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**W A L C H E M**

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IWAKI America Inc.

# W600/W900 Modbus

A decorative graphic consisting of several overlapping, curved lines in a light blue color. The lines originate from the left side of the page and curve towards the right, creating a sense of motion and depth. The lines vary in thickness and curvature, with some being more prominent than others.

Instruction Manual

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180676 Rev D  
December 2017

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## 1.0 SCOPE

This document is a User Interface Specification for the Walchem Modbus/TCP product feature for W600 and W900 Controllers. It contains mapping of the various dynamic variables to their Modbus/TCP address locations.

This document supports the Modbus/TCP feature on controller software versions 3.01 and higher.

## 2.0 INTRODUCTION

The Modbus/TCP feature allows the Walchem controller to communicate with PC-based applications such as WonderWare and Intellution HMI/SCADA programs, Building Energy Management systems, Distributed Control Systems (DCS), as well as stand-alone HMI devices.

The controller is a Modbus Server, meaning that it can respond to requests from the HMI device. The controller cannot initiate the flow of information. For example, it will not immediately send a new alarm message. It will wait until the HMI device requests the current data contained in specific address locations.

If the HMI device does not directly support the Modbus/TCP protocol, then a protocol translation gateway may be required to convert from Modbus/TCP to a protocol that the device supports. Please note that Modbus/RTU requires a serial interface, not Ethernet, and therefore is not directly compatible with the Walchem controller.

## 3.0 OVERVIEW

Modbus/TCP, also known as Modbus TCP/IP, is a form of Modbus that uses the TCP/IP layers as a base for controlling the communications between different devices. This is not to be confused with Modbus *over* TCP/IP, which Walchem controllers do not support.

The Modbus/TCP protocol supports multiple types of data transactions, from reading single bits per transaction, to advanced object oriented operations. However, to ensure the most compatible system available, only a basic subset of these functions is supported in the controller.

The official Modbus/TCP protocol supports data addresses 5 digits in length. A *de facto* extended standard exists which supports data addresses 6 digits in length. However, to ensure compatibility, the Modbus/TCP feature supports only 5-digit data address system.

The Modbus/TCP feature supports reading and writing of single-bit Coils and 16-bit Holding Registers, as well as read-only single-bit Discrete Inputs and 16-bit Input Registers. These data formats allow the controller to establish blocks that contain all the process variables, set points, alarms, and input/output status values that are made public to a Modbus/TCP client. These blocks of data are packaged so that it can be read in 8-bit chunks (for a group of up to 8 Coils or Discrete Inputs) or 16-bit chunks (for a single Holding Register or Input Register), regardless of the type of data within it. In the following sections, the formatting, storing, and reading of this data are described.

### 3.1 Modbus Settings

Settings relating to the Modbus/TCP feature can be configured in the Remote Communication Configuration Menu.

The 'Verbose Logging' setting is used to generate an Event log entry for every Modbus message into and out of the controller. The information may be used in conjunction with an HMI log when troubleshooting communications during commissioning. However, the additional logging adds a significant load on the controller's systems. Therefore, this feature should only be enabled temporarily while actively troubleshooting communications. The setting automatically reverts to Disabled when the controller is restarted.

Detailed information on the Remote Communication Configuration Menu can be found in the controller Instruction Manual.

## 4.0 MODBUS/TCP DRIVER

### 4.1 Modbus/TCP Protocol

The Modbus protocol, as well as the Modbus/TCP variant, is well documented in the specifications which are available at <http://www.modbus.org>, a website established by the Modbus Organization for supporting and organizing the Modbus protocol.

The Modbus/TCP Application Data Unit (ADU) consists of 2 distinct sections:



The total size of the ADU is between 9 and 263 bytes, depending on the function code and number of data addresses requested.

#### 4.1.1 MBAP Header

The Modbus/TCP extension adds 7 additional bytes to the original Modbus protocol, which allows for the transport over the TCP/IP layers. These 7 bytes make up the MBAP Header:

Modbus Application Protocol (MBAP) Header		
Name	Size	Description
Transaction Identifier	2 bytes	Identification of Request/Response transaction. Copied from request to response
Protocol Identifier	2 bytes	0 = Modbus protocol.
Length	2 bytes	Number of following bytes (includes the Unit Identifier and PDU)
Unit Identifier	1 byte	Identification of Remote Device. Can be used for broadcasting (unsupported).

The Unit Identifier has a special consideration in the Modbus/TCP implementation. If the value is 0, then the request is a broadcast message and the packet will be processed, but no response will be generated. If the value is non-zero, the packet will be processed and a response will be returned.

Normally the Slave ID, which is not present in the Modbus/TCP protocol, will be set in the HMI client software to 1. The broadcast Unit Identifier address is not supported by the controller; all supported function codes require a response message at all times.

### 4.1.2 Protocol Data Unit

The Protocol Data Unit (PDU) is made up of between 2 and 256 bytes, depending on the function and number of data addresses requested:

Protocol Data Unit (PDU)		
Name	Size	Description
Function Code	1 byte	Function Code identifier. Can be any of the hexadecimal codes listed in the Function Code table.
Data Payload	1 – 255 byte(s)	Payload for request/response transactions. Varies depending on function code and number of addresses requested.

### 4.1.3 Modbus/TCP Function Codes

The Modbus/TCP Server feature supports the following function codes:

Supported Function Codes			
Function Code	Name	Description	Data Address Range
FC1 (0x01)	Read Coils	Read up to 2000 consecutive 1-bit Coils within a single request/response cycle.	0xxxx
FC2 (0x02)	Read Discrete Inputs	Read up to 2000 consecutive 1-bit Discrete Inputs within a single request/response cycle.	1xxxx
FC3 (0x03)	Read Holding Registers	Read up to 125 consecutive 16-bit Holding Registers within a single request/response cycle.	4xxxx
FC4 (0x04)	Read Input Registers	Read up to 125 consecutive 16-bit Input Registers within a single request/response cycle.	3xxxx
FC5 (0x05)	Write Single Coil	Write a single 1-bit Coil within a single request/response cycle.	0xxxx
FC6 (0x06)	Write Single Holding Register	Write a single 16-bit Holding Register within a single request/response cycle.	4xxxx
FC16 (0x10)	Write Multiple Holding Registers	Write up to 125 consecutive 16-bit Holding Registers within a single request/response cycle.	4xxxx

The consecutive address limitations of the Coils, Discrete Inputs, Holding Registers, and Input Registers were established for the Modbus/TCP standard to maintain consistency with the original Modbus protocol standard, even though a TCP/IP packet can contain a larger payload.

The Modbus/TCP feature allows for Function Codes 1 and 2 to be used interchangeably for read requests. For example, a read coils (FC1) request for data addresses 00605 through 00610 will always return the same result as a read discrete inputs (FC2) request for data addresses 10605 through 10610.

Likewise, the Modbus/TCP feature allows for Function Codes 3 and 4 to also be used interchangeably for read requests. For example, a read holding registers (FC3) request for data addresses 40587 through 40590 will always return the same result as a read input registers (FC4) request for data addresses 30587 through 30590. All addresses accessible as a Coil or Discrete Input may also be accessed as a Holding Register or Input Register.

Only the 4 least significant digits of the data address are explicitly stated in the Modbus message, with the most significant (5<sup>th</sup>) digit being derived from the function code. However, generally the entire 5-digit data address must be specified in the Tag Database of an HMI.

#### 4.1.3.1 Function Code 1, Read Coils

Read Coils Request PDU		
Name	Size	Description
Function Code	1 Byte	Function Code Identifier (0x01).
Starting Address	2 Bytes	The data address of the first Coil to read.
Quantity of Coils	2 Bytes	The number of Coils requested, maximum of 2000 per message.

Read Coils Response PDU		
Name	Size	Description
Function Code	1 Byte	Function Code Identifier (0x01).
Byte Count	1 Byte	The number of data bytes to follow.
Coil Status	1-125 Bytes	8 Coils per byte, up to 2000 Coils per message.

Read Coils Exception PDU		
Name	Size	Description
Error Code	1 Byte	0x80 plus Function Code Identifier (0x81).
Exception Code	1 Byte	See <a href="#">4.1.4 Modbus/TCP Exception Error Codes</a>

#### 4.1.3.2 Function Code 2, Read Discrete Inputs

Read Discrete Inputs Request PDU		
Name	Size	Description
Function Code	1 Byte	Function Code Identifier (0x02).
Starting Address	2 Bytes	The data address of the first Discrete Input to read.
Quantity of Discrete Inputs	2 Bytes	The number of Discrete Inputs requested, maximum of 2000 per message.

Read Discrete Inputs Response PDU		
Name	Size	Description
Function Code	1 Byte	Function Code Identifier (0x02).
Byte Count	1 Byte	The number of data bytes to follow.
Discrete Input Status	1-125 Bytes	8 Discrete Inputs per byte, up to 2000 Discrete Inputs per message.

Read Discrete Inputs Exception PDU		
Name	Size	Description
Error Code	1 Byte	0x80 plus Function Code Identifier (0x82).
Exception Code	1 Byte	See <a href="#">4.1.4 Modbus/TCP Exception Error Codes</a>



#### 4.1.3.3 Function Code 3, Read Holding Registers

Read Holding Registers Request PDU		
Name	Size	Description
Function Code	1 Byte	Function Code Identifier (0x03).
Starting Address	2 Bytes	The data address of the first Holding Register to read.
Quantity of Holding Registers	2 Bytes	The total number of Holding Registers requested, maximum of 125 per message.

Read Holding Registers Response PDU		
Name	Size	Description
Function Code	1 Byte	Function Code Identifier (0x03).
Byte Count	1 Byte	The number of data bytes to follow.
Holding Register Values	2-250 Bytes	1 Holding Register for every 2 bytes, maximum of 125 Holding Registers per message.

Read Holding Registers Exception PDU		
Name	Size	Description
Error Code	1 Byte	0x80 plus Function Code Identifier (0x83).
Exception Code	1 Byte	See <a href="#">4.1.4 Modbus/TCP Exception Error Codes</a>

#### 4.1.3.4 Function Code 4, Read Input Registers

Read Input Registers Request PDU		
Name	Size	Description
Function Code	1 Byte	Function Code Identifier (0x04).
Starting Address	2 Bytes	The data address of the first Input Register to read.
Quantity of Input Registers	2 Bytes	The total number of Input Registers requested, maximum of 125 per message.

Read Input Registers Response PDU		
Name	Size	Description
Function Code	1 Byte	Function Code Identifier (0x04).
Byte Count	1 Byte	The number of data bytes to follow.
Input Register Values	2-250 Bytes	1 Input Register for every 2 bytes, maximum of 125 Input Registers per message.

Read Input Registers Exception PDU		
Name	Size	Description
Error Code	1 Byte	0x80 plus Function Code Identifier (0x84).
Exception Code	1 Byte	See <a href="#">4.1.4 Modbus/TCP Exception Error Codes</a>

#### 4.1.3.5 Function Code 5, Write Single Coil

Write Single Coil Request PDU		
Name	Size	Description
Function Code	1 Byte	Function Code Identifier (0x05).
Coil Address	2 Bytes	The data address of the Coil to which to write.
Coil Value	2 Bytes	The value to write to the Coil (0xFF00 = On, 0x0000 = Off).

Write Single Coil Response PDU		
Name	Size	Description
Function Code	1 Byte	Function Code Identifier (0x05).
Coil Address	2 Bytes	The data address of the Coil written.
Coil Value	2 Bytes	The value written to the Coil (0xFF00 = On, 0x0000 = Off).

Write Single Coil Exception PDU		
Name	Size	Description
Error Code	1 Byte	0x80 plus Function Code Identifier (0x85).
Exception Code	1 Byte	See <a href="#">4.1.4 Modbus/TCP Exception Error Codes</a>

#### 4.1.3.6 Function Code 6, Write Single Holding Register

Write Single Holding Register Request PDU		
Name	Size	Description
Function Code	1 Byte	Function Code Identifier (0x06).
Holding Register Address	2 Bytes	The data address of the Holding Register to which to write.
Holding Register Value	2 Bytes	The value to write to the Holding Register.

Write Single Holding Register Response PDU		
Name	Size	Description
Function Code	1 Byte	Function Code Identifier (0x06).
Holding Register Address	2 Bytes	The data address of the Holding Register written.
Holding Register Value	2 Bytes	The value written to the Holding Register.

Write Single Holding Register Exception PDU		
Name	Size	Description
Error Code	1 Byte	0x80 plus Function Code Identifier (0x86).
Exception Code	1 Byte	See <a href="#">4.1.4 Modbus/TCP Exception Error Codes</a>

#### 4.1.3.7 Function Code 16, Write Multiple Holding Registers

Write Multiple Holding Registers Request PDU		
Name	Size	Description
Function Code	1 Byte	Function Code Identifier (0x10).
Starting Address	2 Bytes	The data address of the first Holding Register to which to write.
Quantity of Holding Registers	2 Bytes	Number of Holding Registers to write.
Byte Count	1 Byte	The number of data bytes to follow.
Holding Register Values	1-250 Bytes	2 bytes for every Holding Register, maximum of 125 Holding Registers per message.

Write Multiple Holding Registers Response PDU		
Name	Size	Description
Function Code	1 Byte	Function Code Identifier (0x10).
Starting Address	2 Bytes	The data address of the Holding Register written.
Quantity of Holding Registers	2 Bytes	Number of Holding Registers written.

Write Multiple Holding Registers Exception PDU		
Name	Size	Description
Error Code	1 Byte	0x80 plus Function Code Identifier (0x90).
Exception Code	1 Byte	See <a href="#">4.1.4 Modbus/TCP Exception Error Codes</a>

#### 4.1.4 Modbus/TCP Exception Error Codes

The Modbus/TCP feature supports the following Exception (Error) Codes:

Supported Exception Codes		
Exception Code	Name	Description
0x01	Illegal Function	The function code received is not supported in the controller.
0x02	Illegal Data Address	The data address received is not an allowable address within the controller. This error will only be generated if the first register requested is not valid for the function.
0x03	Illegal Data Value	A value contained in the query data field for a <i>Write</i> command is not an allowable value for field. This error will only be generated if the first register requested is not valid for the function.
0x04	Slave Device Failure	An unrecoverable error occurred while the controller was attempting to perform the requested action. This is a general exception code indicating that the request was valid, but the controller could provide a response.

When an exception occurs, the Response PDU contains a Function Code of 0x80 plus the original hexadecimal Function Code.

## 4.2 TCP/IP Interface

The Modbus/TCP interface is attached to the TCP/IP stack that is implemented within the Walchem controller. When the Modbus feature is *Enabled*, the controller will listen to all communications that come in on the Modbus/TCP registered port 502. This port can be changed in the Remote Communications Menu.

## 4.3 Data Refresh

To ensure continued connectivity, the Modbus/TCP client should not request data more frequently than once every 5000 msec. Faster refresh rates are unsupported and may result in unexpected behavior.

## 4.4 Data Encoding

Modbus uses a 'big-endian' representation for addresses and data items. This means that within each register, when a numerical quantity larger than a single byte is transmitted, the MOST significant byte is sent first. The following topics describe the different types of encoding and show how the data is encoded within the Modbus/TCP packet. Most client drivers will extract the data from the packet in the correct format for use/display within the client environment.

### 4.4.1 Coils and Discrete Inputs

#### 4.4.1.1 Boolean

Coils and Discrete Inputs can be used for digital input states, relay states, alarm states, and reset buttons that are representable as a 1 or a 0. All binary data is packed from least significant bit to most significant bit into a byte containing up to 8 Coils or Discrete Inputs. Bits not containing the value of a Coil or Discrete Input are space holders and have a value of 0.

Byte Value	Coil 1	Coil 2	6 unused bits
0x02 (00000010)	0	1	000000

Reset buttons may also be packed as a 16-bit word when using the Write Single Coil function code. (0xFF00 = On, 0x0000 = Off)

Word Value	Coil Value	Most Significant Byte	Least Significant Byte
0xFF00 (1111111100000000)	1	0xFF (11111111)	0x00 (00000000)

### 4.4.2 Holding Register and Input Registers

#### 4.4.2.1 16-Bit Word (Boolean)

Holding Registers and Input Registers can be used for digital input states, relay states, alarm states, and reset buttons that are representable as a 1 or a 0. All binary data can be packed into a 16-Bit register, with the least significant bit of the least significant byte being occupied by the 1-bit value. This is functionally identical to a 16-bit integer.

Word Value	Bit Value	Most Significant Byte	Least Significant Byte
0x0001 (0000000000000001)	1	0x00 (00000000)	0x01 (00000001)

#### 4.4.2.2 16-Bit Word (Bitfield)

Holding Registers and Input Registers can be used for Alarm Bitfields. An 8-Bit Alarm bitfield is packed into the least significant byte of a 16-bit register. This is offered as a single-register alternative to accessing alarm states individually. Bitfields can be decoded in section [5.5 Alarm Bitfields](#).

Word Value	Alarm Bitfield Value	Most Significant Byte	Least Significant Byte
0x00AA (0000000010101010)	0xAA	0x00 (00000000)	0xAA (10101010)

#### 4.4.2.3 16-Bit Word (Status)

Holding Registers and Input Registers can be used for enumerated values such as status codes. An 8-Bit status code is packed into the least significant byte of a 16-bit register. This is functionally identical to the 16-bit integer. Status codes are defined in section [5.4 Status Register Codes](#).

Word Value	Alarm Bitfield Value	Most Significant Byte	Least Significant Byte
0x00AA (0000000010101010)	0xAA	0x00 (00000000)	0xAA (10101010)

#### 4.4.2.4 16-Bit Word (Integer)

Holding Registers and Input Registers can be used for 16-bit integers containing HOA settings, and time data that don't require 32-bit integers. All 16-bit integers are unsigned.

Word Value	Most Significant Byte	Least Significant Byte
0x1234	0x12	0x34

#### 4.4.2.5 32-Bit Value (Integer)

Holding Registers and Input Registers can be used for 32-bit integer data containing elapsed time values and timestamps. The system clock register and all registers containing timestamps use the Unix Time format, that counts the seconds passed since 12:00:00 am, January 1<sup>st</sup>, 1970. Registers are only 16 bits wide; therefore, a request message must include 2 consecutive registers to read or write a 32-bit integer. The 32-bit value is transmitted with the least significant word first, then the most significant word. All 32-bit integers are unsigned.

Word Value	Register 1		Register 2	
	Most Significant	Least Significant	Most Significant	Least Significant
	Least Significant Word		Most Significant Word	
0x12345678	0x56	0x78	0x12	0x34

#### 4.4.2.6 32-Bit Value (Float)

Holding Registers and Input Registers can be used for 32-bit floating point data containing set points, sensor readings, percentages, deadbands, etc. Registers are only 16 bits wide; therefore, a request message must include 2 consecutive registers to read or write a 32-bit float. The 32-bit value is transmitted with the least significant word first, then the most significant word.

Word Value	Register 1		Register 2	
	Most Significant	Least Significant	Most Significant	Least Significant
	Least Significant Word		Most Significant Word	
0x12345678	0x56	0x78	0x12	0x34

#### 4.4.2.7 32-Bit Inverse Data Format (Integer or Float)

32-bit integers and floats can use an inverse data format, where the contents of registers 1 and 2 are switched. When inverse data format is selected, the 32-bit value is transmitted with the most significant word first, then the least significant word. The data format setting can be modified in the Remote Communications Settings Menu.

Word Value	Register 1		Register 2	
	Most Significant	Least Significant	Most Significant	Least Significant
	Most Significant Word		Least Significant Word	
0x12345678	0x12	0x34	0x56	0x78

## 5.0 DATA DICTIONARY

### 5.1 Addressing (0- or 1-Based)

The addressing within the Modbus/TCP protocol (that is, the data within the physical packet) is 0-based, meaning the first element/item to be accessed is referenced by address 0. The Modbus standard for handling and displaying data is 1-based, meaning the first element/data item to be accessed is referenced by address 1.

For most client applications, users enter the 1-based number which is converted to 0-based addressing at the protocol level. The addresses defined in the following address maps below are 1-based, as most of the client applications work with this method. Register addresses for individual elements are derived by adding the address offset in the appropriate [Type-Specific Address Map](#) to the starting address in the I/O Channel Address Map below.

### 5.2 Address Maps

The address map is a function code-agnostic map that contains all data values that can be accessed as Coils (0xxxx), Discrete Inputs (1xxxx), Holding Registers (4xxxx), and Input Registers (3xxxx).

The Address Map of the Modbus/TCP feature is modular; valid addresses are determined by the add-on card configuration of the controller and the task being performed by each Input or Output. Each object has a block of 36 addresses.

The Modbus/TCP feature allows all addresses to be accessed as registers. On the following address map tables, values in **BOLD** can also be accessed as a Coil or Discrete Input.

As examples, to read the 'Controller Firmware Version' from the [System Address Map](#) (starting address x0037) as an Input Register (FC4), the address indices 2 and 3 must be requested together: Addresses 30039 and 30040.

To read the 'Low Alarm' status for Sensor 2-1 in a W600 Controller as a Coil (FC1), the [Sensor Input Address Map](#) indicates the starting address is x0865. Address index 28 must be requested: Address 00893. For the W900 Controller, the 'Low Alarm' status for Sensor 2-1 is  $x1729 + 28 =$  Address 01757.

To write the 'Setpoint' for Relay 3 (set to On/Off control mode) in the [Relay On/Off Control Mode Address Map](#) (starting address x9001) as a Holding Register (FC6), the address indices 6 and 7 must be used together: Addresses 49007 and 49008.

### 5.2.1 W600 Controller – I/O Channel Address Maps

The address ranges for each input/output channel in the W600 controller are as follows:

W600 Controller – I/O Channel Address Map			
Object	Starting Address	Ending Address	Type-Specific Address Maps
System	x0037	x0072	See <a href="#">5.3.1 System Address Map</a>
Network	x0145	x0180	See <a href="#">5.3.2 Network Address Map</a>
Sensor Input 1-1	x0577	x0612	See <a href="#">5.3.3 Sensor Input Address Maps</a>
Sensor Input 1-2	x0613	x0648	
Sensor Input 1-3	x0649	x0684	
Sensor Input 2-1	x0865	x0900	
Sensor Input 2-2	x0901	x0936	
Sensor Input 2-3	x0937	x0972	
Digital Input 1	x0289	x0324	See <a href="#">5.3.4 Digital Input Address Maps</a>
Digital Input 2	x0325	x0360	
Digital Input 3	x0361	x0396	
Digital Input 4	x0397	x0432	
Digital Input 5	x0433	x0468	
Digital Input 6	x0469	x0504	
Virtual Input 1	x5761	x5796	See <a href="#">5.3.5 Virtual Input Address Maps</a>
Virtual Input 2	x5797	x5832	
Relay Output 1	x8929	x8964	See <a href="#">5.3.6 Relay Output Address Maps</a>  Or <a href="#">5.3.7 Pulse Relay Output Address Maps</a>
Relay Output 2	x8965	x9000	
Relay Output 3	x9001	x9036	
Relay Output 4	x9037	x9072	
Relay Output 5	x9073	x9108	
Relay Output 6	x9109	x9144	
Analog Output 1	x1153	x1188	See <a href="#">5.3.8 Analog Output Address Maps</a>
Analog Output 2	x1189	x1224	

## 5.2.2 W900 Controller – I/O Channel Address Maps

The address ranges for each input/output channel in the W900 controller are as follows:

W900 Controller – I/O Channel Address Map			
Object	Starting Address	Ending Address	Type-Specific Address Maps
System	x0037	x0072	See <a href="#">5.3.1 System Address Map</a>
Network	x0145	x0180	See <a href="#">5.3.2 Network Address Map</a>
Sensor Input 1-1	x1153	x1188	<p>See <a href="#">5.3.3 Sensor Input Address Maps</a></p> <p>Note: When using P/N 191918 I/O card with 2 Analog Input + 4 Analog Output channels, the two (4-20 mA) Sensor Inputs are mapped from channels 1 and 2 into channels 5 and 6.</p> <p>For example, if the card is installed in the third I/O slot, the register address mapping is:</p> <p>Analog Output 3-1: x2305 to x2340            Analog Output 3-2: x2341 to x2376            Analog Output 3-3: x2377 to x2412            Analog Output 3-4: x2413 to x2448            Sensor Input 3-1: x2449 to x2484            Sensor Input 3-2: x2485 to x2520</p>
Sensor Input 1-2	x1189	x1224	
Sensor Input 1-3	x1225	x1260	
Sensor Input 1-4	x1261	x1296	
Sensor Input 1-5	x1297	x1332	
Sensor Input 1-6	x1333	x1368	
Sensor Input 2-1	x1729	x1764	
Sensor Input 2-2	x1765	x1800	
Sensor Input 2-3	x1801	x1836	
Sensor Input 2-4	x1837	x1872	
Sensor Input 2-5	x1873	x1908	
Sensor Input 2-6	x1909	x1944	
Sensor Input 3-1	x2305	x2340	
Sensor Input 3-2	x2341	x2376	
Sensor Input 3-3	x2377	x2412	
Sensor Input 3-4	x2413	x2448	
Sensor Input 3-5	x2449	x2484	
Sensor Input 3-6	x2485	x2520	
Sensor Input 4-1	x2881	x2916	
Sensor Input 4-2	x2917	x2952	
Sensor Input 4-3	x2953	x2988	
Sensor Input 4-4	x2989	x3024	
Sensor Input 4-5	x3025	x3060	
Sensor Input 4-6	x3061	x3096	
Digital Input 1	x0577	x0612	<p>See <a href="#">5.3.4 Digital Input Address Maps</a></p>
Digital Input 2	x0613	x0648	
Digital Input 3	x0649	x0684	
Digital Input 4	x0685	x0720	
Digital Input 5	x0721	x0756	
Digital Input 6	x0757	x0792	
Digital Input 7	x0793	x0828	
Digital Input 8	x0829	x0864	
Digital Input 9	x0865	x0900	
Digital Input 10	x0901	x0936	
Digital Input 11	x0937	x0972	
Digital Input 12	x0973	x1008	



W900 Controller – I/O Channel Address Map			
Object	Starting Address	Ending Address	Type-Specific Address Maps
Virtual Input 1	x5761	x5796	See <a href="#">5.3.5 Virtual Input Address Maps</a>
Virtual Input 2	x5797	x5832	
Virtual Input 3	x5833	x5868	
Virtual Input 4	x5869	x5904	
Virtual Input 5	x5905	x5940	
Virtual Input 6	x5941	x5976	
Virtual Input 7	x5977	x6012	
Virtual Input 8	x6013	x6048	
Relay Output 1	x8929	x8964	See <a href="#">5.3.6 Relay Output Address Maps</a>  Or <a href="#">5.3.7 Pulse Relay Output Address Maps</a>
Relay Output 2	x8965	x9000	
Relay Output 3	x9001	x9036	
Relay Output 4	x9037	x9072	
Relay Output 5	x9073	x9108	
Relay Output 6	x9109	x9144	
Relay Output 7	x9145	x9180	
Relay Output 8	x9181	x9144	
Analog Output 1-1	x1153	x1188	See <a href="#">5.3.8 Analog Output Address Maps</a>
Analog Output 1-2	x1189	x1224	
Analog Output 1-3	x1225	x1260	
Analog Output 1-4	x1261	x1296	
Analog Output 2-1	x1729	x1764	
Analog Output 2-2	x1765	x1800	
Analog Output 2-3	x1801	x1836	
Analog Output 2-4	x1837	x1872	
Analog Output 3-1	x2305	x2340	
Analog Output 3-2	x2341	x2376	
Analog Output 3-3	x2377	x2412	
Analog Output 3-4	x2413	x2448	
Analog Output 4-1	x2881	x2916	
Analog Output 4-2	x2917	x2952	
Analog Output 4-3	x2953	x2988	
Analog Output 4-4	x2989	x3024	

### 5.2.3 Alternate Address Maps

The Alternate Address Maps provide a more efficient way to access similar data from different objects. Using these address tables, the same field type is accessible using consecutive addresses. For example, the primary values for all sensors installed in the controller can be accessed in a single Modbus FC4 request/response cycle starting at address 39217.

I/O Type	Available Objects	Type-Specific Alternate Address Map
Sensor Inputs	Primary Value Status Alarm Bitfield Low, High Alarms LoLo, HiHi Alarms Calibration Required	See <a href="#">5.3.9.1 Alternate Sensor Input / Temperature Input / Analog Input Address Map</a>
Digital Inputs	DI State Interlock State Total Time Flowrate Flow Total Alarm Bitfield	See <a href="#">5.3.9.2 Alternate Digital Input Address Map</a>
Virtual Inputs	Primary Value Status Alarm Bitfield	See <a href="#">5.3.9.3 Alternate Virtual Input Address Map</a>
Relay Outputs	Relay State Pulse Output Time On Status Alarm Bitfield	See <a href="#">5.3.9.4 Alternate Relay Output Address Map</a>
Analog Outputs	Analog Output Time On Status Alarm Bitfield	See <a href="#">5.3.9.5 Alternate Analog Output Address Map</a>

Note that changing I/O card locations can affect the address used to access individual objects. For example, if a W900 is configured with a Dual SI card in slot 1 and a Dual AI card in slot 3, the alternate address mappings for the primary values are different if a Single SI card is inserted into slot 2:

Scenario #1: I/O Slot 2 Not Populated				Scenario #2: I/O Slot 2 Populated			
Channel	Address	Alternate	Address	Channel	Address	Alternate	Address
<b>I/O Slot 1: Dual Sensor Input Card</b>				<b>I/O Slot 1: Dual Sensor Input Card</b>			
Sensor Input 1-1	x1153	Sensor 1	x9217	Sensor Input 1-1	x1153	Sensor 1	x9217
Sensor Input 1-2	x1189	Sensor 2	x9219	Sensor Input 1-2	x1189	Sensor 2	x9219
Sensor Input 1-3	x1225	Sensor 3	x9221	Sensor Input 1-3	x1225	Sensor 3	x9221
Sensor Input 1-4	x1261	Sensor 4	x9223	Sensor Input 1-4	x1261	Sensor 4	x9223
<b>I/O Slot 2: Not Populated</b>				<b>I/O Slot 2: Single Sensor Input Card</b>			
				Sensor Input 2-1	x1729	Sensor 5	x9225
				Sensor Input 2-2	x1765	Sensor 6	x9227
<b>I/O Slot 3: Dual Analog Input Card</b>				<b>I/O Slot 3: Dual Analog Input Card</b>			
Sensor Input 3-1	x2305	<b>Sensor 5</b>	<b>x9225</b>	Sensor Input 3-1	x2305	<b>Sensor 7</b>	<b>x9229</b>
Sensor Input 3-2	x2341	<b>Sensor 6</b>	<b>x9227</b>	Sensor Input 3-2	x2341	<b>Sensor 8</b>	<b>x9231</b>

## 5.3 Type-Specific Address Maps

### 5.3.1 System Address Map

System Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Controller Time	32-Bit Integer	Read	Unix Time
1				
2	Controller Firmware Version	32-Bit Float	Read	
3				
4	Date of Last Data Log	32-Bit Integer	Read	Unix Time
5				
6	Controller Processor Temperature	32-Bit Float	Read	°C
7				
8	Network Card Temperature	32-Bit Float	Read	°C
9				
10	Digital Input Card Temperature (W900 Only)	32-Bit Float	Read	°C
11				
12	I/O Card 1 Temperature	32-Bit Float	Read	°C
13				
14	I/O Card 2 Temperature	32-Bit Float	Read	°C
15				
16	I/O Card 3 Temperature (W900 Only)	32-Bit Float	Read	°C
17				
18	I/O Card 4 Temperature (W900 Only)	32-Bit Float	Read	°C
19				
20				
21				
22				
23				
24				
25				
26	Battery Power	32-Bit Float	Read	Volt
27				
28	+3.3 V Supply	32-Bit Float	Read	Volt
29				
30	+5 V Supply	32-Bit Float	Read	Volt
31				
32	+12 V Supply (W900 Only)	32-Bit Float	Read	Volt
33				
34				
35	Alarm Bitfield	16-Bit Bitfield	Read	See <a href="#">5.5.1 System Alarm Bitfield</a>

### 5.3.2 Network Address Map

Network Address Map								
Address	Name	Data Encoding	Permissions	Value				
0	VTouch Last Data Time	32-Bit Integer	Read	Unix Time				
1								
2	VTouch Last Configuration Time	32-Bit Integer	Read	Unix Time				
3								
4	VTouch Refresh Rate	32-Bit Float	Read/Write	1 – 1440 Minutes				
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35					Alarm Bitfield	16-Bit Bitfield	Read	See <a href="#">5.5.2 Network Alarm Bitfield</a>

### 5.3.3 Sensor Input Address Maps

#### 5.3.3.1 Sensor Input / Temperature Input / Analog Input (except Flowmeter) Address Map

Sensor Input / Temperature Input / Analog Input (except Flowmeter) Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Primary Value	32-Bit Float	Read	Sensor Units
1				
2	Primary Raw Value	32-Bit Float	Read	Cond: $\mu\text{S}/\text{cm}$ before ATC Active, Cu/Ni: mV 4-20 mA AI: mA Temperature: $\Omega$
3				
4	Last Calibration Date	32-Bit Integer	Read	Unix Time
5				
6				
7				
8				
9				
10	Deadband	32-Bit Float	Read/Write	Sensor Units
11				
12	Smoothing Factor	32-Bit Float	Read/Write	0 – 90%
13				
14	LoLo Alarm Setpoint	32-Bit Float	Read/Write	Sensor Units
15				
16	Low Alarm Setpoint	32-Bit Float	Read/Write	Sensor Units
17				
18	High Alarm Setpoint	32-Bit Float	Read/Write	Sensor Units
19				
20	HiHi Alarm Setpoint	32-Bit Float	Read/Write	Sensor Units
21				
22				
23				
24				
25				
26				
27				
28	<b>Low Alarm</b>	<b>Boolean</b>	<b>Read</b>	<b>1 = Alarm Active</b>
29	<b>High Alarm</b>	<b>Boolean</b>	<b>Read</b>	<b>1 = Alarm Active</b>
30	<b>LoLo Alarm</b>	<b>Boolean</b>	<b>Read</b>	<b>1 = Alarm Active</b>
31	<b>HiHi Alarm</b>	<b>Boolean</b>	<b>Read</b>	<b>1 = Alarm Active</b>
32	<b>Cal Required</b>	<b>Boolean</b>	<b>Read</b>	<b>1 = Alarm Active</b>
33	<b>Input Failure</b>	<b>Boolean</b>	<b>Read</b>	<b>1 = Alarm Active</b>
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	Alarm Bitfield	16-Bit Bitfield	Read	See <a href="#">5.5.3 Sensor Input Alarm Bitfield</a>

### 5.3.3.2 Analog Input Flowmeter Address Map

Analog Input Flowmeter Address Map (W900 Controller Only)				
Address	Name	Data Encoding	Permissions	Value
0	Primary Value	32-Bit Float	Read	Flow Units
1				Rate Units
2	Primary Raw Value	32-Bit Float	Read	mA
3				
4	Last Calibration Date	32-Bit Integer	Read	Unix Time
5				
6	Flow Total	32-Bit Float	Read	Flow Units
7				
8	Input Filter	32-Bit Float	Read/Write	mA
9				
10	Deadband	32-Bit Float	Read/Write	Flow Units
11				Rate Units
12	Smoothing Factor	32-Bit Float	Read/Write	0 – 90%
13				
14	LoLo Alarm Setpoint	32-Bit Float	Read/Write	Flow Units
15				Rate Units
16	Low Alarm Setpoint	32-Bit Float	Read/Write	Flow Units
17				Rate Units
18	High Alarm Setpoint	32-Bit Float	Read/Write	Flow Units
19				Rate Units
20	HiHi Alarm Setpoint	32-Bit Float	Read/Write	Flow Units
21				Rate Units
22				
23				
24				
25	<b>Reset Total Flow</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Flow Total</b>
26				
27				
28	<b>Low Alarm</b>	<b>Boolean</b>	<b>Read</b>	<b>1 = Alarm Active</b>
29	<b>High Alarm</b>	<b>Boolean</b>	<b>Read</b>	<b>1 = Alarm Active</b>
30	<b>LoLo Alarm</b>	<b>Boolean</b>	<b>Read</b>	<b>1 = Alarm Active</b>
31	<b>HiHi Alarm</b>	<b>Boolean</b>	<b>Read</b>	<b>1 = Alarm Active</b>
32	<b>Cal Required</b>	<b>Boolean</b>	<b>Read</b>	<b>1 = Alarm Active</b>
33	<b>Input Failure</b>	<b>Boolean</b>	<b>Read</b>	<b>1 = Alarm Active</b>
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	Alarm Bitfield	16-Bit Bitfield	Read	See <a href="#">5.5.3 Sensor Input Alarm Bitfield</a>

### 5.3.4 Digital Input Address Maps

#### 5.3.4.1 Digital Input / DI State Type Address Map

Digital Input / DI State Type Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Last Reset Date	32-Bit Integer	Read	Unix Time
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Cycle Time	32-Bit Integer	Read	Seconds
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32	Reset Total Time	Boolean	Read/Write	Write 1 to Reset Time
33	DI State	Boolean	Read	0 = Open, 1 = Closed
34	Interlock State	Boolean	Read	0 = Inactive 1 = Active Interlock
35	Alarm Bitfield	16-Bit Bitfield	Read	See <a href="#">5.5.4 Digital Input Alarm Bitfield</a> When accessed as a Coil, Returns 1 if any alarm is active

5.3.4.2 Digital Input / Contacting Flow Meter Type Address Map

Digital Input / Contacting Flow Meter Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Last Reset Date	32-Bit Integer	Read	Unix Time
1				
2	Total Flow	32-Bit Float	Read	Flow Units
3				
4				
5				
6	Total Flow Alarm Setpoint	32-Bit Float	Read/Write	0 – 1,000,000,000 Flow Units
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32	<b>Reset Total Flow</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Flow Total</b>
33				
34				
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.4 Digital Input Alarm Bitfield</a> When accessed as a Coil, Returns 1 if any alarm is active



5.3.4.3 Digital Input / Paddlewheel Flow Meter Type Address Map

Digital Input / Paddlewheel Flow Meter Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Last Reset Date	32-Bit Integer	Read	Unix Time
1				
2	Total Flow	32-Bit Float	Read	Flow Units
3				
4	Current Flowrate	32-Bit Float	Read	Flow Units Rate Units
5				
6	Total Flow Alarm Setpoint	32-Bit Float	Read/Write	0 – 1,000,000,000 Flow Units
7				
8				
9				
10				
11				
12				
13	Smoothing Factor	32-Bit Float	Read/Write	0 – 90%
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32	Reset Total Flow	Boolean	Read/Write	Write 1 to Reset Flow Total
33				
34				
35	Alarm Bitfield	16-Bit Bitfield	Read	See <a href="#">5.5.4 Digital Input Alarm Bitfield</a> When accessed as a Coil, Returns 1 if any alarm is active

5.3.4.4 Digital Input / DI Counter Type Address Map

Digital Input / DI Counter Address Map (W900 Controller Only)				
Address	Name	Data Encoding	Permissions	Value
0	Last Reset Date	32-Bit Integer	Read	Unix Time
1				
2	Total Count	32-Bit Float	Read	Units
3				
4	Current Rate	32-Bit Float	Read	Units Rate Units
5				
6	Total Alarm Setpoint	32-Bit Float	Read/Write	0 – 1,000,000,000 Units
7				
8				
9				
10				
11				
12	Smoothing Factor	32-Bit Float	Read/Write	0 – 90%
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32	<b>Reset Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Total</b>
33				
34				
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.4 Digital Input Alarm Bitfield</a> When accessed as a Coil, Returns 1 if any alarm is active

### 5.3.4.5 Digital Input / Flow Monitor Type Address Map

Digital Input / Flow Monitor Address Map				
Addresses	Name	Data Encoding	Permissions	Value
0	Last Reset Date	32-Bit Integer	Read	Unix Time
1				
2	Total Feed	32-Bit Float	Read	Flow Units
3				
4	Current Flowrate	32-Bit Float	Read	Flow Units Rate Units
5				
6	Totalizer Alarm Setpoint	32-Bit Float	Read/Write	0 – 1,000,000 Flow Units
7				
8	Volume/Contact	32-Bit Float	Read/Write	0.001 – 1000.000 Flow Units / Pulse
9				
10				
11				
12	Smoothing Factor	32-Bit Float	Read/Write	0 – 90%
13				
14	Reprime Time	16-Bit Integer	Read/Write	0 – 3599 Seconds
15	Flow Alarm Delay	16-Bit Integer	Read/Write	10 – 3599 Seconds
16	Flow Alarm Clear	32-Bit Float	Read/Write	1 – 100,000 Pulses
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32	<b>Reset Total Flow</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Flow Total</b>
33				
34				
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.4 Digital Input Alarm Bitfield</a> When accessed as a Coil, Returns 1 if any alarm is active

### 5.3.5 Virtual Input Address Maps

#### 5.3.5.1 Virtual Input / Calculation Type Address Map

Virtual Input / Calculation Type Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Primary Value	32-Bit Float	Read	Virtual Input Units
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12	Smoothing Factor	32-Bit Float	Read/Write	0 – 90%
13				
14	LoLo Alarm Setpoint	32-Bit Float	Read/Write	Virtual Input Units
15				
16	Low Alarm Setpoint	32-Bit Float	Read/Write	Virtual Input Units
17				
18	High Alarm Setpoint	32-Bit Float	Read/Write	Virtual Input Units
19				
20	HiHi Alarm Setpoint	32-Bit Float	Read/Write	Virtual Input Units
21				
22				
23				
24				
25				
26				
27				
28	<b>Low Alarm</b>	<b>Boolean</b>	<b>Read</b>	<b>1 = Alarm Active</b>
29	<b>High Alarm</b>	<b>Boolean</b>	<b>Read</b>	<b>1 = Alarm Active</b>
30	<b>LoLo Alarm</b>	<b>Boolean</b>	<b>Read</b>	<b>1 = Alarm Active</b>
31	<b>HiHi Alarm</b>	<b>Boolean</b>	<b>Read</b>	<b>1 = Alarm Active</b>
32				
33	<b>Misc. Alarm</b>	<b>Boolean</b>	<b>Read</b>	<b>1 = Out-Of-Range or Input Failure Alarm Active</b>
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	Alarm Bitfield	16-Bit Bitfield	Read	See <a href="#">5.5.5 Virtual Input Alarm Bitfield</a>

### 5.3.5.2 Virtual Input / Redundant Sensor Type Address Map

Virtual Input / Redundant Sensor Type Address Map (W900 Controller Only)				
Address	Name	Data Encoding	Permissions	Value
0	Primary Value	32-Bit Float	Read	Virtual Input Units
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18	Deviation Alarm Setpoint	32-Bit Float	Read/Write	Virtual Input Units
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32	Deviation Alarm	Boolean	Read	1 = Alarm Active
33	Misc. Alarm	Boolean	Read	1 = Input Failure Alarm Active
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	Alarm Bitfield	16-Bit Bitfield	Read	See <a href="#">5.5.5 Virtual Input Alarm Bitfield</a>

### 5.3.6 Relay Output Address Maps

#### 5.3.6.1 Relay Output / Manual Control Mode Address Map

Relay Output / Manual Control Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18	On Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Off Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
21				
22				
23				
24				
25				
26				
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30				
31	<b>Relay State</b>	<b>Boolean</b>	<b>Read</b>	<b>0 = Off, 1 = On</b>
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	<b>See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> When accessed as a Coil, Returns 1 if any alarm is active</b>

### 5.3.6.2 Relay Output / On/Off Control Mode Address Map

Relay Output / On/Off Control Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4				
5				
6				
6	Setpoint	32-Bit Float	Read/Write	Input Sensor Units
7				
8				
9				
10	Deadband	32-Bit Float	Read/Write	Input Sensor Units
11				
12	Duty Cycle	32-Bit Float	Read/Write	0 – 100%
13				
14	Duty Cycle Period	16-Bit Integer	Read/Write	0 – 3599 Seconds
15				
16				
17				
18	On Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Off Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24				
25				
26				
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	<b>Reset Output Timeout</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Output Timeout</b>
31	<b>Relay State</b>	<b>Boolean</b>	<b>Read</b>	<b>0 = Off, 1 = On</b>
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>

### 5.3.6.3 Relay Output / Dual Setpoint Control Mode Address Map

Relay Output / Dual Setpoint Control Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4				
5				
6	Setpoint 1	32-Bit Float	Read/Write	Input Sensor Units
7				
8	Setpoint 2	32-Bit Float	Read/Write	Input Sensor Units
9				
10	Deadband	32-Bit Float	Read/Write	Input Sensor Units
11				
12	Duty Cycle	32-Bit Float	Read/Write	0 – 100%
13				
14	Duty Cycle Period	16-Bit Integer	Read/Write	0 – 3599 Seconds
15				
16				
17				
18	On Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Off Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24				
25				
26				
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	<b>Reset Output Timeout</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Output Timeout</b>
31	<b>Relay State</b>	<b>Boolean</b>	<b>Read</b>	<b>0 = Off, 1 = On</b>
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>



### 5.3.6.4 Relay Output / Time Proportional Control Mode Address Map

Relay Output / Time Proportional Control Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Cycle Time	32-Bit Integer	Read	Seconds
5				
6	Setpoint	32-Bit Float	Read/Write	Input Sensor Units
7				
8				
9				
10				
10	Proportional Band	32-Bit Float	Read/Write	Input Sensor Units
11				
12	Current Cycle	32-Bit Float	Read	Seconds
13				
14	Sample Period	32-Bit Integer	Read/Write	10 – 86,399 Seconds
15				
16				
17				
18				
19				
20				
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24				
25				
26				
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	<b>Reset Output Timeout</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Output Timeout</b>
31	<b>Relay State</b>	<b>Boolean</b>	<b>Read</b>	<b>0 = Off, 1 = On</b>
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> When accessed as a Coil, Returns 1 if any alarm is active

### 5.3.6.5 Relay Output / Intermittent Sampling Control Mode Address Map

Relay Output / Intermittent Sampling Control Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Cycle Time	32-Bit Integer	Read	Seconds
5				
6	Setpoint	32-Bit Float	Read/Write	Input Sensor Units
7				
8				
9				
10	Proportional Band	32-Bit Float	Read/Write	Input Sensor Units
11				
12				
13				
14	Sample Time	16-Bit Integer	Read/Write	10 – 3599 Seconds
15	Hold Time	16-Bit Integer	Read/Write	10 – 3599 Seconds
16	Max Blowdown	32-Bit Integer	Read/Write	0 – 86,399 Seconds
17				
18	Wait Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20				
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24				
25				
26				
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	<b>Reset Output Timeout</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Output Timeout</b>
31	<b>Relay State</b>	<b>Boolean</b>	<b>Read</b>	<b>0 = Off, 1 = On</b>
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>

5.3.6.6 Relay Output / Bleed And Feed Control Mode Address Map

Relay Output / Bleed And Feed Control Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22	Feed Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24				
25				
26				
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	<b>Reset Output Timeout</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Output Timeout</b>
31	<b>Relay State</b>	<b>Boolean</b>	<b>Read</b>	<b>0 = Off, 1 = On</b>
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>

### 5.3.6.7 Relay Output / Bleed Then Feed Control Mode Address Map

Relay Output / Bleed Then Feed Control Mode Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Remaining Feed Time	32-Bit Integer	Read	Seconds
5				
6	Bleed Time	32-Bit Integer	Read	Seconds
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20	Feed Percentage	32-Bit Float	Read/Write	0 – 100%
21				
22	Feed Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24				
25				
26				
27	<b>Reset Timer</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Feed Timer</b>
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	<b>Reset Output Timeout</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Output Timeout</b>
31	<b>Relay State</b>	<b>Boolean</b>	<b>Read</b>	<b>0 = Off, 1 = On</b>
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>

5.3.6.8 Relay Output / Flow Timer Control Mode Address Map

Relay Output / Flow Timer Control Mode Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Remaining Feed Time	32-Bit Integer	Read	Seconds
5				
6	Accumulator Volume Setpoint	32-Bit Float	Read/Write	1 – 1,000,000 Flow Units
7				
8	Accumulator Total	32-Bit Float	Read	Flow Units
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20	Feed Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24				
25				
26				
27	<b>Reset Timer</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Feed Timer</b>
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	<b>Reset Output Timeout</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Output Timeout</b>
31	<b>Relay State</b>	<b>Boolean</b>	<b>Read</b>	<b>0 = Off, 1 = On</b>
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> When accessed as a Coil, Returns 1 if any alarm is active

5.3.6.9 Relay Output / Counter Timer Control Mode Address Map

Relay Output / Counter Timer Control Mode Address Map (W900 Controller Only)				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Remaining Feed Time	32-Bit Integer	Read	Seconds
5				
6	Accumulator Setpoint	32-Bit Float	Read/Write	1 – 1,000,000 Units
7				
8	Accumulator Total	32-Bit Float	Read	Units
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20	Feed Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24				
25				
26				
27	<b>Reset Timer</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Feed Timer</b>
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	<b>Reset Output Timeout</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Output Timeout</b>
31	<b>Relay State</b>	<b>Boolean</b>	<b>Read</b>	<b>0 = Off, 1 = On</b>
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> When accessed as a Coil, Returns 1 if any alarm is active

5.3.6.10 Relay Output / Target PPM Control Mode Address Map

Relay Output / Target PPM Control Mode Address Map (W900 Controller Only)				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Remaining Feed Time	32-Bit Integer	Read	Seconds
5				
6	Accumulator Volume Setpoint	32-Bit Float	Read/Write	1 – 1,000,000 Flow Units
7				
8	Accumulator Total	32-Bit Float	Read	Flow Units
9				
10	Target PPM	32-Bit Float	Read/Write	1 – 1,000,000 ppm
11				
12				
13				
14				
15				
16	Specific Gravity Of Product	32-Bit Float	Read/Write	0 – 9.999 mg/l
17				
18	Pump Capacity	32-Bit Float	Read/Write	0 – 10,000 <u>Volume Units</u> Hour
19				
20	Pump Setting	32-Bit Float	Read/Write	0 – 100%
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	Low Cycles Limit	32-Bit Float	Read/Write	0.00 – 100.00
25				
26				
27	<b>Reset Timer</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Feed Timer</b>
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	<b>Reset Output Timeout</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Output Timeout</b>
31	<b>Relay State</b>	<b>Boolean</b>	<b>Read</b>	<b>0 = Off, 1 = On</b>
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> When accessed as a Coil, Returns 1 if any alarm is active

5.3.6.11 Relay Output / PPM By Volume Control Mode Address Map

Relay Output / PPM By Volume Control Mode Address Map (W900 Controller Only)				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Remaining Feed Volume	32-Bit Float	Read	Volume Units
5				
6	Accumulator Volume Setpoint	32-Bit Float	Read/Write	1 – 1,000,000 Flow Units
7				
8	Accumulator Total	32-Bit Float	Read	Flow Units
9				
10	Target PPM	32-Bit Float	Read/Write	1 – 1,000,000 ppm
11				
12				
13				
14				
15				
16	Specific Gravity Of Product	32-Bit Float	Read/Write	0 – 9.999 mg/l
17				
18				
19				
20				
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	Low Cycles Limit	32-Bit Float	Read/Write	0.00 – 100.00
25				
26				
27	<b>Reset Timer</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Feed Timer</b>
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	<b>Reset Output Timeout</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Output Timeout</b>
31	<b>Relay State</b>	<b>Boolean</b>	<b>Read</b>	<b>0 = Off, 1 = On</b>
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>



5.3.6.12 Relay Output / Percent Timer Control Mode Address Map

Relay Output / Percent Timer Control Mode Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Cycle Time	32-Bit Integer	Read	Seconds
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20	Feed Percentage	32-Bit Float	Read/Write	0 – 100%
21				
22	Feed Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24				
25				
26				
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30				
31	<b>Relay State</b>	<b>Boolean</b>	<b>Read</b>	<b>0 = Off, 1 = On</b>
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>

5.3.6.13 Relay Output / Event Timer Control Mode Address Map

Relay Output / Event Timer Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Cycle Time	32-Bit Integer	Read	Seconds
5				
6				
7				
8	Event 5 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
9				
10	Event 5 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
11				
12	Event 4 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
13				
14	Event 4 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
15				
16	Event 3 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
17				
18	Event 3 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Event 2 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
21				
22	Event 2 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	Event 1 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
25				
26	Event 1 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	Active Timer Event	16-Bit Integer	Read	Event Number
31	<b>Relay State</b>	<b>Boolean</b>	<b>Read</b>	<b>0 = Off, 1 = On</b>
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>

5.3.6.14 Relay Output / Biocide Timer Control Mode Address Map

Relay Output / Biocide Timer Control Mode Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Cycle Time	32-Bit Integer	Read	Seconds
5				
6	Bleed Lockout	32-Bit Integer	Read/Write	0 – 86,399 Seconds
7				
8	Prebleed To Setpoint	32-Bit Float	Read/Write	Input Sensor Units
9				
10	Prebleed Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds
11				
12	Event 4 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
13				
14	Event 4 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
15				
16	Event 3 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
17				
18	Event 3 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Event 2 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
21				
22	Event 2 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	Event 1 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
25				
26	Event 1 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	Active Timer Event	16-Bit Integer	Read	Event Number
31	<b>Relay State</b>	<b>Boolean</b>	<b>Read</b>	<b>0 = Off, 1 = On</b>
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>

5.3.6.15 Relay Output / Spike Control Mode Address Map

Relay Output / Spike Control Mode Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Spike Event Time	32-Bit Integer	Read	Seconds
5				
6	Setpoint	32-Bit Float	Read/Write	Input Sensor Units
7				
8	Spike Setpoint	32-Bit Float	Read/Write	Input Sensor Units
9				
10	Deadband	32-Bit Float	Read/Write	Input Sensor Units
11				
12	Duty Cycle	32-Bit Float	Read/Write	0 – 100%
13				
14	Duty Cycle Period	16-Bit Integer	Read/Write	0 – 3599 Seconds
15				
16	Event 3 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
17				
18	Event 3 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Event 2 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
21				
22	Event 2 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	Event 1 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
25				
26	Event 1 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	Active Timer Event	16-Bit Integer	Read	Event Number
31	<b>Relay State</b>	<b>Boolean</b>	<b>Read</b>	<b>0 = Off, 1 = On</b>
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>

5.3.6.16 Relay Output / Probe Wash Control Mode Address Map

Relay Output / Probe Wash Control Mode Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Cycle Time	32-Bit Integer	Read	Seconds
5				
6	Hold Time Limit	32-Bit Integer	Read/Write	0 – 3599 Seconds
7				
8	Event 5 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
9				
10	Event 5 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
11				
12	Event 4 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
13				
14	Event 4 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
15				
16	Event 3 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
17				
18	Event 3 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Event 2 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
21				
22	Event 2 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	Event 1 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
25				
26	Event 1 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	Active Timer Event	16-Bit Integer	Read	Event Number
31	<b>Relay State</b>	<b>Boolean</b>	<b>Read</b>	<b>0 = Off, 1 = On</b>
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>

### 5.3.6.17 Relay Output / Plating Control Mode Address Map

Relay Output / Plating Control Address Map (W600 Controller Only)				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Total Feed Volume	32-Bit Float	Read	Volume Units
5				
6	Setpoint	32-Bit Float	Read/Write	Input Sensor Units
7				
8				
9				
10	Deadband	32-Bit Float	Read/Write	Input Sensor Units
11				
12	Duty Cycle	32-Bit Float	Read/Write	0 – 100%
13				
14	Duty Cycle Period	16-Bit Integer	Read/Write	0 – 3599 Seconds
15				
16	Pump Setting	32-Bit Float	Read/Write	0 – 100%
17				
18	On Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Off Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	Total Turns	32-Bit Float	Read	Turns
25				
26	Turnover Limit	32-Bit Float	Read/Write	0 – 100 Turns
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	<b>Reset Output Timeout</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Output Timeout</b>
31	<b>Relay State</b>	<b>Boolean</b>	<b>Read</b>	<b>0 = Off, 1 = On</b>
32	<b>Reset Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>

5.3.6.18 Relay Output / Plating Follow Control Mode Address Map

Relay Output / Plating Follow Control Address Map (W600 Controller Only)				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Total Feed Volume	32-Bit Float	Read	Volume Units
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16	Pump Setting	32-Bit Float	Read/Write	0 – 100%
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30				
31	<b>Relay State</b>	<b>Boolean</b>	<b>Read</b>	<b>0 = Off, 1 = On</b>
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>

### 5.3.6.19 Relay Output / Lag Output Control Mode Address Map

Relay Output / Lag Output Address Map				
Address	Field	Data Encoding	Permissions	Value
0	Time On †	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4				
5				
6	Setpoint 1 ‡	32-Bit Float	Read/Write	Input Sensor Units
7				
8	Setpoint 2 ‡	32-Bit Float	Read/Write	Input Sensor Units
9				
10	Deadband ‡	32-Bit Float	Read/Write	Input Sensor Units
11				
12	Activation Delay Time ††	32-Bit Integer	Read/Write	0 – 86,399 Seconds
13				
14	Wear Level Cycle Time ††	32-Bit Integer	Read/Write	10 – 86,399 Seconds
15				
16	Current Activation Time ††	32-Bit Integer	Read	Seconds
17				
18	Current Wear Level Cycle Time ††	32-Bit Integer	Read	Seconds
19				
20	No. of Activated Outputs ††	16-Bit Integer	Read	Count
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24				
25				
26				
27				
28				
29				
30	<b>Reset Output Timeout</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Output Timeout</b>
31	<b>Relay State</b>	<b>Boolean</b>	<b>Read</b>	<b>1 = Relay On</b>
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>

† Field is only defined for Lag Outputs configured as the “Last Lag” in the chain.

‡ Field is only meaningful for certain configurations of Lead-Lag chains.



Relay Output / Alarm Control Mode Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30				
31	<b>Relay State</b>	<b>Boolean</b>	<b>Read</b>	<b>0 = Off, 1 = On</b>
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>

### 5.3.7 Pulse Relay Output Address Maps

#### 5.3.7.1 Pulse Relay Output / Manual Control Mode Address Map

Pulse Relay Output / Manual Control Address Map								
Address	Name	Data Encoding	Permissions	Value				
0	Time On	32-Bit Integer	Read	Seconds				
1								
2	Total Time	32-Bit Integer	Read	Seconds				
3								
4	Output	32-Bit Float	Read	Percent				
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18					On Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19								
20					Off Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
21								
22								
23								
24								
25								
26	Hand Output	32-Bit Float	Read/Write	0 – 100%				
27								
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds				
29								
30								
31								
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>				
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode				
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>				
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	<b>See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> When accessed as a Coil, Returns 1 if any alarm is active</b>				

5.3.7.2 Pulse Relay Output / Pulse Proportional Control Mode Address Map

Pulse Relay Output / Pulse Proportional Control Mode Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6	Setpoint	32-Bit Float	Read/Write	Input Sensor Units
7				
8				
9				
10				
11				
10	Proportional Band	32-Bit Float	Read/Write	Input Sensor Units
11				
12				
13				
14				
15				
16				
17				
18	Minimum Output	32-Bit Float	Read/Write	0 – 100%
19				
20	Maximum Output	32-Bit Float	Read/Write	0 – 100%
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24				
25				
26	Hand Output	32-Bit Float	Read/Write	0 – 100%
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	<b>Reset Output Timeout</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Output Timeout</b>
31				
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>

5.3.7.3 Pulse Relay Output / Flow Proportional Control Mode Address Map

Pulse Relay Output / Flow Proportional Control Mode Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6	Target PPM	32-Bit Float	Read/Write	1 – 1,000,000 ppm
7				
8				
9				
10				
11				
12				
13				
14				
15				
16	Specific Gravity Of Product	32-Bit Float	Read/Write	0 – 9.999 mg/l
17				
18	Pump Capacity	32-Bit Float	Read/Write	0 – 10,000 <u>Volume Units</u> Hour
19				
20	Pump Setting	32-Bit Float	Read/Write	0 – 100%
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	Low Cycles Limit	32-Bit Float	Read/Write	0.00 – 100.00
25				
26	Hand Output	32-Bit Float	Read/Write	0 – 100%
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	<b>Reset Output Timeout</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Output Timeout</b>
31				
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>

5.3.7.4 Pulse Relay Output / Pulse PID Control Mode Address Map

Pulse Relay Output / Pulse PID Control Mode Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6	Setpoint	32-Bit Float	Read/Write	Input Sensor Units
7				
8	Current Integral	32-Bit Float	Read	Seconds
9				
10	Gain or Proportional Gain ‡	32-Bit Float	Read/Write	0.001 – 1000
11				
12	Integral Time or Integral Gain ‡	32-Bit Float	Read/Write	0.001 – 1000
13				
14	Derivative Time or Derivative Gain ‡	32-Bit Float	Read/Write	0 – 1000
15				
16				
17				
18	Minimum Output	32-Bit Float	Read/Write	0 – 100%
19				
20	Maximum Output	32-Bit Float	Read/Write	0 – 100%
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 seconds
23				
24				
25	<b>Reset PID Integral</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset PID Integral</b>
26	Hand Output	32-Bit Float	Read/Write	0 – 100%
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	<b>Reset Output Timeout</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Output Timeout</b>
31				
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> When accessed as a Coil, Returns 1 if any alarm is active

‡ Setting is dependent on current selection for “PID Gain Form” (see Controller Instruction Manual)

### 5.3.7.5 Pulse Relay Output / Lag Output Address Map

Pulse Relay Output / Lag Output Address Map				
Address	Field	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Percent Output	32-Bit Float	Read	Percent
5				
6	Setpoint 1 †	32-Bit Float	Read/Write	Input Sensor Units
7				
8	Setpoint 2 †	32-Bit Float	Read/Write	Input Sensor Units
9				
10	Deadband †	32-Bit Float	Read/Write	Input Sensor Units
11				
12	Activation Delay Time †‡	32-Bit Integer	Read/Write	0 – 86,399 Seconds
13				
14	Wear Level Cycle Time †‡	32-Bit Integer	Read/Write	10 – 86,399 Seconds
15				
16	Current Activation Time †‡	32-Bit Integer	Read	Seconds
17				
18	Current Wear Level Cycle Time †‡	32-Bit Integer	Read	Seconds
19				
20	No. of Activated Outputs †‡	16-Bit Integer	Read	Count
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24				
25				
26				
27				
28				
29				
30	<b>Reset Output Timeout</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Output Timeout</b>
31				
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.6 Relay Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>

† Field is only defined for Lag Outputs configured as the “Last Lag” in the chain.

‡ Field is only meaningful for certain configurations of Lead-Lag chains.

### 5.3.8 Analog Output Address Maps

#### 5.3.8.1 Analog Output / Manual Control Mode Address Map

Analog Output / Manual Control Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26	Hand Output	32-Bit Float	Read/Write	0 – 100%
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30				
31				
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.7 Analog Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>

5.3.8.2 Analog Output / Retransmit Mode Address Map

Analog Output / Retransmit Mode Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26	Hand Output	32-Bit Float	Read/Write	0 – 100%
27				
28				
29				
30				
31				
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.7 Analog Output Alarm Bitfield</a> When accessed as a Coil, Returns 1 if any alarm is active



5.3.8.3 Analog Output / Proportional Control Mode Address Map

Analog Output / Proportional Control Mode Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6	Setpoint	32-Bit Float	Read/Write	Input Sensor Units
7				
8				
9				
10	Proportional Band	32-Bit Float	Read/Write	Input Sensor Units
11				
12				
13				
14				
15				
16				
17				
18	Minimum Output	32-Bit Float	Read/Write	0 – 100%
19				
20	Maximum Output	32-Bit Float	Read/Write	0 – 100%
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24				
25				
26	Hand Output	32-Bit Float	Read/Write	0 – 100%
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	<b>Reset Output Timeout</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Output Timeout</b>
31				
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.7 Analog Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>

5.3.8.4 Analog Output / Flow Proportional Control Mode Address Map

Analog Output / Flow Proportional Control Mode Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6	Target PPM	32-Bit Float	Read/Write	1 – 1,000,000 ppm
7				
8				
9				
10				
11				
12				
13				
14				
15				
16	Specific Gravity Of Product	32-Bit Float	Read/Write	0 – 9.999 mg/l
17				
18	Pump Capacity	32-Bit Float	Read/Write	0 – 10,000 <u>Volume Units</u> Hour
19				
20	Pump Setting	32-Bit Float	Read/Write	0 – 100%
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	Low Cycles Limit	32-Bit Float	Read/Write	0.00 – 100.00
25				
26	Hand Output	32-Bit Float	Read/Write	0 – 100%
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	<b>Reset Output Timeout</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Output Timeout</b>
31				
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	<b>See <a href="#">5.5.7 Analog Output Alarm Bitfield</a> When accessed as a Coil, Returns 1 if any alarm is active</b>

5.3.8.5 Analog Output / PID Control Mode Address Map

Analog Output / PID Control Mode Address Map				
Address	Name	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6	Setpoint	32-Bit Float	Read/Write	Input Sensor Units
7				
8	Current Integral	32-Bit Float	Read	Seconds
9				
10	Gain or Proportional Gain ‡	32-Bit Float	Read/Write	0.001 – 1000
11				
12	Integral Time or Integral Gain ‡	32-Bit Float	Read/Write	0.001 – 1000
13				
14	Derivative Time or Derivative Gain ‡	32-Bit Float	Read/Write	0 – 1000
15				
16				
17				
18	Minimum Output	32-Bit Float	Read/Write	0 – 100%
19				
20	Maximum Output	32-Bit Float	Read/Write	0 – 100%
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 seconds
23				
24				
25	<b>Reset PID Integral</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset PID Integral</b>
26	Hand Output	32-Bit Float	Read/Write	0 – 100%
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	<b>Reset Output Timeout</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Output Timeout</b>
31				
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.7 Analog Output Alarm Bitfield</a> When accessed as a Coil, Returns 1 if any alarm is active

‡ Setting is dependent on current selection for “PID Gain Form” (see Controller Instruction Manual)

### 5.3.8.6 Analog Output / Lag Output Control Mode Address Map

Analog Output / Lag Output Control Mode Address Map				
Address	Field	Data Encoding	Permissions	Value
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6	Setpoint 1 ‡	32-Bit Float	Read/Write	Input Sensor Units
7				
8	Setpoint 2 ‡	32-Bit Float	Read/Write	Input Sensor Units
9				
10	Deadband ‡	32-Bit Float	Read/Write	Input Sensor Units
11				
12	Activation Delay Time †‡	32-Bit Integer	Read/Write	0 – 86,399 Seconds
13				
14	Wear Level Cycle Time †‡	32-Bit Integer	Read/Write	10 – 86,399 Seconds
15				
16	Current Activation Time †‡	32-Bit Integer	Read	Seconds
17				
18	Current Wear Level Cycle Time †‡	32-Bit Integer	Read	Seconds
19				
20	No. of Activated Outputs †‡	16-Bit Integer	Read	Count
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24				
25				
26				
27				
28				
29				
30	<b>Reset Output Timeout</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Output Timeout</b>
31				
32	<b>Reset Time Total</b>	<b>Boolean</b>	<b>Read/Write</b>	<b>Write 1 to Reset Time Total</b>
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See <a href="#">5.4 Status Register Codes</a>
35	<b>Alarm Bitfield</b>	<b>16-Bit Bitfield</b>	<b>Read</b>	See <a href="#">5.5.7 Analog Output Alarm Bitfield</a> <b>When accessed as a Coil, Returns 1 if any alarm is active</b>

† Field is only defined for Lag Outputs configured as the “Last Lag” in the chain.

‡ Field is only meaningful for certain configurations of Lead-Lag chains.

### 5.3.9 Alternate Address Maps

#### 5.3.9.1 Alternate Sensor Input / Temperature Input / Analog Input Address Map

Alternate Sensor Input / Temperature Input / Analog Input Address Map								
Object	Primary Value	Status	Alarm Bitfield	Low Alarm	High Alarm	LoLo Alarm	HiHi Alarm	Cal Required
Data Encoding	32-Bit Float	16-Bit Status	16-Bit Bitfield	Boolean	Boolean	Boolean	Boolean	Boolean
Permissions	Read	Read	Read	Read	Read	Read	Read	Read
Value	Sensor Units	See <a href="#">5.4 Status Register Codes</a>	See <a href="#">5.5.3 Sensor Input Alarm Bitfield</a>	1 = Alarm Active	1 = Alarm Active	1 = Alarm Active	1 = Alarm Active	1 = Alarm Active
Sensor Number	Address	Address	Address	Address	Address	Address	Address	Address
Sensor 1	x9217	x9281	<b>x9313</b>	<b>x9345</b>	<b>x9377</b>	<b>x9409</b>	<b>x9441</b>	<b>x9473</b>
Sensor 2	x9219	x9282	<b>x9314</b>	<b>x9346</b>	<b>x9378</b>	<b>x9410</b>	<b>x9442</b>	<b>x9474</b>
Sensor 3	x9221	x9283	<b>x9315</b>	<b>x9347</b>	<b>x9379</b>	<b>x9411</b>	<b>x9443</b>	<b>x9475</b>
Sensor 4	x9223	x9284	<b>x9316</b>	<b>x9348</b>	<b>x9380</b>	<b>x9412</b>	<b>x9444</b>	<b>x9476</b>
Sensor 5	x9225	x9285	<b>x9317</b>	<b>x9349</b>	<b>x9381</b>	<b>x9413</b>	<b>x9445</b>	<b>x9477</b>
Sensor 6	x9227	x9286	<b>x9318</b>	<b>x9350</b>	<b>x9382</b>	<b>x9414</b>	<b>x9446</b>	<b>x9478</b>
Sensor 7	x9229	x9287	<b>x9319</b>	<b>x9351</b>	<b>x9383</b>	<b>x9415</b>	<b>x9447</b>	<b>x9479</b>
Sensor 8	x9231	x9288	<b>x9320</b>	<b>x9352</b>	<b>x9384</b>	<b>x9416</b>	<b>x9448</b>	<b>x9480</b>
Sensor 9	x9233	x9289	<b>x9321</b>	<b>x9353</b>	<b>x9385</b>	<b>x9417</b>	<b>x9449</b>	<b>x9481</b>
Sensor 10	x9235	x9290	<b>x9322</b>	<b>x9354</b>	<b>x9386</b>	<b>x9418</b>	<b>x9450</b>	<b>x9482</b>
Sensor 11	x9237	x9291	<b>x9323</b>	<b>x9355</b>	<b>x9387</b>	<b>x9419</b>	<b>x9451</b>	<b>x9483</b>
Sensor 12	x9239	x9292	<b>x9324</b>	<b>x9356</b>	<b>x9388</b>	<b>x9420</b>	<b>x9452</b>	<b>x9484</b>
Sensor 13	x9241	x9293	<b>x9325</b>	<b>x9357</b>	<b>x9389</b>	<b>x9421</b>	<b>x9453</b>	<b>x9485</b>
Sensor 14	x9243	x9294	<b>x9326</b>	<b>x9358</b>	<b>x9390</b>	<b>x9422</b>	<b>x9454</b>	<b>x9486</b>
Sensor 15	x9245	x9295	<b>x9327</b>	<b>x9359</b>	<b>x9391</b>	<b>x9423</b>	<b>x9455</b>	<b>x9487</b>
Sensor 16	x9247	x9296	<b>x9328</b>	<b>x9360</b>	<b>x9392</b>	<b>x9424</b>	<b>x9456</b>	<b>x9488</b>
Sensor 17	x9249	x9297	<b>x9329</b>	<b>x9361</b>	<b>x9393</b>	<b>x9425</b>	<b>x9457</b>	<b>x9489</b>
Sensor 18	x9251	x9298	<b>x9330</b>	<b>x9362</b>	<b>x9394</b>	<b>x9426</b>	<b>x9458</b>	<b>x9490</b>
Sensor 19	x9253	x9299	<b>x9331</b>	<b>x9363</b>	<b>x9395</b>	<b>x9427</b>	<b>x9459</b>	<b>x9491</b>
Sensor 20	x9255	x9300	<b>x9332</b>	<b>x9364</b>	<b>x9396</b>	<b>x9428</b>	<b>x9460</b>	<b>x9492</b>
Sensor 21	x9257	x9301	<b>x9333</b>	<b>x9365</b>	<b>x9397</b>	<b>x9429</b>	<b>x9461</b>	<b>x9493</b>
Sensor 22	x9259	x9302	<b>x9334</b>	<b>x9366</b>	<b>x9398</b>	<b>x9430</b>	<b>x9462</b>	<b>x9494</b>
Sensor 23	x9261	x9303	<b>x9335</b>	<b>x9367</b>	<b>x9399</b>	<b>x9431</b>	<b>x9463</b>	<b>x9495</b>
Sensor 24	x9263	x9304	<b>x9336</b>	<b>x9368</b>	<b>x9400</b>	<b>x9432</b>	<b>x9464</b>	<b>x9496</b>

5.3.9.2 Alternate Digital Input Address Map

Object	DI State	Interlock State	Total Time	Flowrate	Flow Total	Alarm Bitfield
Data Encoding	Boolean	Boolean	32-Bit Integer	32-Bit Float	32-Bit Float	16-Bit Bitfield
Permissions	Read	Read	Read	Read	Read	Read
Control Modes	DI State	DI State	DI State	Paddlewheel FM Feed Monitor	Contacting FM Paddlewheel FM Feed Monitor	All
Value	0 = Open 1 = Closed	0 = Inactive 1 = Active Interlock	Seconds	<u>Flow Units</u> Rate Units	Flow Units	See <a href="#">5.5.4 Digital Input Alarm Bitfield</a>
Digital Input Number	Address	Address	Address	Address	Address	Address
Digital Input 1	<b>x9681</b>	<b>x9697</b>	x9649	x9617	x9649	<b>x9713</b>
Digital Input 2	<b>x9682</b>	<b>x9698</b>	x9651	x9619	x9651	<b>x9714</b>
Digital Input 3	<b>x9683</b>	<b>x9699</b>	x9653	x9621	x9653	<b>x9715</b>
Digital Input 4	<b>x9684</b>	<b>x9700</b>	x9655	x9623	x9655	<b>x9716</b>
Digital Input 5	<b>x9685</b>	<b>x9701</b>	x9657	x9625	x9657	<b>x9717</b>
Digital Input 6	<b>x9686</b>	<b>x9702</b>	x9659	x9627	x9659	<b>x9718</b>
Digital Input 7	<b>x9687</b>	<b>x9703</b>	x9661	x9629	x9661	<b>x9719</b>
Digital Input 8	<b>x9688</b>	<b>x9704</b>	x9663	x9631	x9663	<b>x9720</b>
Digital Input 9	<b>x9689</b>	<b>x9705</b>	x9665	x9633	x9665	<b>x9721</b>
Digital Input 10	<b>x9690</b>	<b>x9706</b>	x9667	x9635	x9667	<b>x9722</b>
Digital Input 11	<b>x9691</b>	<b>x9707</b>	x9669	x9637	x9669	<b>x9723</b>
Digital Input 12	<b>x9692</b>	<b>x9708</b>	x9671	x9639	x9671	<b>x9724</b>

5.3.9.3 *Alternate Virtual Input Address Map*

<b>Alternate Virtual Input Address Map</b>			
<b>Object</b>	<b>Primary Value</b>	<b>Status</b>	<b>Alarm Bitfield</b>
<b>Data Encoding</b>	<b>32-Bit Float</b>	<b>16-Bit Status</b>	<b>16-Bit Bitfield</b>
<b>Permissions</b>	<b>Read</b>	<b>Read</b>	<b>Read</b>
<b>Value</b>	<b>Virtual Input Units</b>	See <a href="#">5.4 Status Register Codes</a>	See <a href="#">5.5.5 Virtual Input Alarm Bitfield</a>
<b>Virtual Input Number</b>	<b>Address</b>	<b>Address</b>	<b>Address</b>
Virtual Input 1	x9505	x9537	<b>x9553</b>
Virtual Input 2	x9507	x9538	<b>x9554</b>
Virtual Input 3	x9509	x9539	<b>x9555</b>
Virtual Input 4	x9511	x9540	<b>x9556</b>
Virtual Input 5	x9513	x9541	<b>x9557</b>
Virtual Input 6	x9515	x9542	<b>x9558</b>
Virtual Input 7	x9517	x9543	<b>x9559</b>
Virtual Input 8	x9519	x9544	<b>x9560</b>

5.3.9.4 Alternate Relay Output Address Map

Object	Relay State	Pulse Output	Time On	Status	Alarm Bitfield
Data Encoding	Boolean	32-Bit Float	32-Bit Integer	16-Bit Status	16-Bit Bitfield
Permissions	Read	Read	Read	Read	Read
Control Modes	All except Pulse Outputs	Only Pulse Outputs	All	All	All
Value	0 = Off 1 = On	%	Seconds	See <a href="#">5.4 Status Register Codes</a>	See <a href="#">5.5.6 Relay Alarm Bitfield</a>
Relay Number	Address	Address	Address	Address	Address
Relay 1	x9601	x9793	x9729	x9761	x9777
Relay 2	x9602	x9795	x9731	x9762	x9778
Relay 3	x9603	x9797	x9733	x9763	x9779
Relay 4	x9604	x9799	x9735	x9764	x9780
Relay 5	x9605	x9801	x9737	x9765	x9781
Relay 6	x9606	x9803	x9739	x9766	x9782
Relay 7	x9607	x9805	x9741	x9767	x9783
Relay 8	x9608	x9807	x9743	x9768	x9784



5.3.9.5 Alternate Analog Output Address Map

Object	Analog Output	Time On	Status	Alarm Bitfield
Data Encoding	32-Bit Float	32-Bit Integer	16-Bit Status	16-Bit Bitfield
Permissions	Read	Read	Read	Read
Value	%	Seconds	See <a href="#">5.4 Status Register Codes</a>	See <a href="#">5.5.7 Analog Output Alarm Bitfield</a>
Analog Output Number	Address	Address	Address	Address
Analog Output 1	x9825	x9857	x9921	<b>x9953</b>
Analog Output 2	x9827	x9859	x9922	<b>x9954</b>
Analog Output 3	x9829	x9861	x9923	<b>x9955</b>
Analog Output 4	x9831	x9863	x9924	<b>x9956</b>
Analog Output 5	x9833	x9865	x9925	<b>x9957</b>
Analog Output 6	x9835	x9867	x9926	<b>x9958</b>
Analog Output 7	x9837	x9869	x9927	<b>x9959</b>
Analog Output 8	x9839	x9871	x9928	<b>x9960</b>
Analog Output 9	x9841	x9873	x9929	<b>x9961</b>
Analog Output 10	x9843	x9875	x9930	<b>x9962</b>
Analog Output 11	x9845	x9877	x9931	<b>x9963</b>
Analog Output 12	x9847	x9879	x9932	<b>x9964</b>
Analog Output 13	x9849	x9881	x9933	<b>x9965</b>
Analog Output 14	x9851	x9883	x9934	<b>x9966</b>
Analog Output 15	x9853	x9885	x9935	<b>x9967</b>
Analog Output 16	x9855	x9887	x9936	<b>x9968</b>

## 5.4 Status Register Codes

Status Code	Name	Description
0	Error	Generic Error.
1	None	No status to report.
2	Sensor Auto Cal	Sensor Circuit Auto-Calibration in progress.
3	Sensor User Cal	Sensor User-Calibration in progress.
4	DI State: Open	DI State is open.
5	DI State: Closed	DI State is closed.
6	DI Interlock: Active	DI Interlock State is active
7	DI Interlock: Inactive	DI Interlock State is inactive
8	Relay: On	Relay is energized.
9	Relay: Off	Relay is not energized.
10	Unused	Unused.
11	Output Interlocked	Output is interlocked by a DI or another output.
12	Output Forced On	Output is forced on by a DI or by another output.
13	Output Timeout	Output timeout limit exceeded.
14	Output Input Error	No valid measurement could be retrieved from the input.
15	Output Error	Error occurred attempting to set the output.
16	Output Hold	Output control on hold due to calibration.
17	Output HOA: Auto On	Output control in Auto Mode, output on.
18	Output HOA: Auto Off	Output control in Auto Mode, output off.
19	Output HOA: Hand	Output control in Hand Mode.
20	Output HOA: Off	Output control in Off Mode.
21	Output Deadband	Output is on and within the deadband area.
22	Relay Timeout	Timeout alarm: output off.
23	Relay OK	Relay reports it is on.
24	Daily Max Timeout	Daily maximum feed time limit exceeded.
25	Biocide: Prebleed	Pre-Bleed active before timed biocide feed.
26	Biocide: Hold	Bio feed bleed lockout in progress.
27	Biocide: Add	Bio feed in progress.
28	Time Proportional: Off	Off period within a time proportional cycle.
29	Bleed & Feed: Bleeding	Bleed valve activated, feed time accumulating.
30	Bleed & Feed: Timeout	Feed time exceeding user-entered feed time limit.
31	Intermittent Sampling: Wait	Wait cycle between readings.
32	Intermittent Sampling: Sample	Sample cycle before new reading.
33	Intermittent Sampling: Hold	Hold cycle before new reading.
34	Intermittent Sampling: Bleed	Bleed cycle after reading.
35	Probe Wash: On	Probe Wash in progress.
36	Probe Wash: Hold	Hold Cycle after probe wash.
37	Unused	
38	Unused	
39	Unused	
40	Unused	
41	Unused	
42	Unused	

Status Code	Name	Description
43	Unused	
44	Sensor Input Failure	Sensor input failure or sensor board alarm.
45	Sensor Fault Error	Sensor value outside of fault limits.
46	Sensor Range Alarm	Sensor value outside of range limits.
47	Relay Cycle Delay	Relay state change delayed by minimum cycle time setting.
48	Sensor Normal	Sensor is running in normal operation.
49	Sensor Initializing	Sensor input is initializing.
50	Sensor Default Temp	Sensor using default temperature instead of sensor value.
51	Alarm Relay: Open	Alarm Output relay closes on an alarm.
52	Alarm Relay: Closed	Alarm Output relay opens on an alarm.
53	Probe Wash: Relay Off	Probe Wash in progress for input sensor.
54	Disabled	Object is disabled.
55	Duty Cycle: Off	Relay is off due to duty cycle settings.
56	VI Calculation Error	Calculation error while evaluating a virtual input.
57	Output On Delay	Relay is off waiting for on delay to expire.
58	Output Off Delay	Relay is on waiting for off delay to expire.
59	DI Flow Verify: Off	DI Flow Monitor reports an error, output is forced off.
60	DI Flow Verify: Auto	DI Flow Monitor reports an error, output is in auto mode.
61	Output PID Saturated: High	PID integral hold due to output saturated at 100%.
62	Output PID Saturated: Low	PID integral hold due to output saturated at 0%.
63	Output Lead Lag	Lag is controlling (or being controlled) in automatic mode.
64	DI Flow Verify: Reprime	DI Flow Monitor reports an error, output is forced on.
65	Spike Onset	Spike onset climb active before reaching spike setpoint.
66	Spike Event: On	Spike onset value achieved, event in progress, output on.
67	Spike Event: Off	Spike onset value achieved, event in progress, output off.

## 5.5 Alarm Bitfields

Alarm bitfields are comprised of an 8-bit field encapsulated in a 16-bit word. Bit 1 is the least significant bit, bit 8 is the most significant bit. See [4.4.2.2 16-Bit Word \(Bitfield\)](#) for details. Some alarms have multiple causes, consult the Controller Instruction Manual for a comprehensive list of possible alarm causes.

### 5.5.1 System Alarm Bitfield

System Alarm Bitfield		
Bit Name	Bit No.	Description
Temperature Alarm	1	Controller internal temperatures fall below -10°C or exceed 75°C.
Battery Low	2	The button-cell battery voltage falls below 2.4VDC.
Invalid Setting	3	A hardware change creates invalid settings.
Software Version	4	The firmware of an add-on card needs to be updated.
Board Failure	5	An internal controller component has failed.
Internal Voltage	6	One or more internal (3.3V, 5V, 12V) voltage signal is out of range.
Unused	7	
Unused	8	

### 5.5.2 Network Alarm Bitfield

Network Alarm Bitfield		
Bit Name	Bit No.	Description
Web Server Failure	1	Internal error when the web server on the Ethernet card fails.
VTouch Data Comm	2	Controller cannot send data to VTouch.
VTouch LiveConnect	3	Controller cannot create a VPN connection to the VTouch server.
Unused	4	
Unused	5	
Unused	6	
Unused	7	
Unused	8	

### 5.5.3 Sensor Input Alarm Bitfield

Sensor Input Alarm Bitfield			
Bit Name	Bit No.	Description	SI Types
Low	1	The sensor reading drops below the Low Alarm setpoint.	All sensor types
High	2	The sensor reading rises above the High Alarm setpoint.	All sensor types
Low Low	3	The sensor reading drops below the Low Low Alarm setpoint.	All sensor types
High High	4	The sensor reading rises above the High High Alarm setpoint.	All sensor types
Unused †	5		
Unused †	6		
Input Failure †	7	The sensor reading is invalid (out of range, sensor fault, wiring incorrect, sample error, or I/O card failure). This alarm will stop the control for any output using the sensor.	All sensor types
Calibration Required	8	The sensor requires calibration.	All sensor types

† Compatibility Note: In controller software versions 3.09 and earlier, Bit 5 was used for “Out of Range” errors and Bit 6 was used for “Sensor Fault” alarms. In software versions 3.11 and later, these alarms are combined with other types of sensor “Input Failures” reported using Bit 7.

### 5.5.4 Digital Input Alarm Bitfield

Digital Input Alarm Bitfield			
Bit Name	Bit No.	Description	DI Types
DI State	1	The input is in the state selected to generate an alarm.	DI State only
Total	2	The meter total exceeds the limit.	All Digital Meters
Total Range	3	The range of the totalizer is exceeded.	All Digital Meters
Input Failure	4	This digital input circuit is no longer functioning.	All DI Types
Flow Verify	5	Feed Monitor unable to verify chemical feed.	Flow Monitor only
Unused	6		
Unused	7		
Unused	8		

### 5.5.5 Virtual Input Alarm Bitfield

Virtual Input Alarm Bitfield			
Bit Name	Bit No.	Description	VI Types
Low	1	The value drops below the Low Alarm setpoint.	Calculation only
High	2	The value rises above the High Alarm setpoint.	Calculation only
Low Low	3	The value drops below the Low Low Alarm setpoint.	Calculation only
High High	4	The value rises above the High High Alarm setpoint.	Calculation only
Out of Range	5	The value is outside of the acceptable range. This alarm will stop the control for any output using the sensor.	Calculation only
Deviation	5	The difference between the two inputs exceeds the Deviation Alarm setpoint.	Redundant only
Unused	6		
Unused	7		
Input Failure	8	A value required for a virtual calculation is not available. This alarm will stop the control for any output using the sensor.	All VI Types

### 5.5.6 Relay Output Alarm Bitfield

Relay Output Alarm Bitfield			
Bit Name	Bit No.	Description	Control Modes
Output Timeout	1	The relay has been activated for longer than the configured time limit. Control is stopped while the alarm is active.	All modes with <i>Output Time Limit</i> setting
Relay Event Skipped	2	A timer event was not able to be initiated.	All modes with <i>Event Timer</i> settings
Turnover Limit	2	Number of Turns exceeds Turnover Limit setpoint.	Plating Control mode only
Control Failure	3	The relay control circuit is no longer functioning.	All Control Modes
Unused	4		
Unused	5		
Unused	6		
Unused	7		
Unused	8		

### 5.5.7 Analog Output Alarm Bitfield

Analog Output Alarm Bitfield			
Bit Name	Bit No.	Description	Control Modes
Output Timeout	1	The output has been activated for longer than the configured time limit. Control is stopped while the alarm is active.	All modes with <i>Output Time Limit</i> setting
Control Failure	2	The analog control circuit is no longer functioning.	All Control Modes
Unused	3		
Unused	4		
Unused	5		
Unused	6		
Unused	7		
Unused	8		