WALCHEM

An Iwaki America Company

Web Master® WIND

Modbus TCP/IP Option Instruction Manual

s825v008 and higher

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Notice

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1.0 SCOPE

This document is a User Interface Specification for the WebMaster® Modbus/TCP product feature. This is a mapping of the various dynamic variables to their Modbus/TCP register locations.

This document supports the Modbus feature in the following controller software versions:

S825v008

2.0 INTRODUCTION

The WebMaster® product supports TCP/IP communications on 3 different network interfaces (USB, modem, and Ethernet). All configurations of set points are accomplished with a computer running a browser (such as Microsoft Internet Explorer) connected to the WebMaster® over one of these interfaces.

The Modbus/TCP option allows the WebMaster® 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 WebMaster® is a Modbus Server, meaning that it is capable of responding to requests from the HMI device. The WebMaster® 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 register locations.

In version s825v008 or higher, the HMI software can be used to change WebMaster® set points. This manual is divided into two sections, Modbus Read and Modbus Writes.

If the HMI device does not directly support 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 WebMaster®.

3.0 OVERVIEW

Modbus/TCP is a form of Modbus that uses the TCP/IP layers as a base layer for controlling the communications between different devices.

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, the simplest function set is to be made available.

The Modbus/TCP protocol has each transaction type classified in to conformance classes, to ensure consistency and interoperability. Class 0 is the simplest, and allows for reading and writing of multiple 16-bit registers. The Modbus/TCP feature of the WebMaster® will support reading and writing of these 16-bit registers, which allows the WebMaster® to establish a block of data which contains all the process variables, set points, alarms and input/output statuses that are to be made public to a Modbus/TCP client. This block of data is packaged so that it can be read in 16-bit chunks (or registers) at a time, regardless of the type of data within it. In the following sections, the formatting, storing, and reading of this data are described.

4.0 MODBUS/TCP DRIVER

4.1 MODBUS PROTOCOL

The Modbus protocol, as well as the TCP extension, 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. Only the use of the protocol is documented here.

4.1.1 TCP

The Modbus/TCP extension includes 7 additional bytes to the original Modbus protocol, which allows for transport over the TCP/IP layers.

The MBAP Header (Modbus Application Protocol Header) consists of 7 bytes of information:

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
Unit Identifier	1 byte	identification of remote slave, can be used for broadcasting (not supported)

The Unit Identifier has a special consideration in the WebMaster® implementation. If the value is 0, then the request is considered to be a broadcast message; therefore the packet will be processed, and no response will be generated. If the value is anything else, the packet will be processed and a response will be generated.

Normally the Slave ID will be set in the HMI client software to 1.

The broadcast Unit Identifier address is not supported as of this release, as the only function code supported is Read Holding Registers; therefore, a response is required at all times.

4.1.2 Function Codes

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

- Function Code 3 (FC3), Read Multiple Registers, which allows the reading of up to 125 16-bit registers, or quantities, within a single request/response cycle.
- Function Code 16 (FC16), Write Multiple Registers, which allows the writing of up to 125 16-bit registers, or quantities, within a single request/response cycle.
- Function Code 6 (FC6), Write Single Registers, which allows the writing of a single 16-bit register within a single request/response cycle.

FC3 and FC16 have a 125-register limitation, which was established for the Modbus/TCP standard to maintain consistency with the original Modbus protocol standard, even though a TCP/IP packet can support more data.

Request

Function Code	1 byte	0x03
Starting Address	2 bytes	0x0000 to 0xFFFF
Quantity of Registers	2 bytes	1 to 125 (0x01 to 0x7D)

Response

Function Code	1 byte	0x03
Byte Count	1 byte	2 x N*
Register Values	N* x 2 bytes	

*N = quantity of registers

Error

Function Code	1 byte	0x03
Exception Code	1 byte	

Any unsupported Function Code request will be returned with an error response. The error response is also applied to a request for too much data, or data at a register address that is not present.

4.2 TCP/IP INTERFACE

The Modbus/TCP interface is attached to the TCP/IP stack that is implemented within the WebMaster® product, and will listen to all communications that come in on Modbus/TCP registered port 502.

Up to 10 connections/sockets are possible at one time. If there are 10 active connections, any attempt at any more connections is ignored.

Once a connection has been established, it will be closed after 1 minute of inactivity.

4.3 DATA REFRESH

To ensure that the Modbus/TCP client has the most recent data available to it, the Modbus/TCP periodically refreshes the data by reading the selected data and storing it in the specific locations within the tables.

The refresh is performed every four seconds, so the client application should not request data more frequently than once every 4000 msec.

4.4 DATA ENCODING

Modbus uses a ‘big-endian’ representation for addresses and data items. This means that when a numerical quantity larger than a single byte is transmitted, the MOST significant byte is sent first. The following sub-topics describe the different types of encoding and show how the data is encoded as it is 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 Binary

Binary data is used for digital input or alarm states that can be represented as a 1 or a 0. A binary item is represented as a single bit within a data word. All binary data is packed in to 16-bit data words, therefore a single register contains 16 bits of binary data, each having a specific meaning.

value	1st	2nd
0xAA55 (101010100101)	0xAA (10101010)	0x55 (01010101)

4.4.2 16-Bit Word (short)

A 16-bit word item is transmitted with the MOST significant byte first. FC3 reads 16-bit items at a time; therefore, each of these data items will fit within one register that is read.

value	1st	2nd
0x1234	0x12	0x34

4.4.3 32-Bit Word (Integer)

Integer data is used for encoding the status message, input or output state, relay control mode, and relay output mode. A 32-bit word item is transmitted with the MOST significant byte first, then the next MOST significant, until all bytes are transmitted. FC3 reads 16-bit items at a time; therefore, two registers are required to read each 32-bit data item.

	1st register		2nd register	
Value	1st	2nd	1st	2nd
0x12345678	0x12	0x34	0x56	0x78

4.4.4 Float Inverse

Float Inverse data is used to display sensor and analog input and output dynamic data. A float inverse is 32-bits within the WebMaster® product; therefore is transmitted just as a 32-bit word item is. FC3 reads 16-bit items at a time; therefore, two registers are required to read each float inverse data item.

	1st register		2nd register	
Value	1st	2nd	1st	2nd
0x12345678	0x56	0x78	0x12	0x34
(as stored in memory)				

4.4.5 Strings

Strings are used for the System Summary page header data, custom names, and units of measure. A string is a group of 8-bit data items having a fixed length. The first character of a string is transmitted first, followed by the remaining characters. Modbus reads 16-bit items at a time; therefore, a single register contains two characters of the string. To simplify string storage/transfer, each string should be of an even-byte length.

	1st register		2nd register		3rd register		4th register	
value	1st	2nd	1st	2nd	1st	2nd	1st	2nd
'Walchem'	'W'	'a'	'l'	'c'	'h'	'e'	'm'	?

Strings are read by the client application as Hex and decoded into ASCII.

Example:

"Level 2"

Address	Hex value	ASCII
6001	0x4C65	"LE"
6003	0x7665	"VE"
6005	0x6c20	"L "
6007	0x3200	"2 "

4.5 DATA DICTIONARY - READS

The following tables detail the Modbus addresses required to access each item of the public data.

4.5.1 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 the data is 1-based, meaning the first element/data item to be access is referenced by address 1.

Most client applications handle this by having the user enter the 1-based number, and then subtract 1 to revert to the 0-based addressing required at the protocol level.

Some client applications allow the user to enter the 0-based number, or a combination, depending on how it is configured.

The addresses defined within the following table are 1-based, as the majority of the client applications work with this method.

4.5.2 Header Data, Custom Names and Units of Measure

Header data consists of strings that are available to describe miscellaneous parts of the product. Custom names of inputs and outputs describe the purpose of the device connected. Units of measure changes made in the controller can be automatically be updated on the HMI. Refer to section **4.4.5 Strings** for the method to extract the string data.

For example, to read the Date item, a Read Holding Register request is generated with address 40033 and a register quantity of 12.

Data Item	Hardware Channel	Address	Register Quantity	Item Size (bytes)
Controller Name	N/A	0001	16	32
Controller Location	N/A	0017	16	32
Date	N/A	0033	12	24
Software Version Number	N/A	0045	16	32
Model Number	N/A	0061	16	32
Serial Number	N/A	0077	16	32
Controller Phone Number	N/A	0093	16	32
Analog Input Custom Name	1	6001	16	
Analog Input Custom Name	2	6017	16	
Analog Input Custom Name	3	6033	16	
Analog Input Custom Name	4	6049	16	
Analog Input Custom Name	5	6065	16	
Analog Input Custom Name	6	6081	16	
Analog Input Custom Name	7	6097	16	
Analog Input Custom Name	8	6113	16	
Sensor Input Custom Name	1	6257	16	
Sensor Input Custom Name	2	6273	16	
Sensor Input Custom Name	3	6289	16	
Sensor Input Custom Name	4	6305	16	
Digital Input Custom Name	1	6385	16	
Digital Input Custom Name	2	6401	16	
Digital Input Custom Name	3	6417	16	
Digital Input Custom Name	4	6433	16	

Data Item	Hardware Channel	Address	Register Quantity	Item Size (bytes)
Digital Input Custom Name	5	6449	16	
Digital Input Custom Name	6	6465	16	
Digital Input Custom Name	A	6481	16	
Digital Input Custom Name	B	6497	16	
Digital Input Custom Name	C	6513	16	
Digital Input Custom Name	D	6529	16	
Digital Input Custom Name	E	6545	16	
Digital Input Custom Name	F	6561	16	
Relay Custom Name	1	6641	16	
Relay Custom Name	2	6657	16	
Relay Custom Name	3	6673	16	
Relay Custom Name	4	6689	16	
Relay Custom Name	5	6705	16	
Relay Custom Name	6	6721	16	
Relay Custom Name	7	6737	16	
Relay Custom Name	8	6753	16	
Analog Output Custom Name	1	6833	16	
Analog Output Custom Name	2	6849	16	
Analog Output Custom Name	3	6865	16	
Analog Output Custom Name	4	6881	16	
Analog Input Units of Measure	1	6961	16	
Analog Input Units of Measure	2	6977	16	
Analog Input Units of Measure	3	6993	16	
Analog Input Units of Measure	4	7009	16	
Analog Input Units of Measure	5	7025	16	
Analog Input Units of Measure	6	7041	16	
Analog Input Units of Measure	7	7057	16	
Analog Input Units of Measure	8	7073	16	
Sensor Input Units of Measure	1	7217	16	
Sensor Input Units of Measure	2	7233	16	
Sensor Input Units of Measure	3	7249	16	
Sensor Input Units of Measure	4	7265	16	
Digital Input Units of Measure	1	7345	16	
Digital Input Units of Measure	2	7361	16	
Digital Input Units of Measure	3	7377	16	
Digital Input Units of Measure	4	7393	16	
Digital Input Units of Measure	5	7409	16	
Digital Input Units of Measure	6	7425	16	

Data Item	Hardware Channel	Address	Register Quantity	Item Size (bytes)
Digital Input Units of Measure	A	7441	16	
Digital Input Units of Measure	B	7457	16	
Digital Input Units of Measure	C	7473	16	
Digital Input Units of Measure	D	7489	16	
Digital Input Units of Measure	E	7505	16	
Digital Input Units of Measure	F	7521	16	
Relay Units of Measure	1	7601	16	
Relay Units of Measure	2	7617	16	
Relay Units of Measure	3	7633	16	
Relay Units of Measure	4	7649	16	
Relay Units of Measure	5	7665	16	
Relay Units of Measure	6	7681	16	
Relay Units of Measure	7	7697	16	
Relay Units of Measure	8	7713	16	
Analog Output Units of Measure	1	7793	16	
Analog Output Units of Measure	2	7809	16	
Analog Output Units of Measure	3	7825	16	
Analog Output Units of Measure	4	7841	16	

4.5.3 Alarm Data

Alarm states are bit-based (Binary), with up to 16 alarms encoded within each register. To access an individual alarm state, the register is read and the specific bit of the register is checked. Refer to section **4.4.2 16-Bit Word (short)** for the method to properly extract the data.

For example, to check the Modem Failure Alarm, a Read Holding Register is generated with address 41001 and a register quantity of 1. When the data is returned, and is extracted, it is bit-or'ed with 2 to determine the state.

Alarm Data Item	Hardware Channel	Address	Bit #	Bit Count
Modem Failure	N/A	1001	2	1
Ethernet Failure	N/A	1001	3	1
Analog Input Board Failure	N/A	1001	4	1
Digital Input Board Failure	N/A	1001	5	1
Non-Responding Slave	N/A	1001	6	1
4-20mA Output Board Failure	1	1001	7	1

Alarm Data Item	Hardware Channel	Address	Bit #	Bit Count
4-20mA Output Board Failure	2	1001	8	1
4-20mA Output Board Failure	3	1001	9	1
4-20mA Output Board Failure	4	1001	10	1
Sensor: Board Failure	1	1002	1	1
Sensor: Sensor Error	1	1002	2	1
Sensor: Low Alarm	1	1002	3	1
Sensor: High Alarm	1	1002	4	1
Sensor: Calibration Time	1	1002	5	1
Sensor: Low-Low Alarm	1	1042	1	1
Sensor; High-High Alarm	1	1042	2	1
Sensor: Deviation Alarm	1	1042	7	1
Temperature: Error	1	1002	6	1
Temperature: Low Alarm	1	1002	7	1
Temperature: High Alarm	1	1002	8	1
Sensor: Board Failure	2	1002	9	1
Sensor: Sensor Error	2	1002	10	1
Sensor: Low Alarm	2	1002	11	1
Sensor: High Alarm	2	1002	12	1
Sensor: Calibration Time	2	1002	13	1
Sensor: Low-Low Alarm	2	1042	9	1
Sensor; High-High Alarm	2	1042	10	1
Sensor: Deviation Alarm	2	1042	15	1
Temperature: Error	2	1002	14	1
Temperature: Low Alarm	2	1002	15	1
Temperature: High Alarm	2	1002	16	1
Sensor: Board Failure	3	1003	1	1
Sensor: Sensor Error	3	1003	2	1
Sensor: Low Alarm	3	1003	3	1
Sensor: High Alarm	3	1003	4	1

Alarm Data Item	Hardware Channel	Address	Bit #	Bit Count
Sensor: Calibration Time	3	1003	5	1
Sensor: Low-Low Alarm	3	1043	1	1
Sensor; High-High Alarm	3	1043	2	1
Sensor: Deviation Alarm	3	1043	7	1
Temperature: Error	3	1003	6	1
Temperature: Low Alarm	3	1003	7	1
Temperature: High Alarm	3	1003	8	1
Sensor: Board Failure	4	1003	9	1
Sensor: Sensor Error	4	1003	10	1
Sensor: Low Alarm	4	1003	11	1
Sensor: High Alarm	4	1003	12	1
Sensor: Calibration Time	4	1003	13	1
Sensor: Low-Low Alarm	4	1043	9	1
Sensor; High-High Alarm	4	1043	10	1
Sensor: Deviation Alarm	4	1043	15	1
Temperature: Error	4	1003	14	1
Temperature: Low Alarm	4	1003	15	1
Temperature: High Alarm	4	1003	16	1
Analog Level: Low Alarm	1	1004	1	1
Analog Level: Sensor Error	1	1004	2	1
Analog Level: Low-Low Alarm	1	1044	1	1
Analog Level: High Alarm	1	1044	2	1
Analog Level: High-High Alarm	1	1044	3	1
Analog Level: Deviation Alarm	1	1044	4	1
Analog Level: Low Alarm	2	1004	9	1
Analog Level: Sensor Error	2	1004	10	1
Analog Level: Low-Low Alarm	2	1044	9	1
Analog Level: High Alarm	2	1044	10	1

Alarm Data Item	Hardware Channel	Address	Bit #	Bit Count
Analog Level: High-High Alarm	2	1044	11	1
Analog Level: Deviation Alarm	2	1044	12	1
Analog Level: Low Alarm	3	1005	1	1
Analog Level: Sensor Error	3	1005	2	1
Analog Level: Low-Low Alarm	3	1045	1	1
Analog Level: High Alarm	3	1045	2	1
Analog Level: High-High Alarm	3	1045	3	1
Analog Level: Deviation Alarm	3	1045	4	1
Analog Level: Low Alarm	4	1005	9	1
Analog Level: Sensor Error	4	1005	10	1
Analog Level: Low-Low Alarm	4	1045	9	1
Analog Level: High Alarm	4	1045	10	1
Analog Level: High-High Alarm	4	1045	11	1
Analog Level: Deviation Alarm	4	1045	12	1
Analog Level: Low Alarm	5	1006	1	1
Analog Level: Sensor Error	5	1006	2	1
Analog Level: Low-Low Alarm	5	1046	1	1
Analog Level: High Alarm	5	1046	2	1
Analog Level: High-High Alarm	5	1046	3	1
Analog Level: Deviation Alarm	5	1046	4	1
Analog Level: Low Alarm	6	1006	9	1
Analog Level: Sensor Error	6	1006	10	1
Analog Level: Low-Low Alarm	6	1046	9	1
Analog Level: High Alarm	6	1046	10	1
Analog Level: High-High Alarm	6	1046	11	1
Analog Level: Deviation Alarm	6	1046	12	1
Analog Level: Low Alarm	7	1007	1	1
Analog Level: Sensor Error	7	1007	2	1
Analog Level: Low-Low Alarm	7	1047	1	1

Alarm Data Item	Hardware Channel	Address	Bit #	Bit Count
Analog Level: High Alarm	7	1047	2	1
Analog Level: High-High Alarm	7	1047	3	1
Analog Level: Deviation Alarm	7	1047	4	1
Analog Level: Low Alarm	8	1007	9	1
Analog Level: Sensor Error	8	1007	10	1
Analog Level: Low-Low Alarm	8	1047	9	1
Analog Level: High Alarm	8	1047	10	1
Analog Level: High-High Alarm	8	1047	11	1
Analog Level: Deviation Alarm	8	1047	12	1
Analog Generic: Low Alarm	1	1008	1	1
Analog Generic: High Alarm	1	1008	2	1
Analog Generic: Sensor Error	1	1008	3	1
Analog Generic: Low-Low Alarm	1	1048	1	1
Analog Generic: High-High Alarm	1	1048	3	1
Analog Generic: Deviation Alarm	1	1048	4	1
Analog Generic: Low Alarm	2	1008	9	1
Analog Generic: High Alarm	2	1008	10	1
Analog Generic: Sensor Error	2	1008	11	1
Analog Generic: Low-Low Alarm	2	1048	9	1
Analog Generic: High-High Alarm	2	1048	11	1
Analog Generic: Deviation Alarm	2	1048	12	1
Analog Generic: Low Alarm	3	1009	1	1
Analog Generic: High Alarm	3	1009	2	1
Analog Generic: Sensor Error	3	1009	3	1
Analog Generic: Low-Low Alarm	3	1049	1	1
Analog Generic: High-High Alarm	3	1049	3	1
Analog Generic: Deviation Alarm	3	1049	4	1
Analog Generic: Low Alarm	4	1009	9	1

Alarm Data Item	Hardware Channel	Address	Bit #	Bit Count
Analog Generic: High Alarm	4	1009	10	1
Analog Generic: Sensor Error	4	1009	11	1
Analog Generic: Low-Low Alarm	4	1049	9	1
Analog Generic: High-High Alarm	4	1049	11	1
Analog Generic: Deviation Alarm	4	1049	12	1
Analog Generic: Low Alarm	5	1010	1	1
Analog Generic: High Alarm	5	1010	2	1
Analog Generic: Sensor Error	5	1010	3	1
Analog Generic: Low-Low Alarm	5	1050	1	1
Analog Generic: High-High Alarm	5	1050	3	1
Analog Generic: Deviation Alarm	5	1050	4	1
Analog Generic: Low Alarm	6	1010	9	1
Analog Generic: High Alarm	6	1010	10	1
Analog Generic: Sensor Error	6	1010	11	1
Analog Generic: Low-Low Alarm	6	1050	9	1
Analog Generic: High-High Alarm	6	1050	11	1
Analog Generic: Deviation Alarm	6	1050	12	1
Analog Generic: Low Alarm	7	1011	1	1
Analog Generic: High Alarm	7	1011	2	1
Analog Generic: Sensor Error	7	1011	3	1
Analog Generic: Low-Low Alarm	7	1051	1	1
Analog Generic: High-High Alarm	7	1051	3	1
Analog Generic: Deviation Alarm	7	1051	4	1
Analog Generic: Low Alarm	8	1011	9	1
Analog Generic: High Alarm	8	1011	10	1
Analog Generic: Sensor Error	8	1011	11	1
Analog Generic: Low-Low Alarm	8	1051	9	1
Analog Generic: High-High Alarm	8	1051	11	1
Analog Generic: Deviation Alarm	8	1051	12	1

Alarm Data Item	Hardware Channel	Address	Bit #	Bit Count
Analog Flow Meter: Sensor Error	1	1012	1	1
Analog Flow Meter: High Alarm	1	1012	2	1
Analog Flow Meter: Low Alarm	1	1012	3	1
Analog Flow Meter: Total Alarm	1	1012	4	1
Analog Flow Meter: Low-Low Alarm	1	1052	1	1
Analog Flow Meter: High-High Alarm	1	1052	2	1
Analog Flow Meter: Deviation Alarm	1	1052	3	1
Analog Flow Meter: Sensor Error	2	1012	9	1
Analog Flow Meter: High Alarm	2	1012	10	1
Analog Flow Meter: Low Alarm	2	1012	11	1
Analog Flow Meter: Total Alarm	2	1012	12	1
Analog Flow Meter: Low-Low Alarm	2	1052	9	1
Analog Flow Meter: High-High Alarm	2	1052	10	1
Analog Flow Meter: Deviation Alarm	2	1052	11	1
Analog Flow Meter: Sensor Error	3	1013	1	1
Analog Flow Meter: High Alarm	3	1013	2	1
Analog Flow Meter: Low Alarm	3	1013	3	1
Analog Flow Meter: Total Alarm	3	1013	4	1
Analog Flow Meter: Low-Low Alarm	3	1053	1	1
Analog Flow Meter: High-High Alarm	3	1053	2	1
Analog Flow Meter: Deviation Alarm	3	1053	3	1
Analog Flow Meter: Sensor Error	4	1013	9	1
Analog Flow Meter: High Alarm	4	1013	10	1
Analog Flow Meter: Low Alarm	4	1013	11	1
Analog Flow Meter: Total Alarm	4	1013	12	1
Analog Flow Meter: Low-Low Alarm	4	1053	9	1
Analog Flow Meter: High-High Alarm	4	1053	10	1
Analog Flow Meter: Deviation Alarm	4	1053	11	1

Alarm Data Item	Hardware Channel	Address	Bit #	Bit Count
Analog Flow Meter: Sensor Error	5	1014	1	1
Analog Flow Meter: High Alarm	5	1014	2	1
Analog Flow Meter: Low Alarm	5	1014	3	1
Analog Flow Meter: Total Alarm	5	1014	4	1
Analog Flow Meter: Low-Low Alarm	5	1054	1	1
Analog Flow Meter: High-High Alarm	5	1054	2	1
Analog Flow Meter: Deviation Alarm	5	1054	3	1
Analog Flow Meter: Sensor Error	6	1014	9	1
Analog Flow Meter: High Alarm	6	1014	10	1
Analog Flow Meter: Low Alarm	6	1014	11	1
Analog Flow Meter: Total Alarm	6	1014	12	1
Analog Flow Meter: Low-Low Alarm	6	1054	9	1
Analog Flow Meter: High-High Alarm	6	1054	10	1
Analog Flow Meter: Deviation Alarm	6	1054	11	1
Analog Flow Meter: Sensor Error	7	1015	1	1
Analog Flow Meter: High Alarm	7	1015	2	1
Analog Flow Meter: Low Alarm	7	1015	3	1
Analog Flow Meter: Total Alarm	7	1015	4	1
Analog Flow Meter: Low-Low Alarm	7	1055	1	1
Analog Flow Meter: High-High Alarm	7	1055	2	1
Analog Flow Meter: Deviation Alarm	7	1055	3	1
Analog Flow Meter: Sensor Error	8	1015	9	1
Analog Flow Meter: High Alarm	8	1015	10	1
Analog Flow Meter: Low Alarm	8	1015	11	1
Analog Flow Meter: Total Alarm	8	1015	12	1
Analog Flow Meter: Low-Low Alarm	8	1055	9	1
Analog Flow Meter: High-High Alarm	8	1055	10	1
Analog Flow Meter: Deviation Alarm	8	1055	11	1

Alarm Data Item	Hardware Channel	Address	Bit #	Bit Count
Digital Level Switch: Low Alarm	A	1016	1	1
Digital Level Switch: Low Alarm	B	1016	2	1
Digital Level Switch: Low Alarm	C	1016	3	1
Digital Level Switch: Low Alarm	1	1016	4	1
Digital Level Switch: Low Alarm	2	1016	5	1
Digital Level Switch: Low Alarm	3	1016	6	1
Digital Level Switch: Low Alarm	4	1016	7	1
Digital Level Switch: Low Alarm	5	1016	8	1
Digital Level Switch: Low Alarm	6	1017	1	1
Digital Level Switch: Low Alarm	D	1017	2	1
Digital Level Switch: Low Alarm	E	1017	3	1
Digital Level Switch: Low Alarm	F	1017	4	1
Digital Generic Counter: Rate High Alarm	A	1018	1	1
Digital Generic Counter: Rate High Alarm	B	1018	2	1
Digital Generic Counter: Rate High Alarm	C	1018	3	1
Digital Generic Counter: Rate High Alarm	1	1018	4	1
Digital Generic Counter: Rate High Alarm	2	1018	5	1
Digital Generic Counter: Rate High Alarm	3	1018	6	1
Digital Generic Counter: Rate High Alarm	4	1018	7	1
Digital Generic Counter: Rate High Alarm	5	1018	8	1
Digital Generic Counter: Rate High Alarm	6	1019	1	1
Digital Generic Counter: Rate High Alarm	D	1019	2	1
Digital Generic Counter: Rate High Alarm	E	1019	3	1
Digital Generic Counter: Rate High Alarm	F	1019	4	1
Digital Generic Counter: Rate Low Alarm	A	1020	1	1
Digital Generic Counter: Rate Low Alarm	B	1020	2	1
Digital Generic Counter: Rate Low Alarm	C	1020	3	1

Alarm Data Item	Hardware Channel	Address	Bit #	Bit Count
Digital Generic Counter: Rate Low Alarm	1	1020	4	1
Digital Generic Counter: Rate Low Alarm	2	1020	5	1
Digital Generic Counter: Rate Low Alarm	3	1020	6	1
Digital Generic Counter: Rate Low Alarm	4	1020	7	1
Digital Generic Counter: Rate Low Alarm	5	1020	8	1
Digital Generic Counter: Rate Low Alarm	6	1021	1	1
Digital Generic Counter: Rate Low Alarm	D	1021	2	1
Digital Generic Counter: Rate Low Alarm	E	1021	3	1
Digital Generic Counter: Rate Low Alarm	F	1021	4	1
Digital Generic Counter: Total Alarm	A	1022	1	1
Digital Generic Counter: Total Alarm	B	1022	2	1
Digital Generic Counter: Total Alarm	C	1022	3	1
Digital Generic Counter: Total Alarm	1	1022	4	1
Digital Generic Counter: Total Alarm	2	1022	5	1
Digital Generic Counter: Total Alarm	3	1022	6	1
Digital Generic Counter: Total Alarm	4	1022	7	1
Digital Generic Counter: Total Alarm	5	1022	8	1
Digital Generic Counter: Total Alarm	6	1023	1	1
Digital Generic Counter: Total Alarm	D	1023	2	1
Digital Generic Counter: Total Alarm	E	1023	3	1
Digital Generic Counter: Total Alarm	F	1023	4	1
Digital Generic Input: Alarm	A	1024	1	1
Digital Generic Input: Alarm	B	1024	2	1
Digital Generic Input: Alarm	C	1024	3	1
Digital Generic Input: Alarm	1	1024	4	1
Digital Generic Input: Alarm	2	1024	5	1
Digital Generic Input: Alarm	3	1024	6	1

Alarm Data Item	Hardware Channel	Address	Bit #	Bit Count
Digital Generic Input: Alarm	4	1024	7	1
Digital Generic Input: Alarm	5	1024	8	1
Digital Generic Input: Alarm	6	1025	1	1
Digital Generic Input: Alarm	D	1025	2	1
Digital Generic Input: Alarm	E	1025	3	1
Digital Generic Input: Alarm	F	1025	4	1
Digital Flow Meter: Rate High Alarm	A	1026	9	1
Digital Flow Meter: Rate Low Alarm	A	1026	10	1
Digital Flow Meter: Total Alarm	A	1026	11	1
Digital Flow Meter: Deviation Alarm	A	1026	16	1
Digital Flow Meter: Rate Low-Low Alarm	A	1056	1	1
Digital Flow Meter: Rate High-High Alarm	A	1057	1	1
Digital Flow Meter: Rate High Alarm	B	1027	1	1
Digital Flow Meter: Rate Low Alarm	B	1027	2	1
Digital Flow Meter: Total Alarm	B	1027	3	1
Digital Flow Meter: Deviation Alarm	B	1027	15	1
Digital Flow Meter: Rate Low-Low Alarm	B	1056	2	1
Digital Flow Meter: Rate High-High Alarm	B	1057	2	1
Digital Flow Meter: Rate High Alarm	C	1027	9	1
Digital Flow Meter: Rate Low Alarm	C	1027	10	1
Digital Flow Meter: Total Alarm	C	1027	11	1
Digital Flow Meter: Deviation Alarm	C	1027	16	1
Digital Flow Meter: Rate Low-Low Alarm	C	1056	3	1
Digital Flow Meter: Rate High-High Alarm	C	1057	3	1
Digital Flow Meter: Rate High Alarm	1	1028	1	1
Digital Flow Meter: Rate Low Alarm	1	1028	2	1
Digital Flow Meter: Total Alarm	1	1028	3	1
Digital Flow Meter: Deviation Alarm	1	1028	15	1

Alarm Data Item	Hardware Channel	Address	Bit #	Bit Count
Digital Flow Meter: Rate Low-Low Alarm	1	1056	4	1
Digital Flow Meter: Rate High-High Alarm	1	1057	4	1
Digital Flow Meter: Rate High Alarm	2	1028	9	1
Digital Flow Meter: Rate Low Alarm	2	1028	10	1
Digital Flow Meter: Total Alarm	2	1028	11	1
Digital Flow Meter: Deviation Alarm	2	1028	16	1
Digital Flow Meter: Rate Low-Low Alarm	2	1056	5	1
Digital Flow Meter: Rate High-High Alarm	2	1057	5	1
Digital Flow Meter: Rate High Alarm	3	1029	1	1
Digital Flow Meter: Rate Low Alarm	3	1029	2	1
Digital Flow Meter: Total Alarm	3	1029	3	1
Digital Flow Meter: Deviation Alarm	3	1029	15	1
Digital Flow Meter: Rate Low-Low Alarm	3	1056	6	1
Digital Flow Meter: Rate High-High Alarm	3	1057	6	1
Digital Flow Meter: Rate High Alarm	4	1029	9	1
Digital Flow Meter: Rate Low Alarm	4	1029	10	1
Digital Flow Meter: Total Alarm	4	1029	11	1
Digital Flow Meter: Deviation Alarm	4	1029	16	1
Digital Flow Meter: Rate Low-Low Alarm	4	1056	7	1
Digital Flow Meter: Rate High-High Alarm	4	1057	7	1
Digital Flow Meter: Rate High Alarm	5	1030	1	1
Digital Flow Meter: Rate Low Alarm	5	1030	2	1
Digital Flow Meter: Total Alarm	5	1030	3	1
Digital Flow Meter: Deviation Alarm	5	1030	15	1
Digital Flow Meter: Rate Low-Low Alarm	5	1056	8	1
Digital Flow Meter: Rate High-High Alarm	5	1057	8	1
Digital Flow Meter: Rate High Alarm	6	1030	9	1
Digital Flow Meter: Rate Low Alarm	6	1030	10	1
Digital Flow Meter: Total Alarm	6	1030	11	1

Alarm Data Item	Hardware Channel	Address	Bit #	Bit Count
Digital Flow Meter: Deviation Alarm	6	1030	16	1
Digital Flow Meter: Rate Low-Low Alarm	6	1056	9	1
Digital Flow Meter: Rate High-High Alarm	6	1057	9	1
Digital Flow Meter: Rate High Alarm	D	1026	12	1
Digital Flow Meter: Rate Low Alarm	D	1026	13	1
Digital Flow Meter: Total Alarm	D	1026	14	1
Digital Flow Meter: Deviation Alarm	D	1058	1	1
Digital Flow Meter: Rate Low-Low Alarm	D	1056	10	1
Digital Flow Meter: Rate High-High Alarm	D	1057	10	1
NOTE: Rate alarms only apply to Paddlewheel Flow Meter Types				
Digital Feed Verification: Failure	A	1031	1	1
Digital Feed Verification: Failure	B	1031	2	1
Digital Feed Verification: Failure	C	1031	3	1
Digital Feed Verification: Failure	1	1031	4	1
Digital Feed Verification: Failure	2	1031	5	1
Digital Feed Verification: Failure	3	1031	6	1
Digital Feed Verification: Failure	4	1031	7	1
Digital Feed Verification: Failure	5	1031	8	1
Digital Feed Verification: Failure	6	1031	9	1
Digital Feed Verification: Failure	D	1031	10	1
Digital Feed Verification: Failure	E	1031	11	1
Digital Feed Verification: Failure	F	1031	12	1
Interlock Alarm	A	1032	1	1
Interlock Alarm	B	1032	2	1
Interlock Alarm	C	1032	3	1
Interlock Alarm	1	1032	4	1
Interlock Alarm	2	1032	5	1
Interlock Alarm	3	1032	6	1

Alarm Data Item	Hardware Channel	Address	Bit #	Bit Count
Interlock Alarm	4	1032	7	1
Interlock Alarm	5	1032	8	1
Interlock Alarm	6	1032	9	1
Interlock Alarm	D	1032	10	1
Interlock Alarm	E	1032	11	1
Interlock Alarm	F	1032	12	1
Output Timeout Alarm	1	1037	1	1
Output Timeout Alarm	2	1037	2	1
Output Timeout Alarm	3	1037	3	1
Output Timeout Alarm	4	1037	4	1
Output Timeout Alarm	5	1037	5	1
Output Timeout Alarm	6	1037	6	1
Output Timeout Alarm	7	1037	7	1
Output Timeout Alarm	8	1037	8	1

4.5.4 Status Data

Status data consists of 32-bit Word (Integer). Refer to section **4.5.3 32-Bit Word (int)** for the method to properly extract the data. The following rules indicate the format of the table:

Address	defines the starting address to read to access the item
Register Count (Item)	defines the number of registers to read to access the item

For example, to check the Analog Input Status for hardware channel 2, a Read Holding Register is generated with address 42036 and a register quantity of 1.

Status Data Item	Hardware Channel	Address	Register Count (Item)	Data Type
Sensor Status	1	2002	1	Integer
Sensor Status	2	2004	1	Integer
Sensor Status	3	2006	1	Integer
Sensor Status	4	2008	1	Integer

Status Data Item	Hardware Channel	Address	Register Count (Item)	Data Type
Temperature Status	1	2014	1	Integer
Temperature Status	2	2016	1	Integer
Temperature Status	3	2018	1	Integer
Temperature Status	4	2020	1	Integer
Analog Input Status	1	2034	1	Integer
Analog Input Status	2	2036	1	Integer
Analog Input Status	3	2038	1	Integer
Analog Input Status	4	2040	1	Integer
Analog Input Status	5	2042	1	Integer
Analog Input Status	6	2044	1	Integer
Analog Input Status	7	2046	1	Integer
Analog Input Status	8	2048	1	Integer
Digital Input Status	A	2054	1	Integer
Digital Input Status	B	2056	1	Integer
Digital Input Status	C	2058	1	Integer
Digital Input Status	1	2060	1	Integer
Digital Input Status	2	2062	1	Integer
Digital Input Status	3	2064	1	Integer
Digital Input Status	4	2066	1	Integer
Digital Input Status	5	2068	1	Integer
Digital Input Status	6	2070	1	Integer
Digital Input Status	D	2072	1	Integer
Digital Input Status	E	2074	1	Integer
Digital Input Status	F	2076	1	Integer
Analog Output Status	1	2098	1	Integer
Analog Output Status	2	2100	1	Integer
Analog Output Status	3	2102	1	Integer
Analog Output Status	4	2104	1	Integer
Relay Output Control Mode (Hand-Off-Auto)	1	2114	1	Integer
Relay Output Control Mode	2	2116	1	Integer
Relay Output Control Mode	3	2118	1	Integer
Relay Output Control Mode	4	2120	1	Integer
Relay Output Control Mode	5	2122	1	Integer
Relay Output Control Mode	6	2124	1	Integer
Relay Output Control Mode	7	2126	1	Integer
Relay Output Control Mode	8	2128	1	Integer
Relay Output State	1	2137	1	Integer

Status Data Item	Hardware Channel	Address	Register Count (Item)	Data Type
Relay Output State	2	2138	1	Integer
Relay Output State	3	2139	1	Integer
Relay Output State	4	2140	1	Integer
Relay Output State	5	2141	1	Integer
Relay Output State	6	2142	1	Integer
Relay Output State	7	2143	1	Integer
Relay Output State	8	2144	1	Integer

The data is encoded using the following values:

Relay Output Control Mode:

0 = HAND
1 = OFF
2 = AUTO

Relay Output State:

256 = On
0 = Off

Status messages for Sensor inputs, Temperature inputs, Digital inputs and Analog inputs:

0	" "	11	Low Alarm
1	Normal	12	Calibration Time
2	Off	13	Board Failure
3	On	14	Pump Failure
4	OK	15	Total Alarm
5	Self Test	16	Probe wash
6	Wait	17	High High Alarm
7	Sampling	18	Low Low Alarm
8	Hold	19	Sensor Deviation
9	Sensor Error		
10	High Alarm		

Status messages for Analog outputs and Relay outputs:

0	" "	34	Relay 2 Lockout
1	Off	35	Relay 3 Lockout
2	On	36	Relay 4 Lockout
3	Time Out	37	Relay 5 Lockout
4	A/D Startup	38	Relay 6 Lockout
5	Hand	39	Relay 7 Lockout
6	Manual Off	40	Relay 8 Lockout
7	Failure	41	No Sensor Selected
8	Invalid	42	Waiting
9	Calibrate	43	Sampling
10	Calibrate Sen 1	44	Holding
11	Calibrate Sen 2	45	Blowdown
12	Calibrate Sen 3	46	No Feed Verification configured
13	Calibrate Sen 4	47	Units Mismatch
14	Normal	48	Disp. Lockout
15	Overrange	49	Bio Lockout
16	Underrange	50	PreBleed Lockout
17	Loop Cal	51	Pre-Bleed
18	Sensor Error	52	Waiting
19	Internal Lock	53	On Delay
20	Unknown	54	Pending
21	DI A Lockout	55	Bleed Lockout Time
22	DI B Lockout	56	Bio Add
23	DI C Lockout	57	Dispersant Add
24	DI 1 Lockout	58	4-20 mA 1 Lockout
25	DI 2 Lockout	59	4-20 mA 2 Lockout
26	DI 3 Lockout,	60	4-20 mA 3 Lockout
27	DI 4 Lockout	61	4-20 mA 4 Lockout
28	DI 5 Lockout	62	Configuration Error
29	DI 6 Lockout	63	Off Delay
30	DI D Lockout	64	Freeze Guard
31	DI E Lockout	65	Power Up Delay
32	DI F Lockout	66	Wash
33	Relay 1 Lockout	67	No Feed Verification Input

4.5.5 Dynamic Data

Dynamic data generally consists of 16-bit words (Binary), 32-bit word (Integer) or float inverse. To access an individual Dynamic Data item, 1 or 2 registers are required to be read. Refer to sections **4.5.2 16-Bit Word (short), 4.5.3 32-Bit Word (Integer)** and **4.5.4 Float Inverse** for the methods to properly extract the data. The following rules indicate the format of the table:

Address	defines the starting address to read to access the item
Register Count (Item)	defines the number of registers to read to access the item

For example, to check the item Sensor Current Reading for hardware channel 1, a Read Holding Register is generated with address 43001 and a register quantity of 2.

Dynamic Data Item	Hardware Channel	Address	Register Count (Item)	Data Type
Sensor Current Reading	1	3001	2	Float Inverse
Sensor Uncalibrated Reading	1	3017	2	Float Inverse
Sensor mV Output	1	3033	2	Float Inverse
Sensor Temperature Reading	1	3049	2	Float Inverse
Sensor Uncalibrated Temperature	1	3065	2	Float Inverse
Sensor Temperature mV	1	3081	2	Float Inverse
Sensor Current Reading	2	3003	2	Float Inverse
Sensor Uncalibrated Reading	2	3019	2	Float Inverse
Sensor mV Output	2	3035	2	Float Inverse
Sensor Temperature Reading	2	3051	2	Float Inverse
Sensor Uncalibrated Temperature	2	3067	2	Float Inverse
Sensor Temperature mV	2	3083	2	Float Inverse
Sensor Current Reading	3	3005	2	Float Inverse
Sensor Uncalibrated Reading	3	3021	2	Float Inverse
Sensor mV Output	3	3037	2	Float Inverse
Sensor Temperature Reading	3	3053	2	Float Inverse
Sensor Uncalibrated Temperature	3	3069	2	Float Inverse
Sensor Temperature mV	3	3085	2	Float Inverse
Sensor Current Reading	4	3007	2	Float Inverse
Sensor Uncalibrated Reading	4	3023	2	Float Inverse
Sensor mV Output	4	3039	2	Float Inverse
Sensor Temperature Reading	4	3055	2	Float Inverse
Sensor Uncalibrated Temperature	4	3071	2	Float Inverse
Sensor Temperature mV	4	3087	2	Float Inverse
Analog Input Measured Value	1	3097	2	Float Inverse
Analog Input Raw mA	1	3129	2	Float Inverse

Dynamic Data Item	Hardware Channel	Address	Register Count (Item)	Data Type
Analog Input Total *	1	3161	2	Float Inverse
Analog Input Measured Value	2	3099	2	Float Inverse
Analog Input Raw mA	2	3131	2	Float Inverse
Analog Input Total *	2	3163	2	Float Inverse
Analog Input Measured Value	3	3101	2	Float Inverse
Analog Input Raw mA	3	3133	2	Float Inverse
Analog Input Total *	3	3165	2	Float Inverse
Analog Input Measured Value	4	3103	2	Float Inverse
Analog Input Raw mA	4	3135	2	Float Inverse
Analog Input Total *	4	3167	2	Float Inverse
Analog Input Measured Value	5	3105	2	Float Inverse
Analog Input Raw mA	5	3137	2	Float Inverse
Analog Input Total *	5	3169	2	Float Inverse
Analog Input Measured Value	6	3107	2	Float Inverse
Analog Input Raw mA	6	3139	2	Float Inverse
Analog Input Total *	6	3171	2	Float Inverse
Analog Input Measured Value	7	3109	2	Float Inverse
Analog Input Raw mA	7	3141	2	Float Inverse
Analog Input Total *	7	3173	2	Float Inverse
Analog Input Measured Value	8	3111	2	Float Inverse
Analog Input Raw mA	8	3143	2	Float Inverse
Analog Input Total *	8	3175	2	Float Inverse
* NOTE: Total is only applicable for Flow Meter type Analog Inputs				
Analog Output Scaled Input Value	1	3681	2	Float Inverse
Analog Output mA Output	1	3697	2	Float Inverse
Analog Output %	1	3713	2	Float Inverse
Analog Output Scaled Input Value	2	3683	2	Float Inverse
Analog Output mA Output	2	3699	2	Float Inverse
Analog Output %	2	3715	2	Float Inverse
Analog Output Scaled Input Value	3	3685	2	Float Inverse
Analog Output mA Output	3	3701	2	Float Inverse
Analog Output %	3	3717	2	Float Inverse
Analog Output Scaled Input Value	4	3687	2	Float Inverse
Analog Output mA Output	4	3703	2	Float Inverse
Analog Output %	4	3719	2	Float Inverse
RSI	N/A	3729	2	Float Inverse
LSI	N/A	3731	2	Float Inverse

Dynamic Data Item	Hardware Channel	Address	Bit Number	Register Count (Item)	Data Type
Digital Input State	A	3321	9	1 bit	Binary
Digital Input Measured Value	A	3329		2	Float Inverse
Digital Input Total	A	3361		2	Float Inverse
Digital Input State	B	3321	1	1 bit	Binary
Digital Input Measured Value	B	3331		2	Float Inverse
Digital Input Total	B	3363		2	Float Inverse
Digital Input State	C	3322	9	1 bit	Binary
Digital Input Measured Value	C	3333		2	Float Inverse
Digital Input Total	C	3365		2	Float Inverse
Digital Input State	1	3322	1	1 bit	Binary
Digital Input Measured Value	1	3335		2	Float Inverse
Digital Input Total	1	3367		2	Float Inverse
Digital Input State	2	3323	9	1 bit	Binary
Digital Input Measured Value	2	3337		2	Float Inverse
Digital Input Total	2	3369		2	Float Inverse
Digital Input State	3	3323	1	1 bit	Binary
Digital Input Measured Value	3	3339		2	Float Inverse
Digital Input Total	3	3371		2	Float Inverse
Digital Input State	4	3324	9	1 bit	Binary
Digital Input Measured Value	4	3341		2	Float Inverse

Dynamic Data Item	Hardware Channel	Address	Bit Number	Register Count (Item)	Data Type
Digital Input Total	4	3373		2	Float Inverse
Digital Input State	5	3324	1	1 bit	Binary
Digital Input Measured Value	5	3343		2	Float Inverse
Digital Input Total	5	3375		2	Float Inverse
Digital Input State	6	3325	9	1 bit	Binary
Digital Input Measured Value	6	3345		2	Float Inverse
Digital Input Total	6	3377		2	Float Inverse
Digital Input State	D	3325	1	1 bit	Binary
Digital Input Measured Value	D	3347		2	Float Inverse
Digital Input Total	D	3379		2	Float Inverse
Digital Input State	E	3326	9	1 bit	Binary
Digital Input Measured Value	E	3349		2	Float Inverse
Digital Input Total	E	3381		2	Float Inverse
Digital Input State	F	3326	1	1 bit	Binary
Digital Input Measured Value	F	3351		2	Float Inverse
Digital Input Total	F	3383		2	Float Inverse
NOTE: State only applies to Interlock, Level Switch or Generic Input Types. 0 = Open, 256 = Closed					
NOTE: Measured Value only applies to Generic Counter, Paddlewheel Flow Meter and Feed Verification					

Dynamic Data Item	Hardware Channel	Address	Bit Number	Register Count (Item)	Data Type
type inputs					
NOTE: Total does not apply to Interlock, Level Switch or Generic Input types					
Relay Interlocking Another	1	3739	9	1 bit	Binary
Relay Interlocking Another	2	3739	10	1 bit	Binary
Relay Interlocking Another	3	3739	11	1 bit	Binary
Relay Interlocking Another	4	3739	12	1 bit	Binary
Relay Interlocking Another	5	3739	13	1 bit	Binary
Relay Interlocking Another	6	3739	14	1 bit	Binary
Relay Interlocking Another	7	3739	15	1 bit	Binary
Relay Interlocking Another	8	3739	16	1 bit	Binary
1 = Interlocking, 2 = Not Interlocking					
Relay Accumulated Input Volume	1	3741		2	Float Inverse
Relay Accumulated Input Volume	2	3743		2	Float Inverse
Relay Accumulated Input Volume	3	3745		2	Float Inverse
Relay Accumulated Input Volume	4	3747		2	Float Inverse
Relay Accumulated Input Volume	5	3749		2	Float Inverse
Relay Accumulated Input Volume	6	3751		2	Float Inverse
Relay Accumulated Input Volume	7	3753		2	Float Inverse
Relay Accumulated Input Volume	8	3755		2	Float Inverse
Only applicable to flow based relay control modes					
Relay Accumulated Controlled Volume	1	3765		2	Float Inverse

Dynamic Data Item	Hardware Channel	Address	Bit Number	Register Count (Item)	Data Type
Relay Accumulated Controlled Volume	2	3767		2	Float Inverse
Relay Accumulated Controlled Volume	3	3769		2	Float Inverse
Relay Accumulated Controlled Volume	4	3771		2	Float Inverse
Relay Accumulated Controlled Volume	5	3773		2	Float Inverse
Relay Accumulated Controlled Volume	6	3775		2	Float Inverse
Relay Accumulated Controlled Volume	7	3777		2	Float Inverse
Relay Accumulated Controlled Volume	8	3779		2	Float Inverse
Only applicable to Flow Volume based on 2nd Flow Volume relay control mode					
Relay Current Week	1	3790		1	Integer
Relay Current Week	2	3792		1	Integer
Relay Current Week	3	3794		1	Integer
Relay Current Week	4	3796		1	Integer
Relay Current Week	5	3798		1	Integer
Relay Current Week	6	3800		1	Integer
Relay Current Week	7	3802		1	Integer
Relay Current Week	8	3804		1	Integer
Only applicable to 1,2 or 4 week timer relay control modes					

New ones for new algos?

4.6 DATA DICTIONARY - WRITES

The following tables detail the Modbus addresses required to modify each item of the public data.

4.6.1 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 the data is 1-based, meaning the first element/data item to be access is referenced by address 1.

Most client applications handle this by having the user enter the 1-based number, and then subtract 1 to revert to the 0-based addressing required at the protocol level.

Some client applications allow the user to enter the 0-based number, or a combination, depending on how it is configured.

The addresses defined within the following table are 1-based, as the majority of the client applications work with this method.

4.6.2 Dynamic Data - Writes

Dynamic data for Modbus writes are all float inverse. To modify an individual Set Point, 2 registers are required to be written to. Refer to section **4.5.4 Float Inverse** for the methods to properly modify the data. The following rules indicate the format of the table:

Address	defines the starting address to write to modify the item
Size	defines the number of registers to write to modify the set point

For example, to modify the Full Volume set point on Analog Input hardware channel 1, a Write Holding Register is generated with address 20001 and a size of 2.

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
Analog Input 1	Level	Full Volume	20001
		mA when tank empty	20003
		mA when tank full	20005
		Low-low alarm limit	20007
		Low alarm limit	20009

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		High alarm limit	20011
		High-high alarm limit	20013
	Generic	4 mA =	20001
		20 mA =	20003
		Low-low alarm limit	20007
		Low alarm limit	20009
		High alarm limit	20011
		High-high alarm limit	20013
	Flow Meter	4 mA =	20001
		20 mA =	20003
		Dead Band	20005
		Rate Low-low alarm	20007
		Rate Low alarm	20009
		Rate High alarm	20011
		Rate High-high alarm	20013
		Total Alarm Limit	20015
Analog Input 2	Level	Full Volume	20021
		mA when tank empty	20023
		mA when tank full	20025
		Low-low alarm limit	20027
		Low alarm limit	20029
		High alarm limit	20031
		High-high alarm limit	20033
	Generic	4 mA =	20021
		20 mA =	20023
		Low-low alarm limit	20027
		Low alarm limit	20029
		High alarm limit	20031
		High-high alarm limit	20033
	Flow Meter	4 mA =	20021

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		20 mA =	20023
		Dead Band	20025
		Rate Low-low alarm	20027
		Rate Low alarm	20029
		Rate High alarm	20031
		Rate High-high alarm	20033
		Total Alarm Limit	20035
Analog Input 3	Level	Full Volume	20041
		mA when tank empty	20043
		mA when tank full	20045
		Low-low alarm limit	20047
		Low alarm limit	20049
		High alarm limit	20051
		High-high alarm limit	20053
	Generic	4 mA =	20041
		20 mA =	20043
		Low-low alarm limit	20047
		Low alarm limit	20049
		High alarm limit	20051
		High-high alarm limit	20053
	Flow Meter	4 mA =	20041
		20 mA =	20043
		Dead Band	20045
		Rate Low-low alarm	20047
		Rate Low alarm	20049
		Rate High alarm	20051
		Rate High-high alarm	20053
		Total Alarm Limit	20055
Analog Input 4	Level	Full Volume	20061
		mA when tank empty	20063

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		mA when tank full	20065
		Low-low alarm limit	20067
		Low alarm limit	20069
		High alarm limit	20071
		High-high alarm limit	20073
Analog Input 4	Generic	4 mA =	20061
		20 mA =	20063
		Low-low alarm limit	20067
		Low alarm limit	20069
		High alarm limit	20071
		High-high alarm limit	20073
	Flow Meter	4 mA =	20061
		20 mA =	20063
		Dead Band	20065
		Rate Low-low alarm	20067
		Rate Low alarm	20069
		Rate High alarm	20071
		Rate High-high alarm	20073
		Total Alarm Limit	20075
Analog Input 5	Level	Full Volume	20081
		mA when tank empty	20083
		mA when tank full	20085
		Low-low alarm limit	20087
		Low alarm limit	20089
		High alarm limit	20091
		High-high alarm limit	20093
	Generic	4 mA =	20081
		20 mA =	20083
		Low-low alarm limit	20087
		Low alarm limit	20089

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		High alarm limit	20091
		High-high alarm limit	20093
Analog Input 5	Flow Meter	4 mA =	20081
		20 mA =	20083
		Dead Band	20085
		Rate Low-low alarm	20087
		Rate Low alarm	20089
		Rate High alarm	20091
		Rate High-high alarm	20093
		Total Alarm Limit	20095
Analog Input 6	Level	Full Volume	20101
		mA when tank empty	20103
		mA when tank full	20105
		Low-low alarm limit	20107
		Low alarm limit	20109
		High alarm limit	20111
		High-high alarm limit	20113
	Generic	4 mA =	20101
		20 mA =	20103
		Low-low alarm limit	20107
		Low alarm limit	20109
		High alarm limit	20111
		High-high alarm limit	20113
	Flow Meter	4 mA =	20101
		20 mA =	20103
		Dead Band	20105
		Rate Low-low alarm	20107
		Rate Low alarm	20109
		Rate High alarm	20111
		Rate High-high alarm	20113

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Total Alarm Limit	20115
Analog Input 7	Level	Full Volume	20121
		mA when tank empty	20123
		mA when tank full	20125
		Low-low alarm limit	20127
		Low alarm limit	20129
		High alarm limit	20131
		High-high alarm limit	20133
	Generic	4 mA =	20121
		20 mA =	20123
		Low-low alarm limit	20127
		Low alarm limit	20129
		High alarm limit	20131
		High-high alarm limit	20133
	Flow Meter	4 mA =	20121
		20 mA =	20123
		Dead Band	20125
		Rate Low-low alarm	20127
		Rate Low alarm	20129
		Rate High alarm	20131
		Rate High-high alarm	20133
		Total Alarm Limit	20135
Analog Input 8	Level	Full Volume	20141
		mA when tank empty	20143
		mA when tank full	20145
		Low-low alarm limit	20147
		Low alarm limit	20149
		High alarm limit	20151
		High-high alarm limit	20153
	Generic	4 mA =	20141

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		20 mA =	20143
		Low-low alarm limit	20147
		Low alarm limit	20149
		High alarm limit	20151
		High-high alarm limit	20153
Analog Input 8	Flow Meter	4 mA =	20141
		20 mA =	20143
		Dead Band	20145
		Rate Low-low alarm	20147
		Rate Low alarm	20149
		Rate High alarm	20151
		Rate High-high alarm	20153
		Total Alarm Limit	20155
Sensor Input 1	Any	Low-low alarm limit	20321
		Low alarm limit	20323
		High alarm limit	20325
		High-high alarm limit	20327
		Manual Temperature	20329
Sensor Input 2	Any	Low-low alarm limit	20341
		Low alarm limit	20343
		High alarm limit	20345
		High-high alarm limit	20347
		Manual Temperature	20349
Sensor Input 3	Any	Low-low alarm limit	20361
		Low alarm limit	20363
		High alarm limit	20365
		High-high alarm limit	20367
		Manual Temperature	20369
Sensor Input 4	Any	Low-low alarm limit	20381
		Low alarm limit	20383

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		High alarm limit	20385
		High-high alarm limit	20387
		Manual Temperature	20389
Digital Input A	Interlock	Interlock When	20481
	Generic Input	Alarm Active When	20481
	Level Switch	Drum Low When	20481
	Feed Verification	Volume Per Stroke	20481
		Alarm Time	20483
	Generic Counter	One Count =	20481
		Total Alarm Limit	20483
		Rate Low Alarm	20485
		Rate High Alarm	20487
	Contacting Flow Meter	Volume Per Contact	20481
		Total Alarm Limit	20483
	Paddlewheel Flow Meter	K Factor	20481
		Total Alarm Limit	20483
		Rate Low-low Alarm	20485
		Rate Low Alarm	20487
		Rate High Alarm	20489
		Rate High-high Alarm	20491
Digital Input B	Interlock	Interlock When	20501
	Generic Input	Alarm Active When	20501
	Level Switch	Drum Low When	20501
	Feed Verification	Volume Per Stroke	20501
		Alarm Time	20503
	Generic Counter	One Count =	20501
		Total Alarm Limit	20503
		Rate Low Alarm	20505
		Rate High Alarm	20507

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
Digital Input B	Contacting Flow Meter	Volume Per Contact	20501
		Total Alarm Limit	20503
	Paddlewheel Flow Meter	K Factor	20501
		Total Alarm Limit	20503
		Rate Low-low Alarm	20505
		Rate Low Alarm	20507
		Rate High Alarm	20509
		Rate High-high Alarm	20511
Digital Input C	Interlock	Interlock When	20521
	Generic Input	Alarm Active When	20521
	Level Switch	Drum Low When	20521
	Feed Verification	Volume Per Stroke	20521
		Alarm Time	20523
	Generic Counter	One Count =	20521
		Total Alarm Limit	20523
		Rate Low Alarm	20525
		Rate High Alarm	20527
	Contacting Flow Meter	Volume Per Contact	20521
		Total Alarm Limit	20523
	Paddlewheel Flow Meter	K Factor	20521
		Total Alarm Limit	20523
		Rate Low-low Alarm	20525
		Rate Low Alarm	20527
		Rate High Alarm	20529
		Rate High-high Alarm	20531
Digital Input D	Interlock	Interlock When	20701
	Generic Input	Alarm Active When	20701
	Level Switch	Drum Low When	20701
	Feed Verification	Volume Per Stroke	20701

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Alarm Time	20703
Digital Input D	Generic Counter	One Count =	20701
		Total Alarm Limit	20703
		Rate Low Alarm	20705
		Rate High Alarm	20707
	Contacting Flow Meter	Volume Per Contact	20701
		Total Alarm Limit	20703
	Paddlewheel Flow Meter	K Factor	20701
		Total Alarm Limit	20703
		Rate Low-low Alarm	20705
		Rate Low Alarm	20707
		Rate High Alarm	20709
		Rate High-high Alarm	20711
Digital Input E	Interlock	Interlock When	20721
	Generic Input	Alarm Active When	20721
	Level Switch	Drum Low When	20721
	Feed Verification	Volume Per Stroke	20721
		Alarm Time	20723
	Generic Counter	One Count =	20721
		Total Alarm Limit	20723
		Rate Low Alarm	20725
		Rate High Alarm	20727
	Contacting Flow Meter	Volume Per Contact	20721
		Total Alarm Limit	20723
	Paddlewheel Flow Meter	K Factor	20721
		Total Alarm Limit	20723
		Rate Low-low Alarm	20725
		Rate Low Alarm	20727
		Rate High Alarm	20729

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Rate High-high Alarm	20731
Digital Input F	Interlock	Interlock When	20741
	Generic Input	Alarm Active When	20741
	Level Switch	Drum Low When	20741
	Feed Verification	Volume Per Stroke	20741
		Alarm Time	20743
	Generic Counter	One Count =	20741
		Total Alarm Limit	20743
		Rate Low Alarm	20745
		Rate High Alarm	20747
	Contacting Flow Meter	Volume Per Contact	20741
		Total Alarm Limit	20743
	Paddlewheel Flow Meter	K Factor	20741
		Total Alarm Limit	20743
		Rate Low-low Alarm	20745
		Rate Low Alarm	20747
		Rate High Alarm	20749
		Rate High-high Alarm	20751
Digital Input 1	Interlock	Interlock When	20541
	Generic Input	Alarm Active When	20541
	Level Switch	Drum Low When	20541
	Feed Verification	Volume Per Stroke	20541
		Alarm Time	20543
	Generic Counter	One Count =	20541
		Total Alarm Limit	20543
		Rate Low Alarm	20545
		Rate High Alarm	20547
	Contacting Flow Meter	Volume Per Contact	20541
		Total Alarm Limit	20543

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
Digital Input 1	Paddlewheel Flow Meter	K Factor	20541
		Total Alarm Limit	20543
		Rate Low-low Alarm	20545
		Rate Low Alarm	20547
		Rate High Alarm	20549
		Rate High-high Alarm	20551
Digital Input 2	Interlock	Interlock When	20561
	Generic Input	Alarm Active When	20561
	Level Switch	Drum Low When	20561
	Feed Verification	Volume Per Stroke	20561
		Alarm Time	20563
	Generic Counter	One Count =	20561
		Total Alarm Limit	20563
		Rate Low Alarm	20565
		Rate High Alarm	20567
	Contacting Flow Meter	Volume Per Contact	20561
		Total Alarm Limit	20563
	Paddlewheel Flow Meter	K Factor	20561
		Total Alarm Limit	20563
		Rate Low-low Alarm	20565
		Rate Low Alarm	20567
		Rate High Alarm	20569
		Rate High-high Alarm	20571
Digital Input 3	Interlock	Interlock When	20581
	Generic Input	Alarm Active When	20581
	Level Switch	Drum Low When	20581
	Feed Verification	Volume Per Stroke	20581
		Alarm Time	20583
	Generic Counter	One Count =	20581

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Total Alarm Limit	20583
		Rate Low Alarm	20585
		Rate High Alarm	20587
Digital Input 3	Contacting Flow Meter	Volume Per Contact	20581
		Total Alarm Limit	20583
	Paddlewheel Flow Meter	K Factor	20581
		Total Alarm Limit	20583
		Rate Low-low Alarm	20585
		Rate Low Alarm	20587
		Rate High Alarm	20589
		Rate High-high Alarm	20591
Digital Input 4	Interlock	Interlock When	20601
	Generic Input	Alarm Active When	20601
	Level Switch	Drum Low When	20601
	Feed Verification	Volume Per Stroke	20601
		Alarm Time	20603
	Generic Counter	One Count =	20601
		Total Alarm Limit	20603
		Rate Low Alarm	20605
		Rate High Alarm	20607
	Contacting Flow Meter	Volume Per Contact	20601
		Total Alarm Limit	20603
	Paddlewheel Flow Meter	K Factor	20601
		Total Alarm Limit	20603
		Rate Low-low Alarm	20605
		Rate Low Alarm	20607
		Rate High Alarm	20609
		Rate High-high Alarm	20611
Digital Input 5	Interlock	Interlock When	20621

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
Digital Input 5	Generic Input	Alarm Active When	20621
	Level Switch	Drum Low When	20621
	Feed Verification	Volume Per Stroke	20621
		Alarm Time	20623
	Generic Counter	One Count =	20621
		Total Alarm Limit	20623
		Rate Low Alarm	20625
		Rate High Alarm	20627
	Contacting Flow Meter	Volume Per Contact	20621
		Total Alarm Limit	20623
	Paddlewheel Flow Meter	K Factor	20621
		Total Alarm Limit	20623
		Rate Low-low Alarm	20625
		Rate Low Alarm	20627
		Rate High Alarm	20629
		Rate High-high Alarm	20631
Digital Input 6	Interlock	Interlock When	20641
	Generic Input	Alarm Active When	20641
	Level Switch	Drum Low When	20641
	Feed Verification	Volume Per Stroke	20641
		Alarm Time	20643
	Generic Counter	One Count =	20641
		Total Alarm Limit	20643
		Rate Low Alarm	20645
		Rate High Alarm	20647
	Contacting Flow Meter	Volume Per Contact	20641
		Total Alarm Limit	20643
	Paddlewheel Flow Meter	K Factor	20641
		Total Alarm Limit	20643

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Rate Low-low Alarm	20645
		Rate Low Alarm	20647
		Rate High Alarm	20649
		Rate High-high Alarm	20651
Relay 1	On/Off Set Point	Hand-Off-Auto Mode	20801
		Output Time Limit	20803
		Hand Time Limit	20805
		On Delay	20807
		Off Delay	20809
		Set Point	20811
		Dead Band	20813
	Time Proportional	Hand-Off-Auto Mode	20801
		Output Time Limit	20803
		Hand Time Limit	20805
		Set Point	20811
		Proportional Band	20813
		Sample Period	20815
	Flow Based Control	Hand-Off-Auto Mode	20801
		Output Time Limit	20803
		Hand Time Limit	20805
		Unit Vol. to Trigger Output	20811
		Output OnTime Per Unit Volume	20813
	Activate With Another Relay	Hand-Off-Auto Mode	20801
		Output Time Limit	20803
		Hand Time Limit	20805
	Activate After Another Relay (%)	Hand-Off-Auto Mode	20801
		Output Time Limit	20803
		Hand Time Limit	20805

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		% of Other Relay On-Time to Activate	20811
Relay 1	Activate After Another Relay (Fixed Time)	Hand-Off-Auto Mode	20801
		Output Time Limit	20803
		Hand Time Limit	20805
		Fixed Time to Activate	20811
	Activate as % of Time	Hand-Off-Auto Mode	20801
		Output Time Limit	20803
		Hand Time Limit	20805
		% of Period to Activate	20811
		Time Period	20813
	24 Hour Timer	Hand-Off-Auto Mode	20801
		Hand Time Limit	20805
		Additions A-T On Time	20825-20863
	1 Week Timer	Hand-Off-Auto Mode	20801
		Hand Time Limit	20805
		Additions Day1-7 On Time	20825-20837
	2 Week Timer	Hand-Off-Auto Mode	20801
		Hand Time Limit	20805
		Additions Week1 Day1-7 On Time	20825-20837
		Additions Week2 Day1-7 On Time	20839-20851
	4 Week Timer	Hand-Off-Auto Mode	20801
		Hand Time Limit	20805
		Additions Week1 Day1-7 On Time	20825-20837
		Additions Week2 Day1-7 On Time	20839-20851

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Additions Week3 Day1-7 On Time	20853-20865
		Additions Week4 Day1-7 On Time	20867-20879
Relay 1	Activate on a DI	Hand-Off-Auto Mode	20801
		Output Time Limit	20803
		Hand Time Limit	20805
		On Delay	20807
		Off Delay	20809
	Alarm	Hand-Off-Auto Mode	20801
		Output Time Limit	20803
		Hand Time Limit	20805
		On Delay	20807
		Power-up On Delay	20811
	Flow Volume based on 2nd Flow Volume	Hand-Off-Auto Mode	20801
		Output Time Limit	20803
		Hand Time Limit	20805
		Controlled Volume per Input Volume	20811
		Input Volume to Trigger Control	20813
	Pulse Proportional	Hand-Off-Auto Mode	20801
		Output Time Limit	20803
		Hand Time Limit	20805
		Set Point	20811
		Proportional Band	20813
		Maximum Pump Speed	20815
		Minimum Pump Speed	20817
	Probe Wash	Hand-Off-Auto Mode	20801
		Hand Time Limit	20805
		Hold Time	20811

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Additions A-T On Time	20825-20863
Relay 1	PID	Hand-Off-Auto Mode	20801
		Output Time Limit	20803
		Hand Time Limit	20805
		On Delay	20807
		Off Delay	20809
		Set Point	20811
		Proportional Gain	20813
		Integral Gain	20815
		Derivative Gain	20817
		Time Period	20819
	Counter Based Control	Hand-Off-Auto Mode	20801
		Output Time Limit	20803
		Hand Time Limit	20805
		Counts to Trigger Output	20811
		Output On Time Per Counts	20813
	In Range/Out of Range	Hand-Off-Auto Mode	20801
		Output Time Limit	20803
		Hand Time Limit	20805
		On Delay	20807
		Off Delay	20809
		Low Set Point	20811
		Dead Band	20813
		High Set Point	20815
Relay 2	On/Off Set Point	Hand-Off-Auto Mode	20881
		Output Time Limit	20883
		Hand Time Limit	20885
		On Delay	20887
		Off Delay	20889

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Set Point	20891
		Dead Band	20893
Relay 2	Time Proportional	Hand-Off-Auto Mode	20881
		Output Time Limit	20883
		Hand Time Limit	20885
		Set Point	20891
		Proportional Band	20893
		Sample Period	20895
	Flow Based Control	Hand-Off-Auto Mode	20881
		Output Time Limit	20883
		Hand Time Limit	20885
		Unit Vol. to Trigger Output	20891
		Output OnTime Per Unit Volume	20893
	Activate With Another Relay	Hand-Off-Auto Mode	20881
		Output Time Limit	20883
		Hand Time Limit	20885
	Activate After Another Relay (%)	Hand-Off-Auto Mode	20881
		Output Time Limit	20883
		Hand Time Limit	20885
		% of Other Relay On-Time to Activate	20891
	Activate After Another Relay (Fixed Time)	Hand-Off-Auto Mode	20881
		Output Time Limit	20883
		Hand Time Limit	20885
		Fixed Time to Activate	20891
	Activate as % of Time	Hand-Off-Auto Mode	20881
		Output Time Limit	20883
		Hand Time Limit	20885

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		% of Period to Activate	20891
		Time Period	20893
Relay 2	24 Hour Timer	Hand-Off-Auto Mode	20881
		Hand Time Limit	20885
		Additions A-T On Time	20905-20943
	1 Week Timer	Hand-Off-Auto Mode	20881
		Hand Time Limit	20885
		Additions Day1-7 On Time	20905-20917
	2 Week Timer	Hand-Off-Auto Mode	20881
		Hand Time Limit	20885
		Additions Week1 Day1-7 On Time	20905-20917
		Additions Week2 Day1-7 On Time	20919-20931
	4 Week Timer	Hand-Off-Auto Mode	20881
		Hand Time Limit	20885
		Additions Week1 Day1-7 On Time	20905-20917
		Additions Week2 Day1-7 On Time	20919-20931
		Additions Week3 Day1-7 On Time	20933-20945
		Additions Week4 Day1-7 On Time	20947-20959
	Activate on a DI	Hand-Off-Auto Mode	20881
		Output Time Limit	20883
		Hand Time Limit	20885
		On Delay	20887
		Off Delay	20889
	Alarm	Hand-Off-Auto Mode	20881

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Output Time Limit	20883
		Hand Time Limit	20885
		On Delay	20887
		Power-up On Delay	20891
Relay 2	Flow Volume based on 2nd Flow Volume	Hand-Off-Auto Mode	20881
		Output Time Limit	20883
		Hand Time Limit	20885
		Controlled Volume per Input Volume	20891
		Input Volume to Trigger Control	20893
	Pulse Proportional	Hand-Off-Auto Mode	20881
		Output Time Limit	20883
		Hand Time Limit	20885
		Set Point	20891
		Proportional Band	20893
		Maximum Pump Speed	20895
		Minimum Pump Speed	20897
	Probe Wash	Hand-Off-Auto Mode	20881
		Hand Time Limit	20885
		Hold Time	20891
		Additions A-T On Time	20905-20943
	PID	Hand-Off-Auto Mode	20881
		Output Time Limit	20883
		Hand Time Limit	20885
		On Delay	20887
		Off Delay	20889
		Set Point	20891
		Proportional Gain	20893
		Integral Gain	20895

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Derivative Gain	20897
		Time Period	20899
Relay 2	Counter Based Control	Hand-Off-Auto Mode	20881
		Output Time Limit	20883
		Hand Time Limit	20885
		Counts to Trigger Output	20891
		Output On Time Per Counts	20893
	In Range/Out of Range	Hand-Off-Auto Mode	20881
		Output Time Limit	20883
		Hand Time Limit	20885
		On Delay	20887
		Off Delay	20889
		Low Set Point	20891
		Dead Band	20893
		High Set Point	20895
Relay 3	On/Off Set Point	Hand-Off-Auto Mode	20961
		Output Time Limit	20963
		Hand Time Limit	20965
		On Delay	20967
		Off Delay	20969
		Set Point	20971
		Dead Band	20973
	Time Proportional	Hand-Off-Auto Mode	20961
		Output Time Limit	20963
		Hand Time Limit	20965
		Set Point	20971
		Proportional Band	20973
		Sample Period	20975
	Flow Based Control	Hand-Off-Auto Mode	20961
		Output Time Limit	20963

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Hand Time Limit	20965
		Unit Vol. to Trigger Output	20971
		Output OnTime Per Unit Volume	20973
Relay 3	Activate With Another Relay	Hand-Off-Auto Mode	20961
		Output Time Limit	20963
		Hand Time Limit	20965
	Activate After Another Relay (%)	Hand-Off-Auto Mode	20961
		Output Time Limit	20963
		Hand Time Limit	20965
		% of Other Relay On-Time to Activate	20971
	Activate After Another Relay (Fixed Time)	Hand-Off-Auto Mode	20961
		Output Time Limit	20963
		Hand Time Limit	20965
		Fixed Time to Activate	20971
	Activate as % of Time	Hand-Off-Auto Mode	20961
		Output Time Limit	20963
		Hand Time Limit	20965
		% of Period to Activate	20971
		Time Period	20973
	24 Hour Timer	Hand-Off-Auto Mode	20961
		Hand Time Limit	20965
		Additions A-T On Time	20985-21023
	1 Week Timer	Hand-Off-Auto Mode	20961
		Hand Time Limit	20965
		Additions Day1-7 On Time	20985-20997

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
Relay 3	2 Week Timer	Hand-Off-Auto Mode	20961
		Hand Time Limit	20965
		Additions Week1 Day1-7 On Time	20985-20997
		Additions Week2 Day1-7 On Time	20999-21011
	4 Week Timer	Hand-Off-Auto Mode	20961
		Hand Time Limit	20965
		Additions Week1 Day1-7 On Time	20985-20997
		Additions Week2 Day1-7 On Time	20999-21011
		Additions Week3 Day1-7 On Time	21013-21025
		Additions Week4 Day1-7 On Time	21027-21039
	Activate on a DI	Hand-Off-Auto Mode	20961
		Output Time Limit	20963
		Hand Time Limit	20965
		On Delay	20967
		Off Delay	20969
	Alarm	Hand-Off-Auto Mode	20961
		Output Time Limit	20963
		Hand Time Limit	20965
		On Delay	20967
		Power-up On Delay	20971
	Flow Volume based on 2nd Flow Volume	Hand-Off-Auto Mode	20961
		Output Time Limit	20963
		Hand Time Limit	20965
		Controlled Volume per Input Volume	20971

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Input Volume to Trigger Control	20973
Relay 3	Pulse Proportional	Hand-Off-Auto Mode	20961
		Output Time Limit	20963
		Hand Time Limit	20965
		Set Point	20971
		Proportional Band	20973
		Maximum Pump Speed	20975
		Minimum Pump Speed	20977
	Probe Wash	Hand-Off-Auto Mode	20961
		Hand Time Limit	20965
		Hold Time	20971
		Additions A-T On Time	20985-21023
	PID	Hand-Off-Auto Mode	20961
		Output Time Limit	20963
		Hand Time Limit	20965
		On Delay	20967
		Off Delay	20969
		Set Point	20971
		Proportional Gain	20973
		Integral Gain	20975
		Derivative Gain	20977
		Time Period	20979
	Counter Based Control	Hand-Off-Auto Mode	20961
		Output Time Limit	20963
		Hand Time Limit	20965
		Counts to Trigger Output	20971
		Output On Time Per Counts	20973
	In Range/Out of Range	Hand-Off-Auto Mode	20961
		Output Time Limit	20963

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Hand Time Limit	20965
		On Delay	20967
		Off Delay	20969
		Low Set Point	20971
		Dead Band	20973
		High Set Point	20975
Relay 4	On/Off Set Point	Hand-Off-Auto Mode	21041
		Output Time Limit	21043
		Hand Time Limit	21045
		On Delay	21047
		Off Delay	21049
		Set Point	21051
		Dead Band	21053
	Time Proportional	Hand-Off-Auto Mode	21041
		Output Time Limit	21043
		Hand Time Limit	21045
		Set Point	21051
		Proportional Band	21053
		Sample Period	21055
	Flow Based Control	Hand-Off-Auto Mode	21041
		Output Time Limit	21043
		Hand Time Limit	21045
		Unit Vol. to Trigger Output	21051
		Output OnTime Per Unit Volume	21053
	Activate With Another Relay	Hand-Off-Auto Mode	21041
		Output Time Limit	21043
		Hand Time Limit	21045
	Activate After Another Relay (%)	Hand-Off-Auto Mode	21041

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Output Time Limit	21043
		Hand Time Limit	21045
		% of Other Relay On-Time to Activate	21051
Relay 4	Activate After Another Relay (Fixed Time)	Hand-Off-Auto Mode	21041
		Output Time Limit	21043
		Hand Time Limit	21045
		Fixed Time to Activate	21051
	Activate as % of Time	Hand-Off-Auto Mode	21041
		Output Time Limit	21043
		Hand Time Limit	21045
		% of Period to Activate	21051
		Time Period	21053
	24 Hour Timer	Hand-Off-Auto Mode	21041
		Hand Time Limit	21045
		Additions A-T On Time	21065-21103
	1 Week Timer	Hand-Off-Auto Mode	21041
		Hand Time Limit	21045
		Additions Day1-7 On Time	21065-21077
	2 Week Timer	Hand-Off-Auto Mode	21041
		Hand Time Limit	21045
		Additions Week1 Day1-7 On Time	21065-21077
		Additions Week2 Day1-7 On Time	21079-21091
	4 Week Timer	Hand-Off-Auto Mode	21041
		Hand Time Limit	21045
		Additions Week1 Day1-7 On Time	21065-21077

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Additions Week2 Day1-7 On Time	21079-21091
		Additions Week3 Day1-7 On Time	21093-21105
		Additions Week4 Day1-7 On Time	21107-21119
Relay 4	Activate on a DI	Hand-Off-Auto Mode	21041
		Output Time Limit	21043
		Hand Time Limit	21045
		On Delay	21047
		Off Delay	21049
	Alarm	Hand-Off-Auto Mode	21041
		Output Time Limit	21043
		Hand Time Limit	21045
		On Delay	21047
		Power-up On Delay	21051
	Flow Volume based on 2nd Flow Volume	Hand-Off-Auto Mode	21041
		Output Time Limit	21043
		Hand Time Limit	21045
		Controlled Volume per Input Volume	21051
		Input Volume to Trigger Control	21053
	Pulse Proportional	Hand-Off-Auto Mode	21041
		Output Time Limit	21043
		Hand Time Limit	21045
		Set Point	21051
		Proportional Band	21053
		Maximum Pump Speed	21055
		Minimum Pump Speed	21057
	Probe Wash	Hand-Off-Auto Mode	21041
		Hand Time Limit	21045

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Hold Time	21051
		Additions A-T On Time	21065-21103
Relay 4	PID	Hand-Off-Auto Mode	21041
		Output Time Limit	21043
		Hand Time Limit	21045
		On Delay	21047
		Off Delay	21049
		Set Point	21051
		Proportional Gain	21053
		Integral Gain	21055
		Derivative Gain	21057
		Time Period	21059
	Counter Based Control	Hand-Off-Auto Mode	21041
		Output Time Limit	21043
		Hand Time Limit	21045
		Counts to Trigger Output	21051
		Output On Time Per Counts	21053
	In Range/Out of Range	Hand-Off-Auto Mode	21041
		Output Time Limit	21043
		Hand Time Limit	21045
		On Delay	21047
		Off Delay	21049
		Low Set Point	21051
		Dead Band	21053
		High Set Point	21055
Relay 5	On/Off Set Point	Hand-Off-Auto Mode	21121
		Output Time Limit	21123
		Hand Time Limit	21125
		On Delay	21127

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Off Delay	21129
		Set Point	21131
		Dead Band	21133
Relay 5	Time Proportional	Hand-Off-Auto Mode	21121
		Output Time Limit	21123
		Hand Time Limit	21125
		Set Point	21131
		Proportional Band	21133
		Sample Period	21135
	Flow Based Control	Hand-Off-Auto Mode	21121
		Output Time Limit	21123
		Hand Time Limit	21125
		Unit Vol. to Trigger Output	21131
		Output OnTime Per Unit Volume	21133
	Activate With Another Relay	Hand-Off-Auto Mode	21121
		Output Time Limit	21123
		Hand Time Limit	21125
	Activate After Another Relay (%)	Hand-Off-Auto Mode	21121
		Output Time Limit	21123
		Hand Time Limit	21125
		% of Other Relay On-Time to Activate	21131
	Activate After Another Relay (Fixed Time)	Hand-Off-Auto Mode	21121
		Output Time Limit	21123
		Hand Time Limit	21125
		Fixed Time to Activate	21131
	Activate as % of Time	Hand-Off-Auto Mode	21121
		Output Time Limit	21123

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Hand Time Limit	21125
		% of Period to Activate	21131
		Time Period	21133
Relay 5	24 Hour Timer	Hand-Off-Auto Mode	21121
		Hand Time Limit	21125
		Additions A-T On Time	21145-21183
	1 Week Timer	Hand-Off-Auto Mode	21121
		Hand Time Limit	21125
		Additions Day1-7 On Time	21145-21157
	2 Week Timer	Hand-Off-Auto Mode	21121
		Hand Time Limit	21125
		Additions Week1 Day1-7 On Time	21145-21157
		Additions Week2 Day1-7 On Time	21159-21171
	4 Week Timer	Hand-Off-Auto Mode	21121
		Hand Time Limit	21125
		Additions Week1 Day1-7 On Time	21145-21157
		Additions Week2 Day1-7 On Time	21159-21171
		Additions Week3 Day1-7 On Time	21173-21185
		Additions Week4 Day1-7 On Time	21187-21199
	Activate on a DI	Hand-Off-Auto Mode	21121
		Output Time Limit	21123
		Hand Time Limit	21125
		On Delay	21127
		Off Delay	21129

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
Relay 5	Alarm	Hand-Off-Auto Mode	21121
		Output Time Limit	21123
		Hand Time Limit	21125
		On Delay	21127
		Power-up On Delay	21131
	Flow Volume based on 2nd Flow Volume	Hand-Off-Auto Mode	21121
		Output Time Limit	21123
		Hand Time Limit	21125
		Controlled Volume per Input Volume	21131
		Input Volume to Trigger Control	21133
	Pulse Proportional	Hand-Off-Auto Mode	21121
		Output Time Limit	21123
		Hand Time Limit	21125
		Set Point	21131
		Proportional Band	21133
		Maximum Pump Speed	21135
		Minimum Pump Speed	21137
	Probe Wash	Hand-Off-Auto Mode	21121
		Hand Time Limit	21125
		Hold Time	21131
		Additions A-T On Time	21145-21183
	PID	Hand-Off-Auto Mode	21121
		Output Time Limit	21123
		Hand Time Limit	21125
		On Delay	21127
		Off Delay	21129
		Set Point	21131
		Proportional Gain	21133

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Integral Gain	21135
		Derivative Gain	21137
		Time Period	21139
Relay 5	Counter Based Control	Hand-Off-Auto Mode	21121
		Output Time Limit	21123
		Hand Time Limit	21125
		Counts to Trigger Output	21131
		Output On Time Per Counts	21135
	In Range/Out of Range	Hand-Off-Auto Mode	21121
		Output Time Limit	21123
		Hand Time Limit	21125
		On Delay	21127
		Off Delay	21129
		Low Set Point	21131
		Dead Band	21133
		High Set Point	21135
Relay 6	On/Off Set Point	Hand-Off-Auto Mode	21201
		Output Time Limit	21203
		Hand Time Limit	21205
		On Delay	21207
		Off Delay	21209
		Set Point	21211
		Dead Band	21213
	Time Proportional	Hand-Off-Auto Mode	21201
		Output Time Limit	21203
		Hand Time Limit	21205
		Set Point	21211
		Proportional Band	21213
		Sample Period	21215
	Flow Based Control	Hand-Off-Auto Mode	21201

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Output Time Limit	21203
		Hand Time Limit	21205
		Unit Vol. to Trigger Output	21211
		Output OnTime Per Unit Volume	21213
Relay 6	Activate With Another Relay	Hand-Off-Auto Mode	21201
		Output Time Limit	21203
		Hand Time Limit	21205
	Activate After Another Relay (%)	Hand-Off-Auto Mode	21201
		Output Time Limit	21203
		Hand Time Limit	21205
		% of Other Relay On-Time to Activate	
	Activate After Another Relay (Fixed Time)	Hand-Off-Auto Mode	21201
		Output Time Limit	21203
		Hand Time Limit	21205
		Fixed Time to Activate	21211
	Activate as % of Time	Hand-Off-Auto Mode	21201
		Output Time Limit	21203
		Hand Time Limit	21205
		% of Period to Activate	21211
		Time Period	21213
	24 Hour Timer	Hand-Off-Auto Mode	21201
		Hand Time Limit	21205
		Additions A-T On Time	21225-21263
	1 Week Timer	Hand-Off-Auto Mode	21201
		Hand Time Limit	21205

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Additions Day1-7 On Time	21225-21237
Relay 6	2 Week Timer	Hand-Off-Auto Mode	21201
		Hand Time Limit	21205
		Additions Week1 Day1-7 On Time	21225-21237
		Additions Week2 Day1-7 On Time	21239-21251
	4 Week Timer	Hand-Off-Auto Mode	21201
		Hand Time Limit	21205
		Additions Week1 Day1-7 On Time	21225-21237
		Additions Week2 Day1-7 On Time	21239-21251
		Additions Week3 Day1-7 On Time	21253-21265
		Additions Week4 Day1-7 On Time	21267-21279
	Activate on a DI	Hand-Off-Auto Mode	21201
		Output Time Limit	21203
		Hand Time Limit	21205
		On Delay	21207
		Off Delay	21209
	Alarm	Hand-Off-Auto Mode	21201
		Output Time Limit	21203
		Hand Time Limit	21205
		On Delay	21207
		Power-up On Delay	21211
	Flow Volume based on 2nd Flow Volume	Hand-Off-Auto Mode	21201
		Output Time Limit	21203
		Hand Time Limit	21205

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Controlled Volume per Input Volume	21211
		Input Volume to Trigger Control	21213
Relay 6	Pulse Proportional	Hand-Off-Auto Mode	21201
		Output Time Limit	21203
		Hand Time Limit	21205
		Set Point	21211
		Proportional Band	21213
		Maximum Pump Speed	21215
		Minimum Pump Speed	21217
	Probe Wash	Hand-Off-Auto Mode	21201
		Hand Time Limit	21205
		Hold Time	21211
		Additions A-T On Time	21223-21263
	PID	Hand-Off-Auto Mode	21201
		Output Time Limit	21203
		Hand Time Limit	21205
		On Delay	21207
		Off Delay	21209
		Set Point	21211
		Proportional Gain	21213
		Integral Gain	21215
		Derivative Gain	21217
		Time Period	21219
	Counter Based Control	Hand-Off-Auto Mode	21201
		Output Time Limit	21203
		Hand Time Limit	21205
		Counts to Trigger Output	21211
		Output On Time Per Counts	21213
	In Range/Out of Range	Hand-Off-Auto Mode	21201

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Output Time Limit	21203
		Hand Time Limit	21205
		On Delay	21207
		Off Delay	21209
		Low Set Point	21211
		Dead Band	21213
		High Set Point	21215
Relay 7	On/Off Set Point	Hand-Off-Auto Mode	21281
		Output Time Limit	21283
		Hand Time Limit	21285
		On Delay	21287
		Off Delay	21289
		Set Point	21291
		Dead Band	21293
	Time Proportional	Hand-Off-Auto Mode	21281
		Output Time Limit	21283
		Hand Time Limit	21285
		Set Point	21291
		Proportional Band	21293
		Sample Period	21295
	Flow Based Control	Hand-Off-Auto Mode	21281
		Output Time Limit	21283
		Hand Time Limit	21285
		Unit Vol. to Trigger Output	21291
		Output OnTime Per Unit Volume	21293
	Activate With Another Relay	Hand-Off-Auto Mode	21281
		Output Time Limit	21283
		Hand Time Limit	21285

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
Relay 7	Activate After Another Relay (%)	Hand-Off-Auto Mode	21281
		Output Time Limit	21283
		Hand Time Limit	21285
		% of Other Relay On-Time to Activate	21291
	Activate After Another Relay (Fixed Time)	Hand-Off-Auto Mode	21281
		Output Time Limit	21283
		Hand Time Limit	21285
		Fixed Time to Activate	21291
	Activate as % of Time	Hand-Off-Auto Mode	21281
		Output Time Limit	21283
		Hand Time Limit	21285
		% of Period to Activate	21291
		Time Period	21293
	24 Hour Timer	Hand-Off-Auto Mode	21281
		Hand Time Limit	21285
		Additions A-T On Time	21305-21343
	1 Week Timer	Hand-Off-Auto Mode	21281
		Hand Time Limit	21285
		Additions Day1-7 On Time	21305-21317
	2 Week Timer	Hand-Off-Auto Mode	21281
		Hand Time Limit	21285
		Additions Week1 Day1-7 On Time	21305-21317
		Additions Week2 Day1-7 On Time	21319-21331
	4 Week Timer	Hand-Off-Auto Mode	21281
		Hand Time Limit	21285

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Additions Week1 Day1-7 On Time	21305-21317
		Additions Week2 Day1-7 On Time	21319-21331
		Additions Week3 Day1-7 On Time	21333-21345
		Additions Week4 Day1-7 On Time	21347-21359
Relay 7	Activate on a DI	Hand-Off-Auto Mode	21281
		Output Time Limit	21283
		Hand Time Limit	21285
		On Delay	21287
		Off Delay	21289
	Alarm	Hand-Off-Auto Mode	21281
		Output Time Limit	21283
		Hand Time Limit	21285
		On Delay	21287
		Power-up On Delay	21291
	Flow Volume based on 2nd Flow Volume	Hand-Off-Auto Mode	21281
		Output Time Limit	21283
		Hand Time Limit	21285
		Controlled Volume per Input Volume	21291
		Input Volume to Trigger Control	21293
	Pulse Proportional	Hand-Off-Auto Mode	21281
		Output Time Limit	21283
		Hand Time Limit	21285
		Set Point	21291
		Proportional Band	21293
		Maximum Pump Speed	21295
		Minimum Pump Speed	21297

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
Relay 7	Probe Wash	Hand-Off-Auto Mode	21281
		Hand Time Limit	21285
		Hold Time	21291
		Additions A-T On Time	21305-21343
	PID	Hand-Off-Auto Mode	21281
		Output Time Limit	21283
		Hand Time Limit	21285
		On Delay	21287
		Off Delay	21289
		Set Point	21291
		Proportional Gain	21293
		Integral Gain	21295
		Derivative Gain	21297
		Time Period	21299
	Counter Based Control	Hand-Off-Auto Mode	21281
		Output Time Limit	21283
		Hand Time Limit	21285
		Counts to Trigger Output	21291
		Output On Time Per Counts	21293
	In Range/Out of Range	Hand-Off-Auto Mode	21281
		Output Time Limit	21283
		Hand Time Limit	21285
		On Delay	21287
		Off Delay	21289
		Low Set Point	21291
		Dead Band	21293
		High Set Point	21295
Relay 8	On/Off Set Point	Hand-Off-Auto Mode	21361
		Output Time Limit	21363

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Hand Time Limit	21365
		On Delay	21367
		Off Delay	21369
		Set Point	21371
		Dead Band	21373
Relay 8	Time Proportional	Hand-Off-Auto Mode	21361
		Output Time Limit	21363
		Hand Time Limit	21365
		Set Point	21371
		Proportional Band	21373
		Sample Period	21375
	Flow Based Control	Hand-Off-Auto Mode	21361
		Output Time Limit	21363
		Hand Time Limit	21365
		Unit Vol. to Trigger Output	21371
		Output OnTime Per Unit Volume	21373
	Activate With Another Relay	Hand-Off-Auto Mode	21361
		Output Time Limit	21363
		Hand Time Limit	21365
	Activate After Another Relay (%)	Hand-Off-Auto Mode	21361
		Output Time Limit	21363
		Hand Time Limit	21365
		% of Other Relay On-Time to Activate	21371
	Activate After Another Relay (Fixed Time)	Hand-Off-Auto Mode	21361
		Output Time Limit	21363
		Hand Time Limit	21365
		Fixed Time to Activate	21371

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
Relay 8	Activate as % of Time	Hand-Off-Auto Mode	21361
		Output Time Limit	21363
		Hand Time Limit	21365
		% of Period to Activate	21371
		Time Period	21373
	24 Hour Timer	Hand-Off-Auto Mode	21361
		Hand Time Limit	21365
		Additions A-T On Time	21385-21423
	1 Week Timer	Hand-Off-Auto Mode	21361
		Hand Time Limit	21365
		Additions Day1-7 On Time	21385-21397
	2 Week Timer	Hand-Off-Auto Mode	21361
		Hand Time Limit	21365
		Additions Week1 Day1-7 On Time	21385-21397
		Additions Week2 Day1-7 On Time	21399-21411
	4 Week Timer	Hand-Off-Auto Mode	21361
		Hand Time Limit	21365
		Additions Week1 Day1-7 On Time	21385-21397
		Additions Week2 Day1-7 On Time	21399-21411
		Additions Week3 Day1-7 On Time	21413-21425
		Additions Week4 Day1-7 On Time	21427-21439
	Activate on a DI	Hand-Off-Auto Mode	21361
		Output Time Limit	21363
		Hand Time Limit	21365

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		On Delay	21367
		Off Delay	21369
Relay 8	Alarm	Hand-Off-Auto Mode	21361
		Output Time Limit	21363
		Hand Time Limit	21365
		On Delay	21367
		Power-up On Delay	21371
	Flow Volume based on 2nd Flow Volume	Hand-Off-Auto Mode	21361
		Output Time Limit	21363
		Hand Time Limit	21365
		Controlled Volume per Input Volume	21371
		Input Volume to Trigger Control	21373
	Pulse Proportional	Hand-Off-Auto Mode	21361
		Output Time Limit	21363
		Hand Time Limit	21365
		Set Point	21371
		Proportional Band	21373
		Maximum Pump Speed	21375
		Minimum Pump Speed	21377
	Probe Wash	Hand-Off-Auto Mode	21361
		Hand Time Limit	21365
		Hold Time	21371
		Additions A-T On Time	21385-21423
	PID	Hand-Off-Auto Mode	21361
		Output Time Limit	21363
		Hand Time Limit	21365
		On Delay	21367
		Off Delay	21369

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Set Point	21371
		Proportional Gain	21373
		Integral Gain	21375
		Derivative Gain	21377
		Time Period	21379
Relay 8	Counter Based Control	Hand-Off-Auto Mode	21361
		Output Time Limit	21363
		Hand Time Limit	21365
		Counts to Trigger Output	21371
		Output On Time Per Counts	21373
	In Range/Out of Range	Hand-Off-Auto Mode	21361
		Output Time Limit	21363
		Hand Time Limit	21365
		On Delay	21367
		Off Delay	21369
		Low Set Point	21371
		Dead Band	21373
		High Set Point	21375
Analog Output 1	Retransmit	4 mA =	21773
		20 mA =	21775
	Proportional Control	Output Time Limit	21761
		Hand Time Limit	21763
		Hand-Off-Auto Mode	21765
		Input fault Value	21767
		Interlock Value	21769
		HAND value	21771
		Set Point	21773
		Minimum Output Allowed	21775
		Maximum Output Allowed	21777

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Input value when output is Max	21779
Analog Output 1	PID	Output Time Limit	21761
		Hand Time Limit	21763
		Hand-Off-Auto Mode	21765
		Input fault Value	21767
		Interlock Value	21769
		HAND value	21771
		Set Point	21773
		Proportional Gain	21775
		Integral Gain	21777
		Derivative Gain	21779
		Time Period	21781
Analog Output 2	Retransmit	4 mA =	21813
		20 mA =	21815
	Proportional Control	Output Time Limit	21801
		Hand Time Limit	21803
		Hand-Off-Auto Mode	21805
		Input fault Value	21807
		Interlock Value	21809
		HAND value	21811
		Set Point	21813
		Minimum Output Allowed	21815
		Maximum Output Allowed	21817
		Input value when output is Max	21819
	PID	Output Time Limit	21801
		Hand Time Limit	21803
		Hand-Off-Auto Mode	21805
		Input fault Value	21807
		Interlock Value	21809

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		HAND value	21811
		Set Point	21813
		Proportional Gain	21815
		Integral Gain	21817
		Derivative Gain	21819
		Time Period	21821
Analog Output 3	Retransmit	4 mA =	21853
		20 mA =	21855
	Proportional Control	Output Time Limit	21841
		Hand Time Limit	21843
		Hand-Off-Auto Mode	21845
		Input fault Value	21847
		Interlock Value	21849
		HAND value	21851
		Set Point	21853
		Minimum Output Allowed	21855
		Maximum Output Allowed	21857
		Input value when output is Max	21859
	PID	Output Time Limit	21841
		Hand Time Limit	21843
		Hand-Off-Auto Mode	21845
		Input fault Value	21847
		Interlock Value	21849
		HAND value	21851
		Set Point	21853
		Proportional Gain	21855
		Integral Gain	21857
		Derivative Gain	21859
		Time Period	21861

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
Analog Output 4	Retransmit	4 mA =	21893
		20 mA =	21895
	Proportional Control	Output Time Limit	21891
		Hand Time Limit	21883
		Hand-Off-Auto Mode	21885
		Input fault Value	21887
		Interlock Value	21889
		HAND value	21891
		Set Point	21893
		Minimum Output Allowed	21895
		Maximum Output Allowed	21897
		Input value when output is Max	21899
	PID	Output Time Limit	21881
		Hand Time Limit	21883
		Hand-Off-Auto Mode	21885
		Input fault Value	21887
		Interlock Value	21889
		HAND value	21891
		Set Point	21893
		Proportional Gain	21895
		Integral Gain	21897
		Derivative Gain	21899
		Time Period	21901
LSI/RSI Index 1		Conductivity	22081
		Temperature	22083
		Calcium Hardness	22085
		Total Alkalinity	22087
LSI/RSI Index 2		Conductivity	22091

I/O Type& Hardware Channel	Configured As	Available Set Points	Address
		Temperature	22093
		Calcium Hardness	22095
		Total Alkalinity	22097