Honeywell

Modbus® RTU Serial Communications User Manual

Configuration Interface for UDC3300

Supplement to 51-52-25-66

51-52-25-70C

9/99

TotalPlant

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Reference: Modicon Modbus Protocol Reference Guide – PI-MBUS-300 Rev. G

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About This Document

Abstract

This document provides configuration information specific to Honeywell's UDC3300 controllers and should be used in tandem with document number 51-52-25-66, Modbus® RTU Serial Communications User Manual.

Contacts

The following list identifies important contacts within Honeywell.

Service	Contact
Technical Support Please have your instrument's complete model number, serial number, and software version available.	1-800-423-9883
List of frequently asked questions and their answers	1-888-423-9883 (Honeywell's TACFACS— USA and Canada only) http://support.totalplant.honeywell.com (Honeywell's web site)

References

Publication Title	Publication Number
UDC 3300 Universal Digital Controller Product Manual	51-52-25-55
UDC3000/3300/5000/6000/6300 Universal Digital Controllers RS422/485 ASCII Communications Option Product Manual	51-51-25-35
UDC 3000Universal Digital Controller ModBus 485RTU Communications Option	51-52-25-38B

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1. Overview of Modbus RTU Configuration Interface

This User Manual is intended to accompany the Modbus RTU Serial Communications User Manual (51-52-25-66). It describes the function codes needed to upload and download the configuration from a host computer into the UDC3300 controller. The information presented in this manual superceeds the information presented in the ModBus 485RTU Communications Option manual #51-52-25-38B for function codes 14h and 15h when the MODBUS3K protocol is selected. See UDC3300 Product Manual 51-52-25-55B configuration section for protocol selection

2. Modbus RTU Function Codes

2.1 General Information

The UDC3300 supports two modbus protocols**. An older implementation that resides in the UDC3000A** and the **Honeywell Universal Modbus RTU protocol**.

Both protocols use a subset of the standard Modbus RTU function codes to provide access to process-related information. Several MODICON function codes are implemented, but some of the UDC3000A functionality was implemented differently and as such doesn't conform exactly to the newer protocol. The older protocol has been provided for backwards compatability. It is appropriate to define instrument-specific "user-defined" function codes. Where differences occur between the two protocols it will be noted. Several standard Modbus RTU function codes are supported.

Configuration ID Tags

The UDC3300 function codes **20** and **21** use the RS422/485 tag IDs for accessing configuration and process-related data. These tags are fully explained in *Section 3.10.*

The tag IDs represent the *register addresses* used in the Request Message.

Register Address Structure

Table 2-1 Integer Parameter Type

Register Numbers (Dec)	Name	Access	Notes
1	Type = 1	NOT SUPPORTED	16-bit Unsigned Integer
2	Attribute	NOT SUPPORTED	1 = Read Only, 2 = Read/Write
3	Value (16 bit integer)	Read / Write	
4	Not Used	NOT SUPPORTED	
5	Low Range (16 bit integer)	NOT SUPPORTED	
6	Not Used	NOT SUPPORTED	
7	High Range (16 bit Integer)	NOT SUPPORTED	
8	Not Used	NOT SUPPORTED	
9 to 13	Description Text (ASCII string)	NOT SUPPORTED	

Table 2-2 Floating Point Parameter Type

Register Numbers (Dec)	Name	Access	Notes
1	Type = 2	NOT SUPPORTED	IEEE Floating Point
2	Attribute	NOT SUPPORTED	1 = Read Only, 2 = Read/Write
3	Value (float high word)	Read / Write	
4	Value (float low word)	NOT SUPPORTED	
5	Low Range (float high word)	NOT SUPPORTED	
6	Low Range (float low word)	NOT SUPPORTED	
7	High Range (float high word)	NOT SUPPORTED	
8	High Range (float low word)	NOT SUPPORTED	
9 to 13	Description Text (ASCII string)	NOT SUPPORTED	

Register Count

The register count depends on the data format of the registers being read or written.

Integer data is represented in sixteen bits and is transferred high byte first.
Floating point data is transferred in IEEE 32-bit format.

The register count definitions are:

0001 = Integer Data
0002 = Floating Point Data

2.2 Function Code 20 (14h) - Read Configuration Reference Data

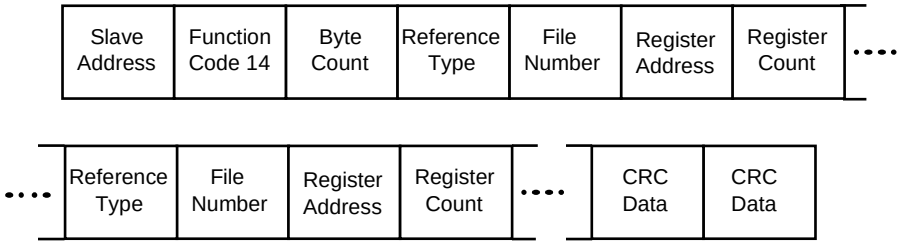
Description

Function code 20 (14 Hex) is used in the UDC3300 to read information stored in the UDC3300 configuration database. Each UDC3300 configuration item is explicitly addressed by a file number and register address. IEEE 32-bit floating point and 16-bit integer formats are supported.

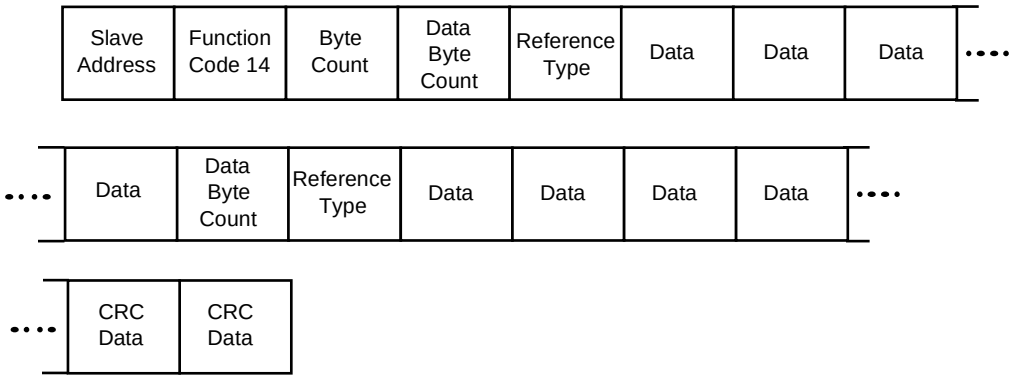
Request and Response Formats

The Request and Response formats for Function code 20 (14 Hex) are shown below. Details for each block reference follow.

Request Message Format



Response Message Format



Byte Count

The Byte Count equals the number of bytes transmitted in either the request or response message and will be the minimum number required to transmit all requested data.

Data Byte Count

The Data Byte Count is the number of data bytes of the *sub response* including the Reference Type but not including itself. A floating point sub response has four bytes of data and one byte representing the reference type making the data byte count equal to five.

Reference Type Definitions

The Reference Type definition is always 06 when the **MODBUS** protocol is selected. *See examples in Subsection 2.2.1*

The Reference Type definition is 02 when 16 Bit Integer is being read when the **MODBUS3K** protocol is selected.

The Reference Type definition is 08 when IEEE Floating Point is being read when the **MODBUS3K** protocol is selected. *See Examples in Subsection 2.2.2*.

File Number

The file number word contains the register number from the register address structure tables on page 3. Although the register address structure tables indicate up to 13 data registers are available for access, only register address 3 is currently supported.

Register Address

The register address word represents the extended code access, loop number and the tag ID number for the parameter(s) being accessed. The register address word is made up of two bytes—the MSB contains the access code type and loop information. The access code is represented as follows: 0x = requests access to standard tag ID(s), 4x = requests access to extended tag ID(s). The loop information is represented as follows: x0 = Loop #1, x1 = Loop #2. The LSB contains the RS422 tag ID number. The tag ID numbers represent the parameter's register address(es). See *Section 3* for the tag ID numbers.

Note: The MODBUS3K protocol selection does not support the extended code access or a second loop access = 41.

Table 2-3 Register Address Format for Function Code 20

Register Address(es) (Decimal)	Register Address(es) (Hex)	Format
001 to 125	0001 to 007D	**analog** formatted data—(Loop 1, Loop 2, Extended) (2 registers – IEEE 32-bit floating point)
128 to 255	0080 to 00FF	**integer** formatted data—(Loop 1 and Loop 2) (1 register – 16-bit integer)

2.2.1 MODBUS Protocol Read Configuration Examples

Example #1 (MODBUS Protocol)

The following is an example of a request to read the Loop 1 - Gain 1 value using Function code 20.

Request Message (Read (Loop 1 Gain 1) = ID Tag 001)

02 14 07 06 00 03 00 01 00 02 (CRC16)

Where:

02	=	Address
14	=	Function Code 20 (14 hex)
07	=	Byte Count
06	=	Reference Type
00,03	=	File Number (Access Data Value)
00,01	=	Register Address (Standard Access / Loop # 1, Gain 1 - Tag ID #1)
00 02	=	Register Count (Floating Point Data)
(CRC16)		

This is the response to the above request.

Response Message

02 14 06 05 06 3F C0 00 00 (CRC16)

Where:

02	=	Address
14	=	Function Code 20 (14 Hex)
06	=	Byte Count
05	=	Sub Message Length
06	=	Reference Type (IEEE Floating Point)
3F C0 00 00	=	1.50 (Value of Proportional Band, Loop 1)
(CRC16)		

Continued next page

2.2.1 MODBUS Protocol Read Configuration Examples, continued

Example #2 (MODBUS Protocol)

The following is another example of a request and response message using Function code 20.

Request Message (Read Loop 1 LSP #1 = ID Tag 39 and Loop 1 LSP #2 = ID Tag 53)

02 14 0E 06 00 03 00 27 00 02 06 00 03 00 35 00 02 (CRC16)

Where:

02	=	Address
14	=	Function Code 20 (14 Hex)
0E	=	Byte Count
06	=	Reference Type (IEEE Floating Point)
00,03	=	File Number (Access Data Value)
00,27	=	Register Address (Standard Access / Loop # 1, LSP #1 - ID Tag 39)
00,02	=	Register Count to read (Floating Point Data)
06	=	Reference Type (IEEE Floating Point)
00,03	=	File Number (Access Data Value)
00,35	=	Register Address (Standard Access / Loop #1, LSP #2 - ID Tag 53)
00,02	=	Register Count to read (Floating Point Data)
(CRC16)		

This is the response to the above request.

Response Message

02 14 0C 05 06 43 C8 00 00 05 06 44 60 00 00 (CRC16)

Where:

02	=	Address
14	=	Function Code 20 (14 Hex)
0C	=	Byte Count
05	=	Data Byte Count (Sub Message Length)
06	=	Reference Type (IEEE Floating Point)
43 C8 00 00	=	400.0 (Value of Local Setpoint #1, Loop 1)
05	=	Data Byte Count (Sub Message Length)
06	=	Reference Type (IEEE Floating Point)
44 60 00 00	=	896.0 (Value of Local Setpoint #2, Loop 1)
(CRC16)		

Continued next page

2.2.1 MODBUS Protocol Read Configuration Examples, continued

Example #3 (MODBUS Protocol)

The following is an example of a request to read the Loop 2 - Gain 3 value using Function code 20.

Request Message (Read (Loop 2 Gain 3) = ID Tag 001)
02 14 07 06 00 03 01 01 00 02 (CRC16)

Where:

02	=	Address
14	=	Function Code 20 (14 hex)
07	=	Byte Count
06	=	Reference Type
00,03	=	File Number (Access Data Value)
01,01	=	Register Address (Standard Access / Loop #2, Gain 3 - Tag ID #1)
00 02 (CRC16)	=	Register Count (Floating Point Data)

This is the response to the above request.

Response Message
02 14 06 05 06 3F C0 00 00 (CRC16)

Where:

02	=	Address
14	=	Function Code 20 (14 Hex)
06	=	Byte Count
05	=	Sub Message Length
06	=	Reference Type (IEEE Floating Point)
3F C0 00 00 (CRC16)	=	1.50 (Value of Proportional Band, Loop 2)

Continued next page

2.2.1 MODBUS Protocol Read Configuration Examples, continued

Example #4 (MODBUS Protocol)

The following is another example of a request and response message for Function code 20.

Request Message (Read Loop 2 LSP #1 = ID Tag 39 and Loop 2 LSP #2 = ID Tag 53)

02 14 0E 06 00 03 01 27 00 02 06 00 03 01 35 00 02 (CRC16)

Where:

02	=	Address
14	=	Function Code 20 (14 Hex)
0E	=	Byte Count
06	=	Reference Type (IEEE Floating Point)
00,03	=	File Number (Access Data Value)
01,27	=	Register Address (Standard Access / Loop #2, LSP #1 - ID Tag 39)
00,02	=	Register Count to read (Floating Point Data)
06	=	Reference Type (IEEE Floating Point)
00,03	=	File Number (Access Data Value)
01,35	=	Register Address (Standard Access / Loop #2, LSP #2 - ID Tag 53)
00,02	=	Register Count to read (Floating Point Data)
(CRC16)		

This is the response to the above request.

Response Message

02 14 0C 05 06 43 C8 00 00 05 06 44 60 00 00 (CRC16)

Where:

02	=	Address
14	=	Function Code 20 (14 Hex)
0C	=	Byte Count
05	=	Data Byte Count (Sub Message Length)
06	=	Reference Type (IEEE Floating Point)
43 C8 00 00	=	400.0 (Value of Local Setpoint #1, Loop 2)
05	=	Data Byte Count (Sub Message Length)
06	=	Reference Type (IEEE Floating Point)
44 60 00 00	=	896.0 (Value of Local Setpoint #2, Loop 2)
(CRC16)		

Continued next page

2.2.1 MODBUS Protocol Read Configuration Examples, continued

Example #5 (MODBUS Protocol)

The following is an example of a request to read the Loop 1 - Extended code PVEU0 value using Function code 20.

Request Message (Read (Loop 1 PVEU0) = ID Tag 001)

02 14 07 06 00 03 40 01 00 02 (CRC16)

Where:

02	=	Address
14	=	Function Code 20 (14 hex)
07	=	Byte Count
06	=	Reference Type
00,03	=	File Number (Access Data Value)
40,01	=	Register Address (Extended Access / Loop #1, PVEU0 - Tag ID #1)
00 02	=	Register Count (Floating Point Data)
(CRC16)		

This is the response to the above request.

Response Message

02 14 06 05 06 3F C0 00 00 (CRC16)

Where:

02	=	Address
14	=	Function Code 20 (14 Hex)
06	=	Byte Count
05	=	Sub Message Length
06	=	Reference Type (IEEE Floating Point)
3F C0 00 00	=	1.50 (Value of PVEU0, Loop 1)
(CRC16)		

Continued next page

2.2.1 MODBUS Protocol Read Configuration Examples, continued

Example #6 (MODBUS Protocol)

The following is an example of a request to read the Loop 2 - Extended JPVEU0 value using Function code 20.

Request Message (Read (Loop 2 JPVEU0) = ID Tag 001)
02 14 07 06 00 03 41 01 00 02 (CRC16)

Where:

02	=	Address
14	=	Function Code 20 (14 hex)
07	=	Byte Count
06	=	Reference Type
00,03	=	File Number (Access Data Value)
41,01	=	Register Address (Extended Access / Loop #2, JPVEU0 - Tag ID #1)
00 02	=	Register Count (Floating Point Data)
(CRC16)		

This is the response to the above request.

Response Message
02 14 06 05 06 3F C0 00 00 (CRC16)

Where:

02	=	Address
14	=	Function Code 20 (14 Hex)
06	=	Byte Count
05	=	Sub Message Length
06	=	Reference Type (IEEE Floating Point)
3F C0 00 00	=	1.50 (Value of JPVEU0, Loop 2)
(CRC16)		

2.2.2 MODBUS3K Protocol Read Configuration Example

Example #1 (MODBUS3K Protocol)

The following is an example of a request to read the Loop 1 - Gain 1 value using Function code 20.

Request Message (Read (Loop 1 Gain 1) = ID Tag 001)

02 14 04 08 00 01 02 (CRC16)

Where:

02	=	Address
14	=	Function Code 20 (14 hex)
04	=	Byte Count
08	=	Reference Type
00	=	File Number (Access Data Value)
01	=	Register Address (Standard Access / Loop # 1, Gain 1 - Tag ID #1)
02	=	Register Count (Floating Point Data)
(CRC16)		

This is the response to the above request.

Response Message

02 14 06 05 08 3F C0 00 00 (CRC16)

Where:

02	=	Address
14	=	Function Code 20 (14 Hex)
06	=	Byte Count
05	=	Sub Message Length
08	=	Reference Type (IEEE Floating Point)
3F C0 00 00	=	1.50 (Value of Proportional Band, Loop 1)
(CRC16)		

2.3 Function Code 21 (15h) - Write Configuration Reference Data

Introduction

Function Code 21 (15 Hex) is used in the UDC3300 to allow writes of integer and floating point values to the UDC3300 configuration database and override values.

The configuration database of the UDC3300 is located in EEROM. The override values are stored in RAM.

Integer format is used to write to "Digital" configuration items. Floating Point format is used to write to "Analog" configuration items as defined by the configuration ID tags.

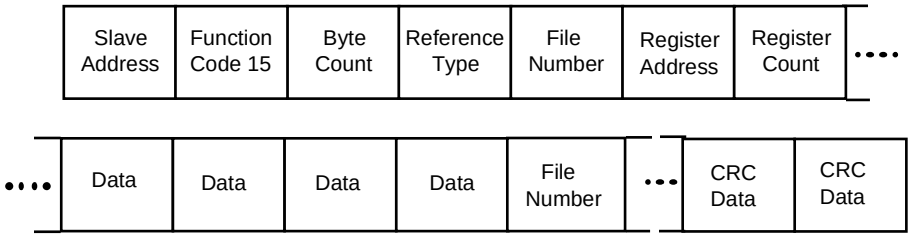
Write Restrictions

Care should be taken not to exceed the 100,000 write limit of the UDC3300 EEROM.

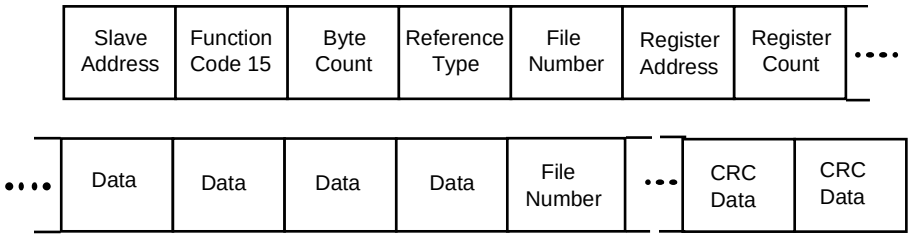
Request and Response Formats

The Request and Response formats for Function code 21 (15 Hex) are shown below. Details for each block reference follow.

Request Message Format



Response Message Format (echo back of request)



The register address is interpreted by the UDC3300 as the extended code access, loop number, and tag ID configuration number.

Reference Type Definitions

The Reference Type definition is always 06 when the **MODBUS** protocol is selected.
See examples in Subsection 2.3.1

The Reference Type definition is 02 when 16 Bit Integer is being written when the **MODBUS3K** protocol is selected.

The Reference Type definition is 08 when IEEE Floating Point is being written when the **MODBUS3K** protocol is selected. *See examples in Subsection 2.3.2*

File Number

The file number word contains the register number from the register address structure tables on page 3. Although the register address structure tables indicate up to 13 data registers are available for access, only register address 3 is currently supported.

Register Address

The register address is used to designate the access type, the loop number and the tag ID number for the parameter being accessed. The register address is made up of two bytes—the MSB contains the access code type and loop information. The access code is represented as follows: 0x = requests access to standard tag ID(s), 4x = requests access to extended tag ID(s). The loop information is represented as follows: x0 = Loop #1, x1 = Loop #2. The LSB contains the RS422 tag ID number. The tag ID numbers represent the parameter's register address(es). See *Section 3* for the tag ID numbers.

Note: The MODBUS3K protocol selection does not support the extended code access or a second loop access = 41.

Table 2-4 Register Address Format for Function Code 21

Register Address(es) (Dec)	Register Address(es) (Hex)	Format
001 to 125	0001 to 007D	**analog** formatted data—Loop 1, Loop 2, Extended (2 registers – IEEE 32-bit floating point)
128 to 215 & 255	0080 to 00D7 & 00FF	**integer** formatted data—Loop 1 and Loop 2 (2 registers – IEEE 32-bit floating point)

Unrestricted Registers

As mentioned previously, all register data is stored in the EEROM of the UDC3300 with some exceptions. These exceptions were made to allow write access to override information. The registers which are designated as Override values are listed below. These registers do not have restrictions on the number of writes.

ID Tag	*Register Number*	*UDC3300 Usage*
123	(7Bh)	Output Override
125	(7Dh)	Computer Setpoint

Restrictions on Parameter Numbers in One Message

The maximum number of writeable parameters per write request is 1.

2.3.1 MODBUS Protocol Write Configuration Examples

Example #1 (MODBUS Protocol)

The following is an example of a request to write the Loop 1 Gain 1 value using Function code 21 (15 Hex).

Request Message (Write Loop 1 Gain 1= 1.5 “ID Tag 1”)

02 15 0B 06 00 03 00 01 00 02 3F C0 00 00 (CRC16)

Where:

02	=	Address
15	=	Function Code 21 (15 Hex)
0B	=	Byte Count
06	=	Reference Type (IEEE Floating Point)
00 03	=	File Number (Access Data Value)
00 01	=	Register Address (Standard Access - Loop 1, Gain 1 - ID Tag 1)
00 02	=	Register Count (Floating Point Data)
3F C0 00 00 (CRC16)	=	1.50

This is the response to the above request.

Response Message (The response is an echo of the request)

02 15 0B 06 00 01 00 02 00 02 3F C0 00 00 (CRC16)

Example #2 (MODBUS Protocol)

The following is an example of a request to write the Loop 2 Gain 3 value using Function code 21 (15 Hex).

Request Message (Write Loop 2 Gain 3= 1.5 “ID Tag 1”)

02 15 0B 06 00 03 01 01 00 02 3F C0 00 00 (CRC16)

Where:

02	=	Address
15	=	Function Code 21 (15 Hex)
0B	=	Byte Count
06	=	Reference Type (IEEE Floating Point)
00 03	=	File Number (Access Data Value)
01 01	=	Register Address (Standard Access - Loop 2, Gain 3 - ID Tag 1)
00 02	=	Register Count (Floating Point Data)
3F C0 00 00 (CRC16)	=	1.50

This is the response to the above request.

Response Message (The response is an echo of the request)

02 15 0B 06 01 01 00 02 00 02 3F C0 00 00 (CRC16)

2.3.1 MODBUS Protocol Write Configuration Examples, continued

Example #3 (MODBUS Protocol)

The following is an example of a request to write the Loop 1 Extended PVEU0 value using Function code 21 (15 Hex).

Request Message (Write Loop 1 Extended PVEU0= 1.5 "ID Tag 1")

02 15 0B 06 00 03 40 01 00 02 3F C0 00 00 (CRC16)

Where:

02	=	Address
15	=	Function Code 21 (15 Hex)
0B	=	Byte Count
06	=	Reference Type (IEEE Floating Point)
00 03	=	File Number (Access Data Value)
40 01	=	Register Address (Extended Access - Loop 1, PVEU0 - ID Tag 1)
00 02	=	Register Count (Floating Point Data)
3F C0 00 00	=	1.50
(CRC16)		

This is the response to the above request.

Response Message (The response is an echo of the request)

02 15 0B 06 40 01 00 02 00 02 3F C0 00 00 (CRC16)

Example #4 (MODBUS Protocol)

The following is an example of a request to write the Loop 2 Extended JPVEU0 value using Function code 21 (15 Hex).

Request Message (Write Loop 2 Extended JPVEU0= 1.5 "ID Tag 1")

02 15 0B 06 00 03 41 01 00 02 3F C0 00 00 (CRC16)

Where:

02	=	Address
15	=	Function Code 21 (15 Hex)
0B	=	Byte Count
06	=	Reference Type (IEEE Floating Point)
00 03	=	File Number (Access Data Value)
41 01	=	Register Address (Extended Access - Loop 2, JPVEU0 - ID Tag 1)
00 02	=	Register Count (Floating Point Data)
3F C0 00 00	=	1.50
(CRC16)		

This is the response to the above request.

Response Message (The response is an echo of the request)

02 15 0B 06 41 01 00 02 00 02 3F C0 00 00 (CRC16)

2.3.2 MODBUS3K Protocol Write Configuration Example

Example #1 (MODBUS3K Protocol)

The following is an example of a request to write the Loop 1 Gain 1 value using Function code 21 (15 Hex).

Request Message (Write Loop 1 Gain 1= 1.5 “ID Tag 1”)

02 15 08 08 00 01 02 3F C0 00 00 (CRC16)

Where:

02	=	Address
15	=	Function Code 21 (15 Hex)
08	=	Byte Count
08	=	Reference Type (IEEE Floating Point)
00	=	File Number
01	=	Register Address (Loop 1, Gain 1 - ID Tag 1)
02	=	Register Count (Floating Point Data)
3F C0 00 00	=	1.50
(CRC16)		

This is the response to the above request.

Response Message

02 95 05 (CRC16)

Where:

02	=	Address
95	=	Function Code 21 (15 Hex) with exception bit
05	=	Exception Code (05 busy)
(CRC16)		

3. Read, Write, and Override Parameters

3.1 Overview

Introduction

This section contains information concerning Reading, Writing, and Overriding parameters in the UDC 3300 Process Controller. There are two types of parameters:

- **Data Transfer**—These parameters include reading control data, option status, and reading or changing setpoints or output.
- **Configuration Data**—All the configuration data is listed in the order in which it appears in the controller.

Each type of parameter has the identifying codes listed with it.

Section Contents

This section contains the following topics:

General Information

Analog Parameters

- Whenever analog register addresses 0001 through 0072 (those that can be changed via communications) are changed, a Write cycle occurs immediately after receipt of the message.

Override Parameters

- Override analog register addresses 0078, 007B and 007D (PV, output, and computer setpoint) are not stored in nonvolatile memory. They can be changed as frequently as desired with no effect on nonvolatile memory retentivity, but the controller must remain in the slave mode.

Digital Parameters

- Whenever digital configuration register addresses 0080 through 00FA are updated via communications, the nonvolatile memory is updated as soon as the message is received.

3.2 Reading Control Data

Overview

You can Read the following control data from the UDC controller.

- Input 1
- Input 2
- Input 3
- PV
- Internal RV

ATTENTION

Loop number is selected in the MSB of the Register Address in the request message.

Register Addresses

Use the identifying codes listed in Table 3-1 to read the specific items.

A Write request for these codes will result in an Error message.

Table 3-1 Control Data Parameters

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Input #1	0076	118	FP	RD	In Engineering Units or Percentage
Input #2	0077	119	FP	RD	In Engineering Units or Percentage
Input #3	0075	117	FP	RD	In Engineering Units or Percentage
PV	0078	120	FP	RD	In Engineering Units or Percentage
Internal RV	0079	121	FP	RD	In Engineering Units or Percentage

3.3 Read Options Status

Read

Doing a Read of register address 00B9 listed in Table 3-2 will tell you which of the available options are enabled / installed or disabled / not installed.

Table 3-2 Option Status

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Option Status (Read only)	00B9	185	INT	RD	See Figure 3-1.

The data field in the response message will be a decimal number from 0 to 255. Convert the decimal number to binary as shown in

Figure 3-1 to determine which options are or are not active.

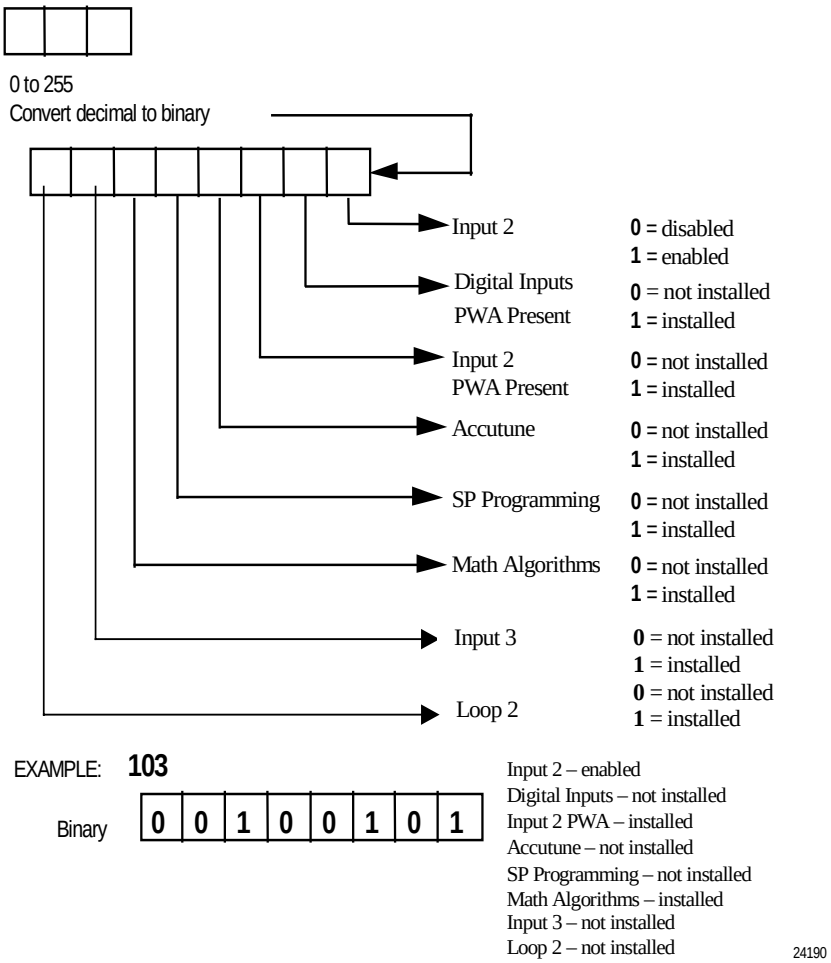


Figure 3-1 Option Status Information

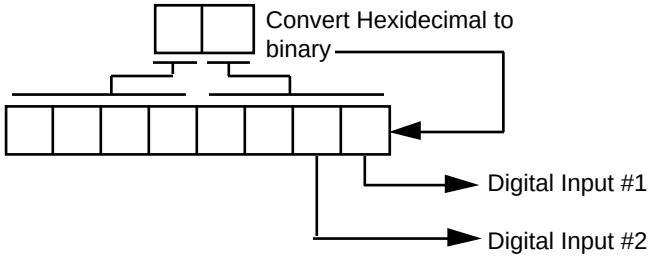
3.4 Miscellaneous Read Only's

3.4.1 Register Addresses for Read Only's

The identifying register addresses listed in Table 3-3 represent some information that is Read only. No Writes allowed.

Table 3-3 Miscellaneous Read Only's

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Software Type	009D	157	INT	RD	READ only (UDC 3300) 41 = Basic UDC 3300 software 42 = Field upgrade for SPP 43 = Expanded Controller Version 44 = Field Upgrade for SPP + Math 45 = Field Upgrade for 2 Loops + SPP 46 = Field Upgrade for SPP + 2 Loops + Math
Software Version	00A7	167	INT	RD	READ only 0 to 255
Auxiliary Output Value	0030	48	FP	RD	READ only Engineering Units for selected type (Write results in error message)
Digital Input Switch Status (Read only)	00BC	188	FP	RD	The data field in the response message will be a hexadecimal number. Convert the HEX to binary as shown below to determine which Digital Input switches are closed.



0 = Switch Open
1 = Switch Closed

EXAMPLE: **02**

Binary	0	0	0	0	0	0	1	0

D/I Switch #1 - Open
D/I Switch #2 - Closed

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Table 3-3 Miscellaneous Read Only's, continued

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
UDC Error Status (Definitions are listed in Table 3-4) Loop 1 or Loop 2 designated in the request message	00FF	255	INT	RD	See below READ/WRITE* 01 = Emergency Manual 02 = Failsafe 04 = Working Calibration Checksum Error 08 = Configuration Checksum Error 10 = Factory Calibration Error 20 = Hardware Failure 40 = Restart after Shed 80 = Configuration/Calibration Memory Changed

*Write to clear.

FOR EXAMPLE:

If Read returns C0 [restart after shed (40) plus configuration change (80)]

Write anything to Register address 00FF.

Read returns 00 (clear).

3.4.2 Error Status Definitions

Table 3-4 lists the UDC error status codes and their definitions.

Table 3-4 Error Status Definitions

Code	Error	Definitions
01	Emergency Manual	Indicates that the output of the unit, which has been in slave operation, is under manual control locally. Error remains until local control is relinquished at the controller.
02	Failsafe	Error occurs whenever the control reverts to failsafe operation and remains as long as the condition exists.
04	Working Calibration Checksum Error	Indicates that an error exists in the working calibration data. Re-select the inputs to load factory calibration data or field calibrate the inputs.
08	Configuration Checksum Error	Error exists in the configuration data. Verify configuration data at the keyboard. Checksum will be recomputed by stepping the controller through the status tests.
10	Factory Calibration Error	Error exists in the factory calibration data and remains as long as the condition exists.
20	Hardware Failure	Indicates either a RAM test failure or Input 1, Input 2, Input 3 failure on two consecutive conversions.
40	Restart After Shed	Error occurs whenever a shed of slave override is performed. Error is reset following a Write command to register address 00FF (064).
80	Configuration/ Calibration Memory Changed	Error occurs whenever shed, configuration, or calibration changed. Also occurs whenever there is a change of state in 001, 002, 004, 008, or 016. Error is reset following a Write command to register address 00FF.

3.5 Setpoints

Overview

You can use three separate local setpoints in the UDC Controller. The identifying register addresses listed Table 3-5 allow you to select which setpoint you want to use and to enter a value in Engineering Units (whichever is selected at register address 00A1) for that setpoint via communications.

Register Addresses

Make your selection using register address 00AD and enter the value for the setpoint chosen using register address in Table 3-5.

ATTENTION

Loop number is selected in the MSB of the Register Address in the request message.

Table 3-5 Setpoint Code Selections

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Local Setpoint #1	0027	039	FP	R/W	Value within the setpoint range limits
Local Setpoint #2	0035	053	FP	R/W	Value within the setpoint range limits
Local Setpoint #3	0074	116	FP	R/W	Value within the setpoint range limits
Number of Local Setpoints	00AD	173	INT	R/W	00 = Local Setpoint #1 only 01 = 2nd Local Setpoint via keyboard or communications 03 = 3rd Local Setpoint via keyboard or communications (This disables RSP.)

Associated Parameters

Refer to Table 3-6 to display or change any of the parameters associated with the setpoint.

Table 3-6 Setpoint Associated Parameters

Parameter	Register Address	
	Hex	Decimal
Setpoint Limits	0007, 0008	007, 008
Computer Setpoint	007D	125

3.6 Using a Computer Setpoint (Overriding Controller Setpoint)

Overview

You can use a setpoint generated from the computer to override the setpoint being used by the controller. The value generated by the computer will have ratio and bias applied by the controller.

Register Addresses

Use the identifying code in Table 3-7 to enter the computer setpoint.

ATTENTION

Loop number is selected in the Register Address in the request message.

Table 3-7 Computer Setpoint Selection

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Computer Setpoint	007D	125	FP	R/W	Value from computer with Ratio and Bias applied by the controller. Within the Setpoint Range Limits in Engineering Units or Percent.

Shed

The computer setpoint override will continue until SHED from communications occurs or the controller is placed into monitor mode through communications. Doing periodic SLAVE READS within the shed time will allow the override to continue until communication is stopped and shed time elapses.

ATTENTION

0 Shed (code 154) allows the override to continue indefinitely or until the reset shed timer register (address 1B90 = Loop1, 1B91 = Loop2) is written using function code 6. Any data value can be written because it is ignored. (See override selections in Table 3-9.)

When SP is overridden, the left most digit in the upper display becomes a "C."

Associated Parameters

Refer to Table 3-8 for the codes to display or change any of the parameters associated with the computer setpoint.

Table 3-8 Computer Setpoint Associated Parameters

Parameter	Register Address	
	Hex	Decimal
Setpoint Limits	0007, 0008	007, 008
Local Setpoint #1	0027	039
Local Setpoint #2	0035	053
Local Setpoint #3	0074	116
Local Setpoint Selection	00AD	173
Loop #1 Computer Setpoint Ratio	0015	021
Loop #1 Computer Setpoint Bias	0016	022

3.7 PV or Setpoint Override Selections

Overview

You can **Read** the present override status or the PV or setpoint, or you can do a **Write** transaction to cancel the override.

Register Addresses

Use the identifying code in Table 3-9 to Read or Write your selection.

ATTENTION

Loop number is selected in the MSB of the Register Address in the request message.

Table 3-9 PV or Setpoint Override Selections

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
PV or Setpoint Override Selection	00B7	183	INT	R/W	01 = Input 1 02 = Input 2 04 = PV 08 = Setpoint

3.8 Reading or Changing the Output

Overview

You can read the output of a particular UDC controller (Read transaction) or you can change it to suit your needs. (Do a Write transaction.)

ID Codes

Use the identifying code in Table 3-10 to monitor (Read) or change (Write) the output (in manual only).

ATTENTION

- To Write (change) the output, the controller must first be in manual mode.
- Loop number is selected in the MSB of the Register Address in the request message.

Table 3-10 Reading or Changing the Output

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Output	007B	123	FP	R/W	–5 to +105% of full span (current output) 0 to 100% (relay type output)

Associated Parameters

Refer to Table 3-11 for the codes required to display or change any of the parameters associated with the output.

Table 3-11 Associated Output Codes

Parameter	Register Address	
	Hex	Decimal
Output Limits	000E, 000F	014, 015
Output Dropoff Limits	0014	020
Failsafe Output Values	0028	040
Output Deadband	0012	018
Output Hysteresis	0013	019
Output Type	00A0	160

3.9 Local Setpoint/PID Selection/Setpoint Ramp Status

Overview

Identifying code 250 lets you monitor or make selections for:

- Tuning Parameter Set #1 or #2
  If Tuning Sets selection is “two keyboard” code 172 = 001
- Local Setpoint #1, #2, or #3
  If “2 Local Setpoints” is selected 131 = 0, 173 = 1
- Run or Hold Setpoint Ramp or a Setpoint Program Data
  If SP Ramp or SP Program is enabled 178 = 1 Program, 178 = 2 Ramp

ATTENTION

Loop number is selected in the MSB of the Register Address in the request message.

Read

Table 3-12 is a list of numbers that could be returned by the UDC 3300 controller. When a Read is requested for this ID Code (250) you can determine which parameters are active from this table.

Write

To Write information to the controller, select what parameters you want from Table 3-123 and enter the associated number in the data field of the Write request.

FOR EXAMPLE:

- Current selection of TUNING SET #1
- Maintain LOCAL SETPOINT #1
- Maintain SP Ramp in Hold
- CHANGE to TUNING SET #2

READ 250 response is 00 or 02

WRITE 250 (07)

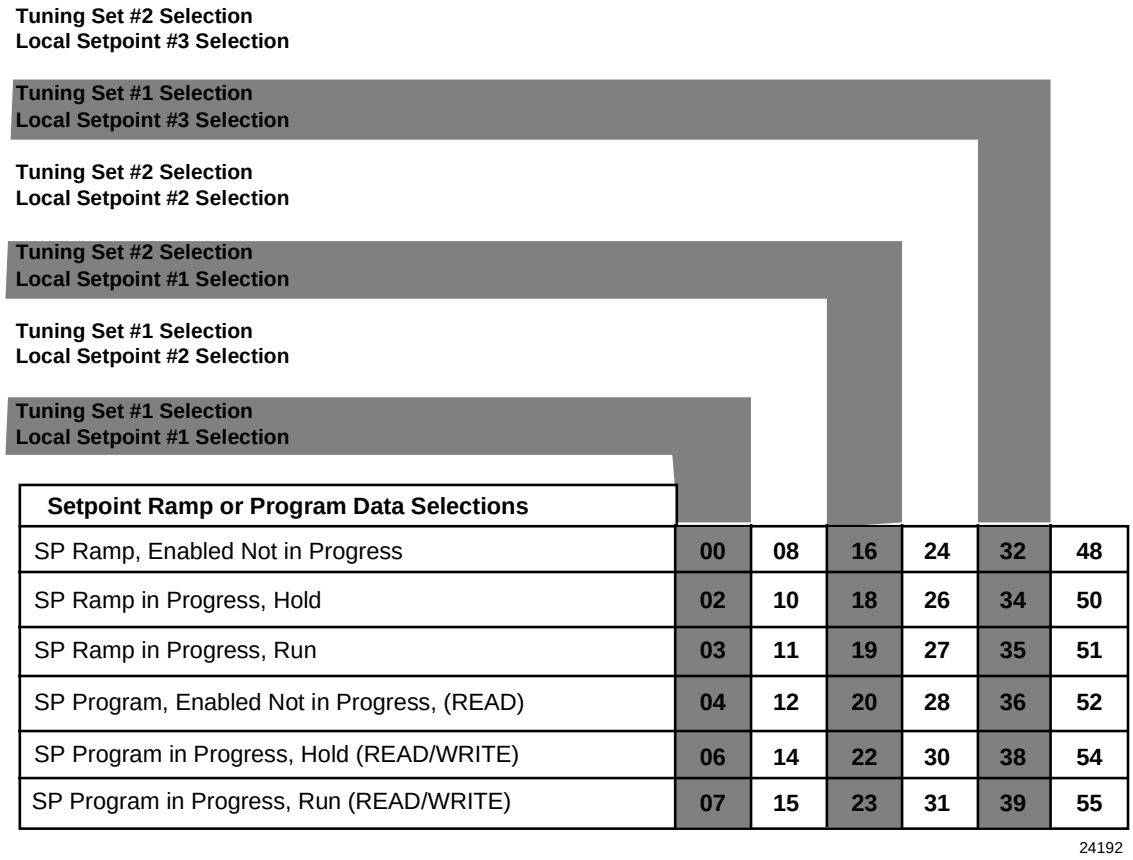
READ 250 Response is 08 or 010

ATTENTION

- Some of the numbers are Read only.
- Loop number is selected in the MSB of the Register Address in the request message.

Table 3-12 LSP/PID Set Selection and Setpoint Ramp Status

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Enhanced Function	00FA	250	INT	R	See code 250 indications listed in Figure 3-2. Note: The numbers in the table below are represented in decimal.



Setpoint Ramp or Program Data Selections						
SP Ramp, Enabled Not in Progress	00	08	16	24	32	48
SP Ramp in Progress, Hold	02	10	18	26	34	50
SP Ramp in Progress, Run	03	11	19	27	35	51
SP Program, Enabled Not in Progress, (READ)	04	12	20	28	36	52
SP Program in Progress, Hold (READ/WRITE)	06	14	22	30	38	54
SP Program in Progress, Run (READ/WRITE)	07	15	23	31	39	55

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Figure 3-2 Code 250 Read Indications

A write of code 250 lets you change the SP ramp status as well as the local setpoint or tuning set selection. Refer to Table 3-13.

Table 3-13 ID Code 250 Writes

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Write Local Setpoint/PID Set Selection and SP Ramp Status	00FA	250	INT	W	00 = Abort SP Ramp 01 = Run SP Ramp 02 = Hold SP Ramp 03 = Start SP Ramp 04 = Change to Local Setpoint #1 05 = Change to Local Setpoint #2 06 = Change to PID Tuning Set #1 07 = Change to PID Tuning Set #2 08 = Change to Local Setpoint #3

ATTENTION

To enable or disable the setpoint ramp, refer to Identifying Code 150.

3.10 Configuration Parameters

Overview

Listed on the next pages are the identifying codes for the parameters in the various Set-up Groups in the UDC3300 Process Controller. The Set-up Groups and their table numbers are listed below. Most of the parameters are configurable through the hosts. Some are Read Only and are indicated as such and cannot be changed.

Reading or Writing

Do a Read or Write, depending on your requirements, using the identifying code and format code listed in the tables. The range or selection available for each range is listed in the tables.

3.10.1 Tuning

Table 3-14 lists all the register addresses and ranges or selections for the function parameters in the Set-up Group Tuning (Loop 1).

ATTENTION

Loop number is selected in the MSB of the Register Address in the request message.

Table 3-14 Set-up Group – Tuning (Loop 1)

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Gain #1 or PB Note 1	0001	001	FP	R/W	0.01 to 1000 Gain 0.1 to 9999 PB
Rate #1 Note 1	0002	002	FP	R/W	0.00 to 10.00
Reset #1 Note 1	0003	003	FP	R/W	0.02 to 50.00
Manual Reset	000D	013	FP	R/W	–100 to +100
Gain #2 or PB Note 1	0004	004	FP	R/W	0.01 to 1000
Rate #2 Note 1	0005	005	FP	R/W	0.00 to 10.00
Reset #2 Note 1	0006	006	FP	R/W	0.02 to 50.00
Cycle Time #1	009E	158	INT	R/W	1 to 120 seconds
Cycle Time #2	009F	159	INT	R/W	1 to 120 seconds
Lockout (keyboard only) Changes to data are always possible via communications regardless of this configuration.	0084	132	INT	R/W	0 = No Lockout 1 = Calibration only 2 = Calibration + Configuration 3 = Calibration + Configuration + View 4 = Maximum Lockout

Table continued on next page

Table 3-14 Set-up Group – Tuning (Loop 1)), continued

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Keyboard Lockout	00BF	191	INT	R/W	0 = All keys enabled 1 = Manual Auto Key Locked 2 = Setpoint Select Key Locked 3 = Manual/Auto and Setpoint Select Keys Locked 4 = Run Hold Key Locked 5 = Run Hold Key and Manual/Auto Keys Locked 6 = Run Hold Key and Setpoint Select Keys Locked 7 = Run Hold, Setpoint Select, and Manual/Auto Keys Locked
PV1 Value Gain Scheduling	0001	001**	FP	R/W	–999 to 9999
PV2 Value Gain Scheduling	0002	002**	FP	R/W	–999 to 9999
PV3 Value Gain Scheduling	0003	003**	FP	R/W	–999 to 9999
PV4 Value Gain Scheduling	0004	004**	FP	R/W	–999 to 9999
PV5 Value Gain Scheduling	0005	005**	FP	R/W	–999 to 9999
PV6 Value Gain Scheduling	0006	006**	FP	R/W	–999 to 9999
PV7 Value Gain Scheduling	0007	007**	FP	R/W	–999 to 9999
PV8 Value Gain Scheduling	0008	008**	FP	R/W	–999 to 9999
Gain 1 Value Gain Scheduling	0009	009**	FP	R/W	0.001 to 1000
Gain 2 Value Gain Scheduling	000A	010**	FP	R/W	0.001 to 1000
Gain 3 Value Gain Scheduling	000B	011**	FP	R/W	0.001 to 1000

Table continued on next page

Table 3-14 Set-up Group – Tuning (Loop 1), continued

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Gain 4 Value Gain Scheduling	000C	012**	FP	R/W	0.001 to 1000
Gain 5 Value Gain Scheduling	000D	013**	FP	R/W	0.001 to 1000
Gain 6 Value Gain Scheduling	000E	014**	FP	R/W	0.001 to 1000
Gain 7 Value Gain Scheduling	000F	015**	FP	R/W	0.001 to 1000
Gain 8 Value Gain Scheduling	0010	016**	FP	R/W	0.001 to 1000

**Extended Codes—Must Set Access Type bit in the MSB of the Register Address.

NOTE 1: Writes to these locations are not available when Accutune is enabled.

3.10.2 Tuning 2

Table 3-15 lists all the register addresses and ranges or selections for the function parameters in the Set-up Group Tuning (Loop 2).

ATTENTION

Loop number is selected in the MSB of the Register Address in the request message.

Table 3-15 Set-up Group – Tuning (Loop 2)

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Gain #3 or PB Note 1	0001	001	FP	R/W	0.01 to 1000 Gain 0.1 to 9999 PB
Rate #3 Note 1	0002	002	FP	R/W	0.00 to 10.00
Reset #3 Note 1	0003	003	FP	R/W	0.02 to 50.00
Manual Reset #3	000D	013	FP	R/W	–100 to +100
Gain #4 or PB Note 1	0004	004	FP	R/W	0.01 to 1000
Rate #4 Note 1	0005	005	FP	R/W	0.00 to 10.00

Table continued on next page

Table 3-15 Set-up Group – Tuning (Loop 2), continued

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Reset #4 Note 1	0006	006	FP	R/W	0.02 to 50.00
Cycle Time #3	009E	158	INT	R/W	1 to 120 seconds
Cycle Time #4	009F	159	INT	R/W	1 to 120 seconds
PV1 Value Gain Scheduling	0001	001**	FP	R/W	–999 to 9999
PV2 Value Gain Scheduling	0002	002**	FP	R/W	–999 to 9999
PV3 Value Gain Scheduling	0003	003**	FP	R/W	–999 to 9999
PV4 Value Gain Scheduling	0004	004**	FP	R/W	–999 to 9999
PV5 Value Gain Scheduling	0005	005**	FP	R/W	–999 to 9999
PV6 Value Gain Scheduling	0006	006**	FP	R/W	–999 to 9999
PV7 Value Gain Scheduling	0007	007**	FP	R/W	–999 to 9999
PV8 Value Gain Scheduling	0008	008**	FP	R/W	–999 to 9999
Gain 1 Value Gain Scheduling	0009	009**	FP	R/W	0.001 to 1000
Gain 2 Value Gain Scheduling	000A	010**	FP	R/W	0.001 to 1000
Gain 3 Value Gain Scheduling	000B	011**	FP	R/W	0.001 to 1000
Gain 4 Value Gain Scheduling	000C	012**	FP	R/W	0.001 to 1000
Gain 5 Value Gain Scheduling	000D	013**	FP	R/W	0.001 to 1000
Gain 6 Value Gain Scheduling	000E	014**	FP	R/W	0.001 to 1000
Gain 7 Value Gain Scheduling	000F	015**	FP	R/W	0.001 to 1000
Gain 8 Value Gain Scheduling	0010	016**	FP	R/W	0.001 to 1000

**Extended Codes—Must Set Access Type bit in the MSB of the Register Address.

3.10.3 SP Ramp/Rate/Program

Table 3-16 lists all the register addresses and ranges or selections for the function parameters in Set-up Group Setpoint Ramp/Rate.

ATTENTION

Loop number is selected in the MSB of the Register Address in the request message.

Table 3-16 Set-up Group – Setpoint Ramp/Rate

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Setpoint Program Ramp Selection (Loop 1 only)	00B2	178	INT	R/W	0 = SP Program, Rate, and Ramp Disabled 1 = SP Program Enabled Loop 1 2 = SP Ramp Enabled Loop 1 3 = SP Rate Enabled Loop 1 4 = SP Program Enabled Loop 2 5 = SP Program Enabled Loop 1/2 6 = SP Ramp Enabled Loop 2 7 = SP Ramp Enabled Loop 1/2 8 = SP Rate Enabled Loop 2 9 = SP Rate Enabled Loop 1/2
SP Ramp	0096	150	INT	R/W	0 = OFF 2 = Loop 1 3 = Loop 2 4 = Both Loops
Single SP Ramp Time	00AE	174	INT	R/W	0 to 255 (minutes)
Final Ramp SP Value	001A	026	FP	R/W	PV Range in Engineering Units
SP Rate					
Rate Up (EU/HR)	006C	108	FP	R/W	0 to 9999
Rate Down (EU/HR)	006D	109	FP	R/W	0 to 9999
SP Program					
Start Segment #	00AF	175	INT	R/W	1 to 11
End Segment #(Soak)	00B0	176	INT	R/W	2, 4, 6, 8, 10, or 12
Engineering Units or Ramp Segments	00B6	182	INT	R/W	0 = HRS:MIN 1 = Degrees/Minute
Program Recycles	00B1	177	INT	R/W	0 to 99
Guaranteed Soak Deviation	0057	087	FP	R/W	0 to 99.9 (0 = no soak)
Program End State	00B5	181	INT	R/W	0 = Disable SP Program 1 = Hold at Program End

Table continued on next page

Table 3-16 Set-up Group – Setpoint Ramp/Rate, continued

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Controller Status at Program End	00B4	180	INT	R/W	0 = Last Setpoint and Mode 1 = Manual, Failsafe Output
Reset SP Program (ToBEGIN)	00B3	179	INT	R/W	0 = Disable 1 = Via Keypad0 = Disable 2 = Rerun
Segment #1 Ramp Time	0039	057	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #2 Soak Setpoint Value	003A	058	FP	R/W	Within Setpoint Limits
Segment #2 Soak Time	003B	059	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Segment #3 Ramp Time	003C	060	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #4 Soak Setpoint Value	003D	061	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #4 Soak Time	003E	062	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Segment #5 Ramp Time	003F	063	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #6 Soak Setpoint Value	0040	063	FP	R/W	Within Setpoint Limits
Segment #6 Soak Time	0041	065	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Segment #7 Ramp Time	0042	066	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #8 Soak Setpoint Value	0043	067	FP	R/W	Within Setpoint Limits
Segment #8 Soak Time	0044	068	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Segment #9 Ramp Time	0045	069	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)

Table continued on next page

Table 3-16 Set-up Group – Setpoint Ramp/Rate, continued

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Segment #10 Soak Setpoint Value	0046	070	FP	R/W	Within Setpoint Limits
Segment #10 Soak Time	0047	071	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Segment #11 Ramp Time	0048	072	FP	R/W	99.59 (0-99 Hrs:0-59 Min) or 0 to 999 (Degrees/Minute)
Segment #12 Soak Setpoint Value	0049	073	FP	R/W	Within Setpoint Limits
Segment #12 Soak Time	004A	074	FP	R/W	99.59 (0-99 Hrs:0-59 Min)
Present Segment Number	00FB	251	INT	RD	(READ ONLY) 1 to 12
Time Remaining — Minutes	00FC	252	INT	RD	(READ ONLY) 0-59 minutes (SP Program) 0-255 minutes (SP Ramp)
Time Remaining — Hours	00FD	253	INT	RD	(READ ONLY) 0 to 99
Cycles Remaining	00FE	254	INT	RD	(READ ONLY) 0 to 99

3.10.4 Accutune

Table 3-17 lists all the register addresses and ranges or selections for the function parameters in Set-up Group Adaptive Tune. Loop number is selected in the MSB of the Register Address in the request message.

Table 3-17 Set-up Group – Adaptive Tune

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Fuzzy Overshoot Suppression	00C1	193	INT	R/W	0 = Disabled 1 = Loop 1 Enabled 2 = Loop 2 Enabled 3 = Both loops Enabled
Accutune Enable – Loops 1 and 2	0098	152	INT	R/W	0 = Accutune Disabled 1 = Limit Tune 2 = Limit Tune + PV 3 = SP Tune – Normal 4 = SP Tune – Fast 5 = SP Tune + PV – Normal 6 = SP Tune + PV – Fast
Setpoint Change	0099	153	INT	R/W	5 to 15% span
Process Gain (KPG)	0072	114	FP	R/W	0.10 to 10.00
Accutune Error (Read only)	0097	151	INT	R/W	0 = None 1 = Output less than or greater than Output Limits or Man Step = 0 2 = Output greater or less than Heat/Cool Limits 3 = Not applicable 4 = PV change not sufficient 5 = Process Identification failed 6 = Calculated Reset outside Reset Limits 7 = Calculated Gain outside Gain Limits 8 = Accutune aborted on command 9 = Input 1 error detected 10 = Accutune illegal during Ramp 11 = Accutune aborted when external switch detected 12 = Running

3.10.5 Algorithm

Table 3-18 lists all the register addresses and ranges or selections for the function parameters in Set-up Group Algorithm. Loop number is selected in the MSB of the Register Address in the request message.

Table 3-18 Set-up Group – Algorithm

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Control Algorithm Selection (Selection here will affect ID code 160 in Output Algorithms.) † Not Available for Loop 2	0080	128	INT	R/W	0 = ON/OFF 1 = PID-A 2 = PID-B 3 = PD-A with Manual Reset 4 = Three Position Step†
Loop 2 Selection (Loop 2 address only)	00A8	168	INT	R/W	0 = Loop 1 Only 1 = Loop 2 Enabled 2 = Loops 1 and 2 are cascaded. Loop 2 primary (no output) – Loop 1 secondary.
Input Algorithm 1 † Input source selected via ID 205, 206, 207.	00CC	204	INT	R/W	0 = None 1 = Weighted Average (LSP)† 2 = Feedforward – Summer† 3 = Feedforward – Multiplier† 4 = Relative Humidity 5 = Summer (with ratio and bias)† 6 = Input High Select (with ratio and bias)† 7 = Input low Select (with ratio and bias)† 8 = General Math A (sq. rt., mult., div.)† 9 = General Math B (sq. rt., mult.)† 10 = General Math C (mult., div.)† 11 = General Math D (mult.)† 12 = Carbon A 13 = Carbon B 14 = Carbon C 15 = Carbon D 16 = Carbon FCC 17 = Oxygen 18 = Dewpoint

Table continued on next page

Table 3-18 Set-up Group – Algorithm, continued

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Input Algorithm 2 † Input source selected via ID 210, 211, 212.	00D1	209	INT	R/W	0 = None 1 = Weighted Average (LSP)† 2 = Feedforward – Summer† 3 = Feedforward – Multiplier† 4 = Summer (with ratio and bias)† 5 = Input High Select (with ratio and bias)† 6 = Input low Select (with ratio and bias)† 7 = General Math A (sq. rt., mult., div.)† 8 = General Math B (sq. rt., mult.)† 9 = General Math C (mult., div.)† 10 = General Math D (mult.)† 11 = Dewpoint
Timer (Enab / Disab)	00D8	216	INT	R/W	0 = Disable, 1 = Enable
Timeout Period	0063	099	FP	R/W	00.00 to 99.59
Start (Initiation)	00D9	217	INT	R/W	0 = Key(Run/Hold key), 1 = Alarm2
L Disp (Selection)	00DA	218	INT	R/W	0 = TI REM, 1 = Elapsed Time
Constant K for Math Algorithm 1	002D	045	FP	R/W	0.001 to 1000
Calc High (for Input Algorithm 1)	001F	031	FP	R/W	–999.0 to +9999 in Engineering Units
Calc Low (for Input Algorithm 1)	0020	032	FP	R/W	–999.0 to +9999 in Engineering Units
Constant K for Math Algorithm 2	002F	047	FP	R/W	0.001 to 1000
Calc High (for Input Algorithm 2)	0033	051	FP	R/W	–999.0 to +9999 in Engineering Units
Calc Low (for Input Algorithm 2)	0034	052	FP	R/W	–999.0 to +9999 in Engineering Units
Input Algorithm 1 Input A Selection (used with ID 204 math calculations)	00CD	205	INT	R/W	0 = Input 1 1 = Input 2 2 = Loop 1 Output 3 = Loop 2 Output 4 = Input Algorithm 1 5 = Input Algorithm 2 6 = Input 3
Input Algorithm 1 Input B Selection (used with ID 204 math calculations)	00CE	206	INT	R/W	0 = Input 1 1 = Input 2 2 = Loop 1 Output 3 = Loop 2 Output 4 = Input Algorithm 1 5 = Input Algorithm 2 6 = Input 3

Table continued on next page

Table 3-18 Set-up Group – Algorithm, continued

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Input Algorithm 1 Input C Selection (used with ID 204 math calculations)	00CF	207	INT	R/W	0 = None 1 = Input 1 2 = Input 2 3 = Loop 1 Output 4 = Loop 2 Output 5 = Input Algorithm 1 6 = Input Algorithm 2 7 = Input 3
Atmospheric Pressure	0018	024	FP	R/W	590.0 to 760.0
Algorithm1 bias	005C	092	FP	R/W	-999.0 to 9999 in Engineering Units
Percent Carbon Selection	00CB	203	INT	R/W	0 = Fixed via PC Carbon Value 1 = On-line via Input 3
Percent Carbon Value	002E	046	FP	R/W	0.02 to 0.350
Percent Hydrogen	0022	034	FP	R/W	1 to 99 (% H_2)
Algorithm 2 bias	005D	093	FP	R/W	-999.0 to 9999 in Engineering Units
Input Algorithm 2 Input A Selection (used with ID 209 math calculations)	00D2	210	INT	R/W	0 = Input 1 1 = Input 2 2 = Loop 1 Output 3 = Loop 2 Output 4 = Input Algorithm 1 5 = Input Algorithm 2 6 = Input 3
Input Algorithm 2 Input B Selection (used with ID 209 math calculations)	00D3	211	INT	R/W	0 = Input 1 1 = Input 2 2 = Loop 1 Output 3 = Loop 2 Output 4 = Input Algorithm 1 5 = Input Algorithm 2 6 = Input 3
Input Algorithm 2 Input C Selection (used with ID 209 math calculations)	00D4	212	INT	R/W	0 = None 1 = Input 1 2 = Input 2 3 = Loop 1 Output 4 = Loop 2 Output 5 = Input Algorithm 1 6 = Input Algorithm 2 7 = Input 3
8-segment Characterizer 1	00C6	198	INT	R/W	0 = Disable 1 = Input 1 2 = Input 2 3 = Loop 1 – Output 4 = Loop 2 – Output
X0 Input to 8-segment Characterizer	001A	026**	FP	R/W	0 to 99.99

Table continued on next page

Table 3-18 Set-up Group – Algorithm, continued

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
X1 Input	001B	027**	FP	R/W	0 to 99.99
X2 Input	001C	028**	FP	R/W	0 to 99.99
X3 Input	001D	029**	FP	R/W	0 to 99.99
X4 Input	001E	030**	FP	R/W	0 to 99.99
X5 Input	001F	031**	FP	R/W	0 to 99.99
X6 Input	0020	032**	FP	R/W	0 to 99.99
X7 Input	0021	033**	FP	R/W	0 to 99.99
X8 Input	0022	034**	FP	R/W	0 to 99.99
Y0 Output from 8-segment Characterizer	0023	035**	FP	R/W	0 to 99.99
Y1 Output	0024	036**	FP	R/W	0 to 99.99
Y2 Output	0025	037**	FP	R/W	0 to 99.99
Y3 Output	0026	038**	FP	R/W	0 to 99.99
Y4 Output	0027	039**	FP	R/W	0 to 99.99
Y5 Output	0028	040**	FP	R/W	0 to 99.99
Y6 Output	0029	041**	FP	R/W	0 to 99.99
Y7 Output	0030	042**	FP	R/W	0 to 99.99
Y8 Output	0031	043**	FP	R/W	0 to 99.99
8-segment Characterizer 2	00C7	199	INT	R/W	0 = Disable 1 = Input 1 2 = Input 2 3 = Loop 1 – Output 4 = Loop 2 – Output
X0 Input to 8-segment Characterizer 2	002D	045**	FP	R/W	0 to 99.99
X1 Input (Char.2)	002E	046**	FP	R/W	0 to 99.99
X2 Input (Char.2)	002F	047**	FP	R/W	0 to 99.99
X3 Input (Char.2)	0030	048**	FP	R/W	0 to 99.99
X4 Input (Char.2)	0031	049**	FP	R/W	0 to 99.99
X5 INPUT (CHAR.2)	0032	050**	FP	R/W	0 to 99.99
X6 Input (Char.2)	0033	051**	FP	R/W	0 to 99.99

Table continued on next page

Table 3-18 Set-up Group – Algorithm, continued

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
X7 Input (Char.2)	0034	052**	FP	R/W	0 to 99.99
X8 Input (Char.2)	0035	053**	FP	R/W	0 to 99.99
Y0 Output from 8-segment Characterizer2	0036	054**	FP	R/W	0 to 99.99
Y1 Output (Char.2)	0037	055**	FP	R/W	0 to 99.99
Y2 Output (Char.2)	0038	056**	FP	R/W	0 to 99.99
Y3 Output (Char.2)	0039	057**	FP	R/W	0 to 99.99
Y4 Output (Char.2)	003A	058**	FP	R/W	0 to 99.99
Y5 Output (Char.2)	003B	059**	FP	R/W	0 to 99.99
Y6 Output (Char.2)	003C	060**	FP	R/W	0 to 99.99
Y7 Output (Char.2)	003D	061**	FP	R/W	0 to 99.99
Y8 Output (Char.2)	003E	062**	FP	R/W	0 to 99.99
Totalizer	00C2	194	INT	R/W	0 = Disable 1 = Input 1 2 = Input Algorithm 1 3 = Input Algorithm 2
Totalizer Scale Factor (display only)	00C3	195	INT	R/W	0 = 10^0 = 1 1 = 10^1 = 10 2 = 10^2 = 100 3 = 10^3 = 1,000 4 = 10^4 = 10,000 5 = 10^5 = 100,000 6 = 10^6 = 1,000,000
Totalizer Reset Lock (When locked, totalizer cannot be reset from keyboard.)	00C4	196	INT	R/W	0 = Unlock 1 = Lock
Current Totalizer Value	0067	103	INT	R/W	0 to 10^{14}–1 NOTE: A value of “0” may be written to reset the totalizer. A write of any other value is not accepted.
Totalizer Integration Rate	00C5	197	INT	R/W	0 = Second 1 = Minute 2 = Hour 3 = Day 4 = Million/Day

**Denotes Extended Code.

3.10.6 Output Algorithm

Table 3-19 lists all the register addresses and ranges or selections for the function parameters in Set-up Group Output Algorithm. Loop number is selected in the MSB of the Register Address in the request message.

Table 3-19 Set-up Group – Output Algorithm

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Output Algorithm Loop 1	00A0	160	INT	R/W	0 = Not Allowed 1 = 3 Position Step or Position Proportioning 2 = Relay Simplex 3 = Relay Duplex (Loop 1 only) 4 = Current Simplex 5 = Current Duplex 6 = Relay/Current Duplex (Relay on Heat/Current Full) 7 = Current/Relay Duplex (Relay on Cool/Current Full) 8 = Current Duplex - Loop 1 only (Current Output - Cool, 2nd Current Output - Heat) 9 = Relay/Current Duplex - Loop 1 only (Relay on Heat/Current Split) 10 = Relay/Current Duplex - Loop 1 only (Relay on Cool/Current Split)
Relay Cycle Time Increments	00BE	190	INT	R/W	0 = 1 second increments 1 = 1/3 second increments
Output Algorithm Loop 2	00A0	160	INT	R/W	0 = Relay Simplex 1 = Current Simplex 2 = None 3 = Relay Duplex 4 = Current Duplex 5 = Current/Relay 6 = Relay/Current

3.10.7 Input 1

Table 3-20 lists all the register addresses and ranges or selections for the function parameters in Set-up Group Input 1.

Table 3-20 Set-up Group – Input 1 (Loop 1 Address only)

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Input 1 Type	00A8	168	INT	R/W	0 = Disable 1 = B TC 2 = E TC H 3 = E TC L 4 = J TC H 5 = J TC L 6 = K TC H 7 = K TC L 8 = NNM H 9 = NNM L 10 = NM90 H 11 = NM90 L 12 = Nicrosil TC 13 = R TC 14 = S TC 15 = T TC H 16 = T TC L 17 = W TC H 18 = W TC L 19 = 100 PT RTD 20 = 100 PT LO RTD 21 = 200 PT RTD 22 = 500 PT RTD 23 = Radiamatic RH 24 = Radiamatic RI 25 = 0-20 mA 26 = 4-20 mA 27 = 0-10 mV 28 = 0-50 mV 29 = 0-5 Vdc 30 = 1-5 Vdc 31 = 0-10 Vdc 32 = Unused 33 = Carbon 34 = Oxygen
	ATTENTION Changing the Input Type will result in the loss of Field Calibration values and will restore the Factory Calibration values.				

Table continued on next page

Table 3-20 Set-up Group – Input 1 (Loop 1 Address only), continued

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Input 1 Transmitter Characterization	00A9	169	INT	R/W	0 = B TC 1 = E TC H 2 = E TC L 3 = J TC H 4 = J TC L 5 = K TC H 6 = K TC L 7 = NNM TC H 8 = NNM TC L 9 = R TC 10 = S TC 11 = T TC H 12 = T TC L 13 = W TC H 14 = W TC L 15 = 100 PT RTD 16 = 500 PT RTD 17 = 100 PT LO RTD 18 = Linear 19 = Square Root 20 = Nicrosil TC 21 = Radiamatic RH 22 = Radiamatic RI 23 = 200 PT RTD 24 = NM90 H 25 = NM90 L
Input 1 High Range Value	001D	029	FP	R/W	–999. to 9999. Engineering Units (Linear types only)
Input 1 Low Range Value	001E	030	FP	R/W	–999 to 9999. Engineering Units (Linear types only)
Input 1 Ratio	006A	106	FP	R/W	–20.00 to 20.00
Input 1 Bias	006B	107	FP	R/W	–999 to 9999. Engineering Units
Input 1 Filter	002A	042	FP	R/W	0 to 120 seconds
Burnout (Open Circuit Detection)	00A4	164	INT	R/W	0 = None and Failsafe 1 = Upscale 2 = Downscale 3 = No F.S.
Emissivity	0017	023	FP	R/W	0.01 to 1.00

3.10.8 Input 2

Table 3-21 lists all the register addresses and ranges or selections for the function parameters in Set-up Group Input 2.

Table 3-21 Set-up Group – Input 2 (Loop 1 Address only)

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Input 2 Type	00AA	170	INT	R/W	0 = Disable 1 = B TC 2 = E TC H 3 = E TC L 4 = J TC H 5 = J TC L 6 = K TC H 7 = K TC L 8 = NNM H 9 = NNM L 10 = NM90 H 11 = NM90 L 12 = Nicrosil TC 13 = R TC 14 = S TC 15 = T TC H 16 = T TC L 17 = W TC H 18 = W TC L 19 = 100 PT RTD 20 = 100 PT LO RTD 21 = 200 PT RTD 22 = 500 PT RTD 23 = Radiamatic RH 24 = Radiamatic RI 25 = 0-20 mA 26 = 4-20 mA 27 = 0-10 mV 28 = 0-50 mV 29 = 0-5 Vdc 30 = 1-5 Vdc 31 = 0-10 Vdc 32 = Slidewire 33 = Unused 34 = Unused
	ATTENTION Changing the Input Type will result in the loss of Field Calibration values and will restore the Factory Calibration values.				

Table continued on next page

Table 3-21 Set-up Group – Input 2 (Loop 1 Address only), continued

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Input 2 Transmitter Characterization	00AB	171	INT	R/W	0 = B TC 1 = E TC H 2 = E TC L 3 = J TC H 4 = J TC L 5 = K TC H 6 = K TC L 7 = NNM TC H 8 = NNM TC L 9 = R TC 10 = S TC 11 = T TC H 12 = T TC L 13 = W TC H 14 = W TC L 15 = 100 PT RTD 16 = 500 PT RTD 17 = 100 PT LO RTD 18 = Linear 19 = Square Root 20 = Nicrosil TC 21 = Radiamatic RH 22 = Radiamatic RI 23 = 200 PT RTD 24 = NM90 H 25 = NM90 L 26 = Cotton
Input 2 High Range Value	0023	035	FP	R/W	–999. to 9999. Engineering Units
Input 2 Low Range Value	0024	036	FP	R/W	–999 to 9999. Engineering Units
Input 2 Ratio	0025	037	FP	R/W	–20.00 to 20.00
Input 2 Bias	0026	038	FP	R/W	–999 to 9999. Engineering Units
Input 2 Filter	002B	043	FP	R/W	0 to 120 seconds
Burnout 2	00A5	165	INT	R/W	0 = None and Failsafe 1 = Upscale 2 = Downscale 3 = No F.S.
Emissivity 2	002C	044	FP	R/W	0.01 to 1.00

3.10.9 Input 3

Table 3-22 lists all the register addresses and ranges or selections for the function parameters in Set-up Group Input 3.

Table 3-22 Set-up Group – Input 3 (Loop 1 Address only)

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Input 3 Type	00D6	214	INT	R/W	0 = Disable 1 = 0-20 mA 2 = 4-20 mA 3 = 0-5 Vdc 4 = 1-5 Vdc
	ATTENTION Changing the Input Type will result in the loss of Field Calibration values and will restore the Factory Calibration values.				
Input 3 Transmitter Characterization	00D7	215	INT	R/W	0 = B TC 1 = E TC H 2 = E TC L 3 = J TC H 4 = J TC L 5 = K TC H 6 = K TC L 7 = NNM TC H 8 = NNM TC L 9 = R TC 10 = S TC 11 = T TC H 12 = T TC L 13 = W TC H 14 = W TC L 15 = 100 PT RTD 16 = 500 PT RTD 17 = 100 PT LO RTD 18 = Linear 19 = Square Root 20 = Nicrosil TC 21 = Radiamatic RH 22 = Radiamatic RI 23 = 200 PT RTD 24 = NM90 H 25 = NM90 L

Table continued on next page

Table 3-22 Set-up Group – Input 3 (Loop 1 Address only), continued

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Input 3 High Range Value	001B	027	FP	R/W	–999. to 9999. Engineering Units
Input 3 Low Range Value	001C	028	FP	R/W	–999 to 9999. Engineering Units
Input 3 Ratio	0025	104	FP	R/W	–20.00 to 20.00
Input 3 Bias	0026	105	FP	R/W	–999 to 9999. Engineering Units
Input 3 Filter	002B	033	FP	R/W	0 to 120 seconds

3.10.10 Control/Control 2

Table 3-23 lists all the register addresses and ranges or selections for the function prompts in Set-up Group Control/Control 2. Loop number is selected in the MSB of the Register Address in the request message.

Table 3-23 Set-up Group – Control and Control 2

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
PV Source	0085	133	INT	R/W	0 = Input 1 1 = Input 2 2 = Input Algorithm 1 3 = Input Algorithm 2 4 = Input 3
Tuning Parameter Selection	00AC	172	INT	R/W	0 = One set only 1 = 2 sets keyboard selected 2 = 2 sets with PV automatic switchover 3 = 2 sets with setpoint (SP) automatic switchover 4 = Gain scheduling
Automatic Switchover Value (used with 172 selection 2 or 3)	0038	056	FP	R/W	Within the PV Range in engineering units
Local Setpoint Source (Number of LSPs)	00AD	173	INT	R/W	0 = One Local Setpoint 1 = Two Local Setpoints 3 = Three Local Setpoints (disables RSP)
Power Up Mode Recall (Loop 1 only)	0082	130	INT	R/W	**Control Mode / Setpoint Mode** 0 = MAN / LSP 1 = AUTO / LSP 2 = AUTO / Last SP 3 = LAST / Last SP 4 = LAST / Last local SP
Setpoint Source	0083	131	INT	R/W	0 = None 1 = Input 2 2 = Input Algorithm 1 3 = Input Algorithm 2 4 = Input 3
Auto-Bias (LSP to RSP)	0089	137	INT	R/W	0 = Disabled (bump) 1 = Enabled (bumpless)
Setpoint Tracking	008A	138	INT	R/W	0 = None 1 = LSP = PV (when in Manual) 2 = LSP = RSP (when switched)
Control Setpoint High Limit	0007	007	FP	R/W	0 to 100% of PV (engineering units)

Table continued on next page

Table 3-23 Set-up Group – Control and Control 2, continued

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Control Setpoint Low Limit	0008	008	FP	R/W	0 to 100% of PV (engineering units)
Force Link Control Modes (Loops 1 and 2)	0084	132‘	INT	R/W	0 = Disable 1 = Link Control Modes
Control Output Direction/Alarm Outputs	0087	135	INT	R/W	0 = Direct Action Alarm Output energized 1 = Direct Action Alarm Output de-energized 2 = Reverse Action Alarm Output energized 3 = Reverse Action Alarm Output de-energized
High Output Limit	000E	014	FP	R/W	–5 to 105% of output
Low Output Limit	000F	015	FP	R/W	–5 to 105% of output
High Reset Limit	0010	016	FP	R/W	–5 to 105% of output
Low Reset Limit	0011	017	FP	R/W	–5 to 105% of output
Output Change Rate Limiting	00BD	189	INT	R/W	0 = Disable 1 = Enable
Output Change Rate Up	006E	110	FP	R/W	0 to 9999%/minute
Output Change Rate Down	006F	111	FP	R/W	0 to 9999%/minute
Controller Dropoff Value	0014	020	FP	R/W	–5 to 105% of output
Output Deadband	0012	018	FP	R/W	–5 to +25.0%
Output Hysteresis (Loop 1 address only)	0013	019	FP	R/W	0 to 5.0%
Failsafe Mode	00D5	213	INT	R/W	0 = Latching 1 = Non latching
Failsafe Output Level	0028	040	FP	R/W	0 to 100%
Manual Power Up Output (Loop 1 only)	0070	112	FP	R/W	0 to 100
Auto Power Up Output (Loop 1 only)	0071	113	FP	R/W	0 to 100
Proportional Band Units (Loop 1 address only)	0094	148	INT	R/W	0 = Gain 1 = Proportional band
Reset Units (Loop 1 address only)	0095	149	INT	R/W	0 = Minutes 1 = RPM

3.10.11 Options

Table 3-24 lists all the register addresses and ranges or selections for the function parameters in Set-up Group Options. Loop number is selected in the MSB of the Register Address in the request message.

Table 3-24 Set-up Groups – Options

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Auxiliary Output	0086	134	INT	R/W	0 = None 1 = Input 1 2 = Input 2 3 = PV – Loop 1 4 = Deviation – Loop 1 5 = Output – Loop 1 6 = Setpoint – Loop 1 7 = LSP1 – Loop 1 8 = Input Algorithm 1 9 = Input Algorithm 2 10 = Input 3 11 = Unused 12 = PV – Loop 2 13 = Deviation – Loop 2 14 = Output – Loop 2 15 = Setpoint – Loop 2 16 = LSP1 – Loop 2
Low Scaling Factor (Loop 1 address only)	0031	049	FP	R/W	Within the range of the selected variable in ID 134
High Scaling Factory (Loop 1 address only)	0032	050	FP	R/W	Within the range of the selected variable in ID 134

Table continued on next page

Table 3-24 Set-up Groups – Options, continued

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Digital Input #1 (Loop 1 address only)	00BA	186	INT	R/W	0 = None 1 = To Manual 2 = To Local Setpoint #1 3 = To Local Setpoint #2 4 = To Direct Action 5 = To Hold Ramp 6 = To PID Set #2 7 = PV = Input 2 8 = To Run Ramp 9 = Reset SP Program 10 = Inhibit Reset 11 = To Manual/Failsafe Output 12 = Disable Keyboard 13 = To Automatic Output 14 = To Timer 15 = To Auto/Man Station 16 = To Local Setpoint #3 17 = Initiate Limit Cycle Tuning 18 = Setpoint Initialization 19 = Output 1 Tracks Input 2 21 = To RSP 23 = External Reset Feedback 24 = To Purge 25 = To Low Fire 27 = Manual Latching 28 = PV = Input 3 29 = Rerun 30 = Reset Totalizer For 0 through 255 loop selected by address in request message. For digital input combinations see Figure 3-3.

Table continued on next page

Table 3-24 Set-up Groups – Options, continued

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Digital Input #2 (Loop 1 address only)	00BB	187	INT	R/W	0 = None 1 = To Manual 2 = To Local Setpoint #1 3 = To Local Setpoint #2 4 = To Direct Action 5 = To Hold Ramp 6 = To PID Set #2 7 = PV = Input 2 8 = To Run Ramp 9 = Reset SP Program 10 = Inhibit Reset 11 = To Manual/Failsafe Output 12 = Disable Keyboard 13 = To Automatic Output 14 = To Timer 15 = To Auto/Man Station 16 = To Local Setpoint #3 17 = Initiate Limit Cycle Tuning 18 = Setpoint Initialization 19 = Output 1 Tracks Input 2 21 = To RSP 23 = External Reset Feedback 24 = To Purge 25 = To Low Fire 27 = Manual Latching 28 = Input 3 29 = Rerun 30 = Reset Totalizer For 0 through 255 loop selected by address in request message. For digital input combinations see Figure 3-3.

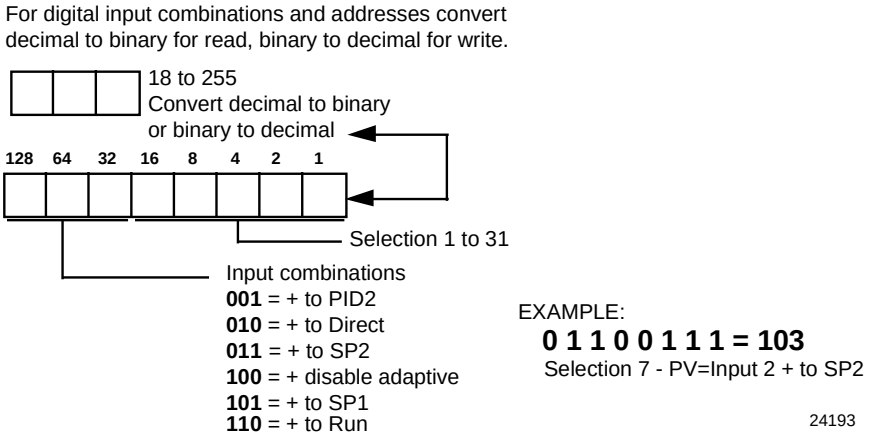

Figure 3-3 Digital Input Combinations, Inputs 1 and 2

3.10.12 Communications

Table 3-25 lists all the register addresses and ranges or selections for the function parameters in Set-up Group Communications. Loop number is selected in the MSB of the Register Address in the request message.

Table 3-25 Set-up Group – Communications

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Shed Time (Loop 1 address only)	009A	154	INT	R/W	0 = No Shed 1 = 255 sample periods
Shed Mode and Output (Loop 1 address only)	00A2	162	INT	R/W	0 = Last Mode and Last Output 1 = Manual Mode, Last Output 2 = Manual Mode, Failsafe Output 3 = Automatic Mode
Shed Setpoint Recall (Loop 1 address only)	00A3	163	INT	R/W	0 = To Last Local Setpoint used 1 = Last Setpoint prior to Shed
Computer Setpoint Ratio	0015	021	FP	R/W	–20.00 to 20.00
Computer Setpoint Bias	0016	022	FP	R/W	–999 to 9999.

3.10.13 Alarms

Table 3-26 lists all the register addresses and ranges or selections for the function parameters in Set-up Group Alarms.

Table 3-26 Set-up Group – Alarms (Loop 1 Address only)

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Alarm 1 Setpoint 1 Value	0009	009	FP	R/W	Within the range of selected parameter or PV span for deviation alarm
Alarm 1 Setpoint 2 Value	000A	010	FP	R/W	Within the range of selected parameter or PV span for deviation alarm
Alarm 2 Setpoint 1 Value	000B	011	FP	R/W	Within the range of selected parameter or PV span for deviation alarm
Alarm 2 Setpoint 2 Value	000C	012	FP	R/W	Within the range of selected parameter or PV span for deviation alarm
Alarm 1 Setpoint 1 Type	008C	140	INT	R/W	0 = None 1 = Input 1 2 = Input 2 3 = PV – Loop 1 4 = Deviation – Loop 1 5 = Output – Loop 1 6 = Alarm on Shed 7 = SP Event On 8 = SP Event Off 9 = Manual – Loop 1 10 = Remote Setpoint – Loop 1 11 = Failsafe – Loop 1 12 = PV Rate of Change – Loop 1 13 = Input 3 15 = PV – Loop 2 16 = Deviation – Loop 2 17 = Output – Loop 2 18 = Manual – Loop 2 19 = Remote Setpoint – Loop 2 20 = Failsafe – Loop 2 21 = PV Rate of Change – Loop 2 22 = Break 23 = Break 2 24 = Totalizer
Alarm 1 Setpoint 2 Type	008E	142	INT	R/W	Same as 140
Alarm 2 Setpoint 1 Type	0090	144	INT	R/W	Same as 140

Table continued on next page

Table 3-26 Set-up Group – Alarms (Loop 1 Address only)continued

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Alarm 2 Setpoint 2 Type	0092	146	INT	R/W	Same as 140
Alarm 1 Setpoint 1 Event	008D	141	INT	R/W	0 = Low Alarm 1 = High Alarm
Alarm 1 Setpoint 2 Event	008F	143	INT	R/W	0 = Low Alarm 1 = High Alarm
Alarm 2 Setpoint 1 Event	0091	145	INT	R/W	0 = Low Alarm 1 = High Alarm
Alarm 2 Setpoint 2 Event	0093	147	INT	R/W	0 = Low Alarm 1 = High Alarm
Alarm Hysteresis	0029	041	FP	R/W	0.0 to 100% of output or span
Alarm Latching for Output 1	00C8	200	INT	R/W	0 = Non Latching 1 = Latching
Alarm States	00C9	201	INT	R/W	State = 0 = Not in Alarm State = 1 = In Alarm Bit 0 = Alarm 11 State Bit 1 = Alarm 12 State Bit 2 = Alarm 21 State Bit 3 = Alarm 22 State Event = 0 = Low Event = 1 = High Bit 4 = Alarm 11 Event Bit 5 = Alarm 12 Event Bit 6 = Alarm 21 Event Bit 7 = Alarm 22 Event
Alarm 1 Blocking	00CA	202	INT	R/W	0 = Disable 1 = Block 1 2 = Block 2 3 = Block 1 2

3.10.14 Display

Table 3-27 lists all the register addresses and ranges or selections for the function parameters in Set-up Group Display.

ATTENTION

Loop number is selected in the MSB of the Register Address in the request message.

Table 3-27 Set-up Group – Display

Parameter Description	Register Address		Data Type	Access	Data Range or Enumerated Selection
	Hex	Decimal			
Temperature Units	0081	129	INT	R/W	0 = °F 1 = °C 2 = None
Language (Displays)	00C0	192	INT	R/W	0 = English 1 = French 2 = German 3 = Spanish 4 = Italian
Front Panel Ratio 2 Enabled	00D0	208	INT	R/W	0 = Disabled 1 = Enabled on Lower Display
Power Frequency (Loop 1 address only)	00A6	166	INT	R/W	0 = 60 Hertz 1 = 50 Hertz
Decimal Point Location	009B	155	INT	R/W	0 = XXXX – Fixed 1 = XXX.X – Floating decimal point to one 2 = XX.XX – Floating decimal point to two 3 = X.XXX – Floating decimal point to three

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