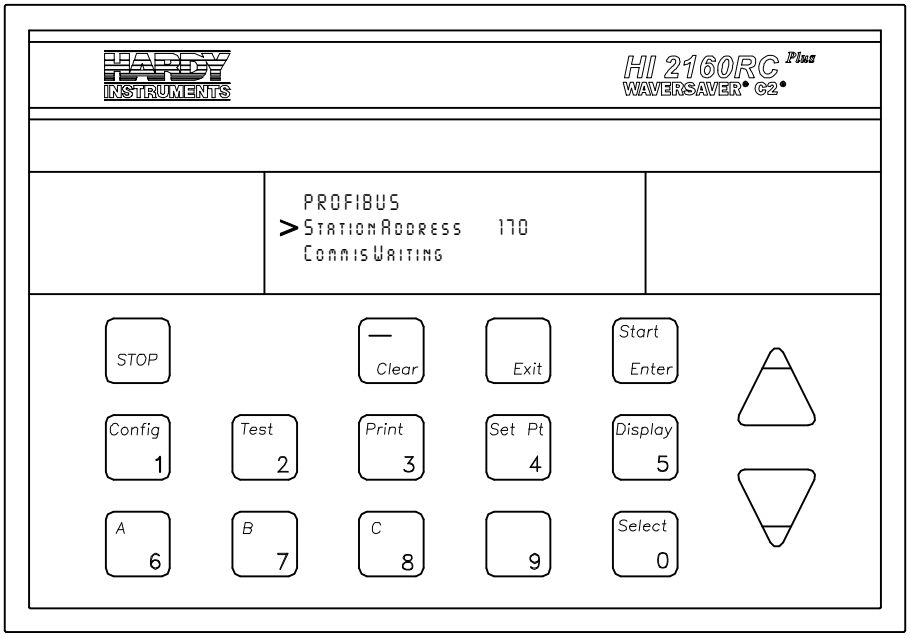


FIG. 8-4 WRONG ADDRESS DISPLAY

Updating the Screen Information

Update the display when you are not certain if the information on the display is current or not.

Step 1. Press the Clear button.
Step 2. Press the Exit button. The Main Menu is displayed.
Step 3. Press the Start/Enter button. The updated status is displayed.

APPENDIX A - IEEE FOR NORMAL FLOAT TYPE

IEEE Format for Normal Float Type

Used for Block Read #21 and Selectable Read Parameter #15.

Sign bit - 31

Exponent (8 bits) - 30 29 28 27 26 25 24 23

Mantissa (23 bits) - 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

Sign bit	0 = Positive Value 1 = Negative Value
Exponent	8 bit value - 127 (decimal) = EXPONENT VALUE
Mantissa	1 + 23 bit of mantissa (where binary point is just left of bit 22) = MANTISSA VALUE

Example:

To read NET weight, read bytes 4 through 7 in Read Data Buffer and interpret NET weight value as floating point.

Sign	Exponent	Mantissa
0	01111110	00000000000000000000
+	126 - 127 = -1	$1 + 0 = 1 + (1.0 \times 2^{-1}) = 0.5$

APPENDIX B - DECIMAL, HEX, OCTAL AND BINARY CONVERSION CHART

Binary	Octal	Decimal	Hex
0000	0	0	0
0001	1	1	1
0010	2	2	2
0011	3	3	3
0100	4	4	4
0101	5	5	5
0110	6	6	6
0111	7	7	7
1000	10	8	8
1001	11	9	9
1010	12	10	A
1011	13	11	B
1100	14	12	C
1101	15	13	D
1110	16	14	E
1111	17	15	F

Hexadecimal and Equivalent Numbers

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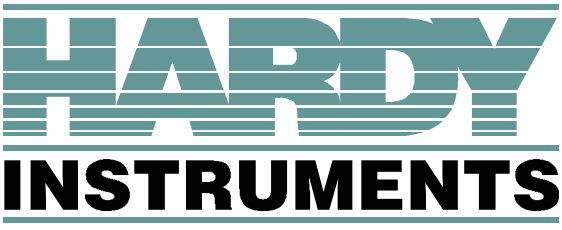

3860 Calle Fortunada, San Diego, CA 92123-1825
Telephone: 1-800-821-5831 FAX: (858) 278-6700
Web Address: http://www.hardyinstruments.com

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