5 YEAR WARRANTY

OMEGA®

User's Guide

PLATINUM™ Series

CN32Pt, CN16Pt, CN16DPt, CN8Pt, CN8DPt, CN8EPt

DP32Pt, DP16Pt, DP8Pt, DP8EPt

Modbus Interface

OMEGA®

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1 Introduction

1.1 Purpose

The following document defines the Modbus protocol support and register mapping used by the Platinum product family.

The Modbus interface is available on all communication channels and support is provided for MODBUS/ASCII, MODBUS/RTU and MODBUS/TCP/IP transactions.

1.2 Definition of Terms and Acronyms

I2C	2-wire serial interface	**ADC**	Analog to Digital Converter
Base Device	Device connected to slave device	**DAC**	Digital to Analog Converter
Smart Input	Device supporting 1 or more Input sensors	**RS485**	Electrical signals used for serial communications
Smart Output	Device supporting 1 or more Output Elements	**RS232**	Electrical signals used for serial communications
Sensor Element	One of the physical sensing elements on a Smart Output	**CSV**	Comma Separated Values
AC	Alternating Current	**COTS**	Commercially-Off-The-Shelf
DC	Direct Current	**ESD**	Electro Static Discharge
CS	Chip Select	**FW**	Firmware
RS232	Electrical signals used for serial communications	**HW**	Hardware
CSV	Comma Separated Values	**I/O**	Input/output
COTS	Commercially-Off-The-Shelf	**LED**	Light Emitting Diode
ESD	Electro Static Discharge	**Hexadecimal**	Values expressed using base 16 (2^4)

1.3 Supporting Documents

Doc. #	Name / Description
M5457	Platinum Load and Save File Format
	Platinum Ramp and Soak Processing
	MODBUS APPLICATION PROTOCOL SPECIFICATION

2 Modbus Interface

The Modbus interface is fully described in MODBUS APPLICATION PROTOCOL SPECIFICATION (V1.1b3).

The Modbus specification allows accessing to up 65535 internal 'holding' registers using register READ, register WRITE and WRITE MULTIPLE commands. Each Modbus holding register is defined as a 16 bit entity structured as BIG ENDIAN values (most significant byte always presented first).

The Platinum Modbus interface provides access to the internal database of the Platinum product family by internally mapping Modbus holding registers to specific database items.

Modbus is structured using a MASTER-SLAVE topology, in which there is one MASTER device and up to 255 slave devices. All transactions are initiated by the MASTER device.

Modbus slave devices are individually accessed using a one byte SLAVE address. The MASTER device initiates a transaction by sending a request packet to a specific slave. The SLAVE device processes the transaction and returns either response packet indicating success or failure.

Address 0 is reserved as a 'broadcast' address, in which all slave devices will accept and process the transaction but will not send a response.

2.1 Modbus Functions

The Platinum Modbus interface supports the following Modbus FUNCTION requests.

Function Code	Mnemonic	Description
0x03	Read Holding Register	Reads one or more consecutive 16 bit holding registers
0x06	Write Single Register	Writes a specific 16 bit holding register
0x07	Read Exception status	Reads structured status information
0x08	Diagnostic	Read/Write diagnostic information
0x10	Write Multiple Registers	Write one or more consecutive 16 bit holding registers
0x0b	Get Comm events	Read communication event counters

2.2 Data Formats

Modbus holding registers are represented as 16 bit entities. The following encoding is used for extended data items. Note that 'byte 0' will be the first byte received/transmitted.

For data types that can be represented in 16 bit (Boolean, byte, char, int16 and uint16) a single register is used.

For data types that require 32 bits two consecutive registers are used. The lower number register will represent the most significant data. The 2nd register represents the leas significant data.

2.2.1 Multiple Register Reads

When reading a dual register entity the lower order register should be used as the requested 'holding register', with a request for a minimum of 2 registers. Internally the entire entity is read and data is then built into a response packet.

The access can be split into 2 consecutive single register reads. When the lower (base) register is accessed the entire 32 bit entity is read and the two most significant bytes are returned. The following single register read must specify the next consecutive register address. The two least significant bytes of the internally buffered data used in the response.

Attempts to access the two least significant bytes without first reading the two most significant bytes will result in an error response.

2.2.2 Multiple Register Writes

When writing a dual register entity the lower order register should be used as the requested 'holding register', with a request for minimum of 2 registers. The write data is internally buffered and transferred to the database entry as a 32 bit value.

The access can be split into 2 consecutive single register writes. When the lower (base) register is written the 16 bit entity is internally buffered BUT NO DATA TRANSFER IS MADE TO THE DATABASE. The following single register write must specify the next consecutive register address. The two least significant bytes of the write request are combined with the previous write data and the entire 32 bit entity is written to the database.

Attempts to write the two least significant bytes without first writing the two most significant bytes will result in an error response.

Data Types	Number of Registers	Byte				Description
		0	1	2	3	
Boolean	1	--	LSB	N/A		Zero = OFF, non-zero = ON
Byte, Char	1	--	LSB			Entity contained in LSB of register, Byte 0 ignored.
Int16, uint16	1	MSB	LSB			Entity contained in MSB/LSB of register.
		0	1	2	3	(dual register data)
Int32, uint32	2	MSB	B-1	B-2	LSB	Requires 2 consecutive registers, MSB transferred first
float	2	Sign+Exp	Mantisa MSB	B-1	Mantisa LSB	IEEE formatted value contained in 2 consecutive register

2.2.3 Request Packet Sizes

Multiple consecutive registers may be accessed in a single transaction.

The Platinum Modbus interface imposes a maximum of 64 bytes for the total transaction. Allowing for the required framing, addressing and integrity checks results in the following data size restrictions using the READ and WRITE MULTIPLE functions.

Format	Protocol Overhead	Maximum Read data	Maximum Write data
ASCII	16	12 Registers	12 Registers
RTU	8	23 Registers	23 Registers
TCP/IP	8	23 Registers	23 Registers

2.2.4 Modbus USB Support

The Modbus specification supports RS232 and RS485 serial data. For ASCII formatted packets a USB virtual comm channel provides full support since the framing information is specified by unique characters (SOF = ':', EOF = CR/LF).

For RTU formatted packets the Modbus requires specific inter-frame character timing to determine the framing of each transaction. This information is not available using a generic virtual comm channel across USB, which will typically collect 'serial' data into 64 byte packets for transmission, as determined by the USB end-point buffer size. The USB Modbus RTU interface relies on the USB channel collecting data into 64 byte packets.

3 Platinum Modbus Register Assignments

All accesses to the Platinum database information is made thru the following Modbus registers.

Mnemonic entries marked with '*' are identical to those used by the Platinum LOAD and SAVE file formats.

Mnemonic entries marked with '**' are identical to those used by the Platinum LOAD and SAVE file formats but are referenced in LOAD and FILE data are made using Meta characters (%).

Data types are:

R – Single 16 bit register (may be Boolean, byte, char, and int16 or uint16 data)

L – Dual (32 bit) register (may be int32 or uint32 data)

F – IEEE Floating point value

All data is transferred using Big Endian formatting, where the most significant byte is transmitted first.

3.1 Non Volatile Memory Accesses

The NV column indicates volatility. A 'R" indicates the parameter is 'Read Only.' An 'NV' indicates a non-volatile parameter which should be only written during configuration. Modbus traffic should allow a minimum of 500 msec following a write to non-volatile memory. Standard memory accesses should be limited to 10 transactions / second.

Index		Mnemonic	NV	Type	Description
512	0x0200	DEVICE_ID**	R	L	Device Identifier
514	0x0202	VERSION_NUMBER**	R	L	Version Number
516	0x0204	SYSTEM_STATUS	R	L	Enumerated Status information
518	0x0206	BOOT_LOADER_VERSION	R	L	Boot Loader Version
520	0x0208	HARDWARE_VERSION	R	L	Hardware Version
522	0x020a	SMART OUTPUT VERSION	R	L	Smart Output Module Version
524	0x020c	ISOLATED OUTPUT VERSION	R	L	Isolated Output Module Version
528	0x0210	CURRENT_INPUT_VALUE	R	F	Primary Input Scaled value
530	0x0212	REMOTE_SENSOR_VALUE		F	Internal Use Only
532	0x0214	REMOTE_SETPOINT_VALUE	RW	F	
534	0x0216	SMART SENSOR VALUE	R	F	Currently selected Smart Sensor value
542	0x021e	INPUT_DIGITAL	R	R	State of digital input pin
544	0x0220	CURRENT_SETPOINT_1	RW	F	Current value of Setpoint 1
546	0x0222	CURRENT_SETPOINT_2	RW	F	Current value of Setpoint 2
548	0x0224	CONTROL_SETPOINT	RW	F	Setpoint used in PID calculations
550	0x0226	PEAK_VALUE	RW	F	Maximum Value processed

Index		Mnemonic	NV	Type	Description
552	0x0228	VALLEY_VALUE	RW	F	Minimum Value processed
554	0x022a	PID_OUTPUT	R	F	PID Output level (0.100%)
556	0x022c	CURRENT_INPUT_VALID	R	R	Flag indicating process value is valid
557	0x022d	ALARM_STATE	R	R	
558	0x022e	RAMP_SOAK_STATE	R	R	Enumerated value - R&S state
560	0x0230	OUTPUT_1_STATE	R	R	State of Output (0/1)
561	0x0231	OUTPUT_2_STATE	R	R	State of Output (0/1)
562	0x0232	OUTPUT_3_STATE	R	R	State of Output (0/1)
563	0x0233	OUTPUT_4_STATE	R	R	State of Output (0/1)
564	0x0234	OUTPUT_5_STATE	R	R	State of Output (0/1)
565	0x0235	OUTPUT_6_STATE	R	R	State of Output (0/1)
566	0x0236	OUTPUT_7_STATE	R	R	State of Output (0/1)
567	0x0237	OUTPUT_8_STATE	R	R	State of Output (0/1)
Control Functions					
576	0x0240	RUN_MODE	RW	R	Enumerated value – system running state
577	0x0241	FACTORY_RESET	W	R	Write 1 to force reset to factory defaults
578	0x0242	LATCH_RESET	W	R	Write 1 to reset latched alarms
579	0x0243	PID_AUTOTUNE_START	W	R	Write 1 to force Autotuning to start
580	0x0244	PID_AUTOTUNE_DONE	R	R	Internal use only
581	0x0245	PROCESS_SCALE_ENABLE	RW	R	Enables Scaling on Process values (LIVE/MANUAL)
582	0x0246	TARE_RESET	W	R	Write 1 to force TARE
Display Functions					
584	0x0248	READING_DECIMAL_POSITION*	NV	R	Enumerated value – number of decimal points
585	0x0249	DISPLAY_UNITS*	NV	R	Enumerated value – units of measure
586	0x024a	DISPLAY_COLOR_NORMAL*	NV	R	Enumerated value to set display color
587	0x024b	DISPLAY_BRIGHTNESS*	NV	R	Enumerated value to set display brightness
588	0x024c	TIME_FORMAT*	NV	R	Enumerated value to indicate time format
589	0x024d	DISPLAY_ALARM_CONTROL		R	
590	0x024e	DISPLAY ROUNDING	NV	F	Determines display rounding
User Calibration					
592	0x0250	TCAL_TYPE*	NV	R	Enumerated value indicating type of TCAL
593	0x0251	SET_ICE_POINT	NV	R	Write 1 to set ICE POINT offset
594	0x0252	SET_TCAL_1_POINT	NV	R	Write 1 to set 1 point Cal. offset

Index		Mnemonic	NV	Type	Description
595	0x0253	SET_TCAL_2_POINT_LOW	NV	R	Write 1 to set 2 point Cal. LOW point
596	0x0254	SET_TCAL_2_POINT_HIGH	NV	R	Write 1 to set 2 point Cal. HIGH point
600	0x0258	TCAL_ICE_POINT_OFFSET*	NV	F	Stored ICE POINT offset
602	0x025a	TCAL_1_POINT_OFFSET*	NV	F	Stored 1 point CAL offset
604	0x025c	TCAL_2_POINT_OFFSET*	NV	F	Stored 2 point CAL offset
606	0x025e	TCAL_2_POINT_GAIN*	NV	F	Stored 2 point CAL gain
Ramp & Soak (Sequencer)					
608	0x0260	RAMP_SOAK_MODE*	NV	R	Enumerated – Ramp and Soak mode
609	0x0261	RAMP_SOAK_PROFILE_SELECT*	RW	R	Starting Profile for Ramp and Soak
610	0x0262	CURRENT_PROFILE	RW	R	Use to select R&S profile to access
611	0x0263	CURRENT_SEGMENT	RW	R	Use to select profile segment to access
Ramp & Soak – Profile Specific					
612	0x0264	SEGMENTS_PER_PROFILE*	NV	R	Number of segments in current profile
613	0x0265	SOAK_ACTION*	NV	R	Enumerated – Soak Action
614	0x0266	SOAK_LINK*	NV	R	Profile to link to after current profile
615	0x0267	TRACKING_TYPE*	NV	R	Enumerated – R&S tracking type
Ramp & Soak – Segment Specific					
616	0x0268	RAMP_EVENT*	NV	R	RE.ON flag set for current segment
617	0x0269	SOAK_EVENT*	NV	R	SE.ON flag set for current segment
618	0x026a	SOAK_PROCESS_VALUE*	NV	F	Target SOAK setpoint for current segment
620	0x026c	RAMP_TIME*	NV	L	Time (msec) to reach target SOAK setpoint
622	0x026e	SOAK_TIME*	NV	L	Time (msec) to hold at SOAK setpoint
Ramp & Soak - Running Status					
624	0x0270	CONTROL_SETPOINT	RW	F	Setpoint used for PID/Control functions
626	0x0272	RAMP_SOAK_REMAINING_TIME	R	L	Ramp or Soak time remaining
628	0x0274	RAMP_SOAK_STATE	R	R	Enumerated – R&S flags
Input Type/Configuration					
640	0x0280	CURRENT_INPUT_VALUE	R	F	Current Process value
642	0x0282	INPUT_SENSOR*	NV	R	Enumerated sensor (input) type
643	0x0283	TC_TYPE*	NV	R	Enumerated Thermocouple type
644	0x0284	RTD_WIRE*	NV	R	Enumerated RTD wire type

Index		Mnemonic	NV	Type	Description
645	0x0285	RTD_ACRV_OHM_TYPE*	NV	R	Enumerated RTD Curve
646	0x0286	THERMISTOR_VALUE*	NV	R	Enumerated Thermistor type
647	0x0287	PROCESS_RANGE*	NV	R	Enumerated process input range
648	0x0288	PROCESS TYPE*	NV	R	Enumerated input type
653	0x028d	TARE MODE	NV	R	Tare Mode
654	0x028e	RATE_MODE	NV	R	Rate Mode (RESERVED)
655	0x028f	READING_FILTER_CONSTANT*	NV	R	Enumerated input filtering constant
Smart Sensors					
656	0x0290	SMART SENSOR PRESET	R	R	Enumerated Toggle
657	0x0291	SMART SENSOR SELECT	NV	R	Selects active Sensor input
658	0x0292	SMART SENSOR READING 1	R	F	Sensor 1 Input
659	0x0294	SMART SENSOR READING 2	R	F	
660	0x0296	SMART SENSOR READING 3	R	F	
661	0x0298	SMART SENSOR READING 4	R	F	
PID Parameters					
672	0x02a0	PID_ADAPTIVE_CONTROL_ENABLE*	NV	R	Enumerated Toggle
673	0x02a1	PID_ACTION*	NV	R	Enumerated PID control action
674	0x02a2	PID_AUTOTUNE_TIMEOUT*	NV	L	Timeout (msec) for Autotuning
676	0x02a4	PID_P_*	NV	F	Proportional Gain value
678	0x02a6	PID_I_*	NV	F	Integral Gain value
680	0x02a8	PID_D_*	NV	F	Derivative Gain value
682	0x02aa	PID_PERCENT_LOW*	NV	F	Minimum PID Control output value
684	0x02ac	PID_PERCENT_HIGH*	NV	F	Maximum PID Control output value
686	0x02ae	PID_MAX_RATE*	NV	F	PID maximum rate of change
688	0x02b0	PID_ STABILITY_TIMEOUT*	NV	L	Autotune stability test timeout
690	0x02b2	PID_ STABILITY_RATE*	NV	F	Autotune maximum rate of change stability test
Safety					
704	0x02c0	SAFETY_DELAYED_POWER_ON_RUN*	NV	R	Write 1 to DISABLE auto RUN on power up
705	0x02c1	SAFETY_DELAYED_OPER_RUN*	NV	R	Write 1 to DISABLE return to RUN in OPER
706	0x02c2	SAFETY_SETPOINT_LIMIT_LOW*	NV	F	Minimum allowed setpoint value
708	0x02c4	SAFETY_SETPOINT_LIMIT_HIGH*	NV	F	Maximum allowed setpoint value
710	0x02c6	LOOP_BREAK_ENABLE*	NV	R	Enumerated Toggle
712	0x02c8	LOOP_BREAK_TIME*	NV	L	Time (msec) for break test
714	0x02ca	OPEN_CIRCUIT_ENABLE*	NV	R	Write 1 to enable open circuit test
Password / Access Control					

Index		Mnemonic	NV	Type	Description
720	0x02d0	PASSWORD_INIT_ENABLE*	NV	R	Write 1 to enable INIT menu password
722	0x02d2	PASSWORD_INIT*	NV	L	INIT menu password
724	0x02d4	PASSWORD_PROGRAM_ENABLE*	NV	R	Write 1 to enable PROG menu password
726	0x02d6	PASSWORD_PROGRAM*	NV	L	PROG menu password
Setpoints					
736	0x02e0	SETPOINT_1_MODE*	NV	R	Enumerated Setpoint 1 mode
738	0x02e2	ABSOLUTE SETPOINT_1*	NV	F	Setpoint 1 Absolute value
740	0x02e8	SETPOINT_2_MODE*	NV	R	Enumerated Setpoint 2 mode
742	0x02ea	ABSOLUTE_SETPOINT_2*	NV	F	Setpoint 2 Absolute value
744	0x02ec	DEVIATION_SETPOINT_2*	NV	F	Setpoint 2 value (derivative mode)
Process Input Range (Scaling)					
768	0x0300	DB_4_20_MANUAL_LIVE*	NV	R	Enumerated Input Process mode
770	0x0302	DB_4_20_READING_1*	NV	F	Scale reading value 1
772	0x0304	DB_4_20_INPUT_1*	NV	F	Scale input value 1
774	0x0306	DB_4_20_READING_2*	NV	F	Scale reading value 2
776	0x0308	DB_4_20_INPUT_2*	NV	F	Scale input value 2
800	0x0320	DB_0_24_MANUAL_LIVE*	NV	R	Enumerated Input Process mode
802	0x0322	DB_0_24_ READING_1*	NV	F	Scale reading value 1
804	0x0324	DB_0_24_ INPUT_1*	NV	F	Scale input value 1
806	0x0326	DB_0_24_ READING_2*	NV	F	Scale reading value 2
808	0x0328	DB_0_24_ INPUT_2*	NV	F	Scale input value 2
832	0x0340	DB_10_MANUAL_LIVE*	NV	R	Enumerated Input Process mode
834	0x0342	DB_10_ READING_1*	NV	F	Scale reading value 1
836	0x0344	DB_10_INPUT_1*	NV	F	Scale input value 1
838	0x0346	DB_10_READING_2*	NV	F	Scale reading value 2
840	0x0348	DB_10_INPUT_2*	NV	F	Scale input value 2
864	0x0360	DB_1_MANUAL_LIVE*	NV	R	Enumerated Input Process mode
866	0x0362	DB_1_ READING_1*	NV	F	Scale reading value 1
868	0x0364	DB_1_ INPUT_1*	NV	F	Scale input value 1
870	0x0366	DB_1_READING_2*	NV	F	Scale reading value 2
872	0x0368	DB_1_ INPUT_2*	NV	F	Scale input value 2
896	0x0380	DB_POINT_1_MANUAL_ LIVE*	NV	R	Enumerated Input Process mode
898	0x0382	DB_POINT_1_ READING_1*	NV	F	Scale reading value 1
890	0x0384	DB_POINT_1_ INPUT_1*	NV	F	Scale input value 1
892	0x0386	DB_POINT_1_ READING_2*	NV	F	Scale reading value 2
894	0x0388	DB_POINT_1_ INPUT_2*	NV	F	Scale input value 2
928	0x03a0	DB_POINT_05_MANUAL_LIVE*	NV	R	Enumerated Input Process mode
930	0x03a2	DB_POINT_05_READING_1*	NV	F	Scale reading value 1

Index		Mnemonic	NV	Type	Description
932	0x03a4	DB_POINT_05_INPUT_1*	NV	F	Scale input value 1
934	0x03a6	DB_POINT_05_READING_2*	NV	F	Scale reading value 2
936	0x03a8	DB_POINT_05_INPUT_2*	NV	F	Scale input value 2
Auxiliary Input (Remote Setpoint)					
976	0x03d0	RSP_PROCESS_RANGE*	NV	R	Enumerated Process Range
977	0x03d2	RSP_ENABLE*	NV	R	Enumerated Toggle (sets SP 1 mode)
Auxiliary Input Scaling					
984	0x03d8	RSP_4_20_SETPOINT_MIN*	NV	F	Minimum Setpoint
986	0x03da	RSP_4_20_INPUT_MIN*	NV	F	Minimum Input
988	0x03dc	RSP_4_20_SETPPOINT_MAX*	NV	F	Maximum Setpoint
990	0x03de	RSP_4_20_INPUT_MAX*	NV	F	Maximum Input
992	0x03e0	RSP_0_24_SETPOINT_MIN*	NV	F	
994	0x03e2	RSP_0_24_INPUT_MIN*	NV	F	
996	0x03e4	RSP_0_24_SETPOINT_MAX*	NV	F	
998	0x03e6	RSP_0_24_INPUT_MAX*	NV	F	
1000	0x03e8	RSP_0_10_SETPOINT_MIN*	NV	F	
1002	0x03ea	RSP_0_10_INPUT_MIN*	NV	F	
1004	0x03ec	RSP_0_10_SETPOINT_MAX*	NV	F	
1006	0x03ee	RSP_0_10_INPUT_MAX*	NV	F	
1008	0x03f0	RSP_0_1_SETPOINT_MIN*	NV	F	
1010	0x03f2	RSP_0_1_INPUT_MIN*	NV	F	
1012	0x03f4	RSP_0_1_SETPOINT_MAX*	NV	F	
1014	0x03f6	RSP_0_1_INPUT_MAX*	NV	F	
Output Configuration					
1024	0x0400	OUTPUT_1_HW_TYPE	R	R	Enumerated Hardware Type – upper 4 bits provide the 'Instance' count
1025	0x0401	OUTPUT_1_MODE*	NV	R	Enumerated Output Mode
1026	0x0402	OUTPUT_1_ON_OFF_ACTION*	NV	R	Enumerated On-Off Action
1027	0x0403	OUTPUT_1_SETPOINT*	NV	R	Output Setpoint selection
1028	0x0404	OUTPUT_1_PULSE_LENGTH*	NV	F	Pulse Length (.1 sec increments)
1030	0x0406	OUTPUT_1_ON_OFF_DEADBAND*	NV	F	Deadband
1032	0x0408	OUTPUT_1_OUTPUT_RANGE*	NV	R	Enumerated Output Analog Range
1034	0x040a	OUTPUT_1_RETRAN_READING_1*	NV	F	Retransmission Reading Low
1036	0x040c	OUTPUT_1_RETRAN_OUTPUT_1*	NV	F	Output Level Low
1038	0x040e	OUTPUT_1_RETRAN_READING_2*	NV	F	Retransmission Reading High
1040	0x0410	OUTPUT_1_RETRAN_OUTPUT_2*	NV	F	Output Level High

Index		Mnemonic	NV	Type	Description
1056	0x0420	OUTPUT_2_HW_TYPE	R	R	Enumerated Hardware Type – upper 4 bits provide the 'Instance' count
1057	0x0421	OUTPUT_2_MODE*	NV	R	Enumerated Output Mode
1058	0x0422	OUTPUT_2_ON_OFF_ACTION*	NV	R	Enumerated On-Off Action
1059	0x0423	OUTPUT_2_SETPOINT*	NV	R	Output Setpoint selection
1060	0x0424	OUTPUT_2_PULSE_LENGTH*	NV	F	Pulse Length (.1 sec increments)
1062	0x0426	OUTPUT_2_ON_OFF_DEADBAND*	NV	F	Deadband
1064	0x0428	OUTPUT_2_OUTPUT_RANGE*	NV	R	Enumerated Output Analog Range
1066	0x042a	OUTPUT_2_RETRAN_READING_1*	NV	F	Retransmission Reading Low
1068	0x042c	OUTPUT_2_RETRAN_OUTPUT_1*	NV	F	Output Level Low
1070	0x042e	OUTPUT_2_RETRAN_READING_2*	NV	F	Retransmission Reading High
1072	0x0430	OUTPUT_2_RETRAN_OUTPUT_2*	NV	F	Output Level High
1088	0x0440	OUTPUT_3_HW_TYPE	R	R	Enumerated Hardware Type – upper 4 bits provide the 'Instance' count
1089	0x0441	OUTPUT_3_MODE*	NV	R	Enumerated Output Mode
1090	0x0442	OUTPUT_3_ON_OFF_ACTION*	NV	R	Enumerated On-Off Action
1091	0x0443	OUTPUT_3_SETPOINT*	NV	R	Output Setpoint selection
1092	0x0444	OUTPUT_3_PULSE_LENGTH*	NV	F	Pulse Length (.1 sec increments)
1094	0x0446	OUTPUT_3_ON_OFF_DEADBAND*	NV	F	Deadband
1096	0x0448	OUTPUT_3_OUTPUT_RANGE*	NV	R	Enumerated Output Analog Range
1098	0x044a	OUTPUT_3_RETRAN_READING_1*	NV	F	Retransmission Reading Low
1100	0x044c	OUTPUT_3_RETRAN_OUTPUT_1*	NV	F	Output Level Low
1102	0x044e	OUTPUT_3_RETRAN_READING_2*	NV	F	Retransmission Reading High
1104	0x0450	OUTPUT_3_RETRAN_OUTPUT_2*	NV	F	Output Level High
1120	0x0460	OUTPUT_4_HW_TYPE	R	R	Enumerated Hardware Type – upper 4 bits provide the 'Instance' count
1121	0x0461	OUTPUT_4_MODE*	NV	R	Enumerated Output Mode
1122	0x0462	OUTPUT_4_ON_OFF_ACTION*	NV	R	Enumerated On-Off Action
1123	0x0463	OUTPUT_4_SETPOINT*	NV	R	Output Setpoint selection
1124	0x0464	OUTPUT_4_PULSE_LENGTH*	NV	F	Pulse Length (.1 sec increments)
1126	0x0466	OUTPUT_4_ON_OFF_DEADBAND*	NV	F	Deadband
1128	0x0468	OUTPUT_4_OUTPUT_RANGE*	NV	R	Enumerated Output Analog Range
1130	0x046a	OUTPUT_4_RETRAN_READING_1*	NV	F	Retransmission Reading Low
1132	0x046c	OUTPUT_4_RETRAN_OUTPUT_1*	NV	F	Output Level Low
1134	0x046e	OUTPUT_4_RETRAN_READING_2*	NV	F	Retransmission Reading High
1136	0x0470	OUTPUT_4_RETRAN_OUTPUT_28	NV	F	Output Level High

Index		Mnemonic	NV	Type	Description
1152	0x0480	OUTPUT_5_HW_TYPE	R	R	Enumerated Hardware Type – upper 4 bits provide the 'Instance' count
1153	0x0481	OUTPUT_5_MODE*	NV	R	Enumerated Output Mode
1154	0x0482	OUTPUT_5_ON_OFF_ACTION*	NV	R	Enumerated On-Off Action
1155	0x0483	OUTPUT_5_SETPOINT*	NV	R	Output Setpoint selection
1156	0x0484	OUTPUT_5_PULSE_LENGTH*	NV	F	Pulse Length (.1 sec increments)
1158	0x0486	OUTPUT_5_ON_OFF_DEADBAND*	NV	F	Deadband
1160	0x0488	OUTPUT_5_OUTPUT_RANGE*	NV	R	Enumerated Output Analog Range
1162	0x048a	OUTPUT_5_RETRAN_READING_1*	NV	F	Retransmission Reading Low
1164	0x048c	OUTPUT_5_RETRAN_OUTPUT_1*	NV	F	Output Level Low
1165	0x048e	OUTPUT_5_RETRAN_READING_2*	NV	F	Retransmission Reading High
1168	0x0490	OUTPUT_5_RETRAN_OUTPUT_28	NV	F	Output Level High
1184	0x04a0	OUTPUT_6_HW_TYPE	R	R	Enumerated Hardware Type – upper 4 bits provide the 'Instance' count
1185	0x04a1	OUTPUT_6_MODE*	NV	R	Enumerated Output Mode
1186	0x04a2	OUTPUT_6_ON_OFF_ACTION*	NV	R	Enumerated On-Off Action
1187	0x04a3	OUTPUT_6_SETPOINT*	NV	R	Output Setpoint selection
1188	0x04a4	OUTPUT_6_PULSE_LENGTH*	NV	F	Pulse Length (.1 sec increments)
1190	0x04a6	OUTPUT_6_ON_OFF_DEADBAND*	NV	F	Deadband
1192	0x04a8	OUTPUT_6_OUTPUT_RANGE*	NV	R	Enumerated Output Analog Range
1194	0x04aa	OUTPUT_6_RETRAN_READING_1*	NV	F	Retransmission Reading Low
1196	0x04ac	OUTPUT_6_RETRAN_OUTPUT_1*	NV	F	Output Level Low
1198	0x04ae	OUTPUT_6_RETRAN_READING_2*	NV	F	Retransmission Reading High
1200	0x04b0	OUTPUT_6_RETRAN_OUTPUT_28	NV	F	Output Level High
1216	0x04c0	OUTPUT_7_HW_TYPE	R	R	Enumerated Hardware Type – upper 4 bits provide the 'Instance' count
1217	0x04c1	OUTPUT_7_MODE*	NV	R	Enumerated Output Mode
1218	0x04c2	OUTPUT_7_ON_OFF_ACTION*	NV	R	Enumerated On-Off Action
1219	0x04c3	OUTPUT_7_SETPOINT*	NV	R	Output Setpoint selection
1220	0x04c4	OUTPUT_7_PULSE_LENGTH*	NV	F	Pulse Length (.1 sec increments)
1222	0x04c6	OUTPUT_7_ON_OFF_DEADBAND*	NV	F	Deadband
1224	0x04c8	OUTPUT_7_OUTPUT_RANGE*	NV	R	Enumerated Output Analog Range
1226	0x04ca	OUTPUT_7_RETRAN_READING_1*	NV	F	Retransmission Reading Low
1228	0x04cc	OUTPUT_7_RETRAN_OUTPUT_1*	NV	F	Output Level Low
1230	0x04ce	OUTPUT_7_RETRAN_READING_2*	NV	F	Retransmission Reading High
1232	0x04d0	OUTPUT_7_RETRAN_OUTPUT_28	NV	F	Output Level High

Index		Mnemonic	NV	Type	Description
1248	0x04e0	OUTPUT_8_HW_TYPE	R	R	Enumerated Hardware Type – upper 4 bits provide the 'Instance' count
1259	0x04e1	OUTPUT_8_MODE*	NV	R	Enumerated Output Mode
1250	0x04e2	OUTPUT_8_ON_OFF_ACTION*	NV	R	Enumerated On-Off Action
1251	0x04e3	OUTPUT_8_SETPOINT*	NV	R	Output Setpoint selection
1252	0x04e4	OUTPUT_8_PULSE_LENGTH*	NV	F	Pulse Length (.1 sec increments)
1254	0x04e6	OUTPUT_8_ON_OFF_DEADBAND*	NV	F	Deadband
1256	0x04e8	OUTPUT_8_OUTPUT_RANGE*	NV	R	Enumerated Output Analog Range
1258	0x04ea	OUTPUT_8_RETRAN_READING_1*	NV	F	Retransmission Reading Low
1260	0x04ec	OUTPUT_8_RETRAN_OUTPUT_1*	NV	F	Output Level Low
1262	0x04ee	OUTPUT_8_RETRAN_READING_2*	NV	F	Retransmission Reading High
1264	0x04f0	OUTPUT_8_RETRAN_OUTPUT_28	NV	F	Output Level High
Alarm Configuration					
1280	0x0500	ALARM_STATE	R	R	Alarm state (Bit 0)
1281	0x0501	ALARM_1_TYPE*	NV	R	Enumerated Alarm type
1282	0x0502	ALARM_1_MODE*	NV	R	Enumerated Alarm Mode
1283	0x0503	ALARM_1_DISPLAY_COLOR*	NV	R	Enumerated Alarm Color
1284	0x0504	ALARM_1_HIGH_HIGH_MODE*	NV	R	Enumerated Toggle value
1285	0x0505	ALARM_1_LATCH_TYPE*	NV	R	Enumerated Toggle value
1286	0x0506	ALARM_1_CONTACT_CLOSURE_TYPE*	NV	R	Enumerated Contact closure type
1287	0x0507	ALARM_1_POWER_ON_STATE*	NV	R	Enumerated Power on control
1288	0x0508	ABSOLUTE_ALARM_1_LOW*	NV	F	Alarm Low value (Absolute mode)
1290	0x050a	ABSOLUTE_ALARM_1_HIGH*	NV	F	Alarm High value (Absolute mode)
1292	0x050c	DEVIATION_ALARM_1_LOW*	NV	F	Alarm Low offset (Deviation mode)
1294	0x050e	DEVIATION_ALARM_1_HIGH*	NV	F	Alarm High offset (Deviation mode)
1296	0x0510	ALARM_1_HIGH_HIGH_OFFSET*	NV	F	Alarm High-High offset
1298	0x0512	ALARM_1_ON_DELAY*	NV	F	Alarm On Delay
1300	0x0514	ALARM_1_OFF_DELAY*	NV	F	Alarm Off Delay
1312	0x0520	ALARM_STATE	R	R	Alarm state (Bit 0)
1313	0x0521	ALARM_2_TYPE*	NV	R	Enumerated Alarm type
1314	0x0522	ALARM_2_MODE*	NV	R	Enumerated Alarm Mode
1315	0x0523	ALARM_2_DISPLAY_COLOR*	NV	R	Enumerated Alarm Color
1316	0x0524	ALARM_2_HIGH_HIGH_MODE*	NV	R	Enumerated Toggle value
1317	0x0525	ALARM_2_LATCH_TYPE*	NV	R	Enumerated Toggle value
1318	0x0526	ALARM_2_CONTACT_CLOSURE_TYPE*	NV	R	Enumerated Contact closure type
1319	0x0527	ALARM_2_POWER_ON_STATE*	NV	R	Enumerated Power on control

Index		Mnemonic	NV	Type	Description
1320	0x0528	ABSOLUTE_ALARM_2_LOW*	NV	F	Alarm Low value (Absolute mode)
1322	0x052a	ABSOLUTE_ALARM_2_HIGH*	NV	F	Alarm High value (Absolute mode)
1324	0x052c	DEVIATION_ALARM_2_LOW*	NV	F	Alarm Low offset (Deviation mode)
1326	0x052e	DEVIATION_ALARM_2_HIGH*	NV	F	Alarm High offset (Deviation mode)
1328	0x0530	ALARM_2_HIGH_HIGH_OFFSET*	NV	F	Alarm High-High offset
1330	0x0532	ALARM_2_ON_DELAY*	NV	F	Alarm On Delay
1332	0x0534	ALARM_2_OFF_DELAY*	NV	F	Alarm Off Delay
Excitation Voltage					
1472	0x05c0	EXCITATION_VOLTAGE*	NV	R	Enumerated Excitation Voltage
Annunciators					
1504	0x05e0	DB_ANNUNCIATOR_STATE	R	R	Enumerated Annunciator State
1505	0x05e1	DB_ANNUNCIATOR_1_MODE*	NV	R	Enumerated Annunciator Mode
1508	0x05e4	DB_ANNUNCIATOR_STATE	R	R	Enumerated Annunciator State
1509	0x05e5	DB_ANNUNCIATOR_2_MODE*	NV	R	Enumerated Annunciator Mode
1512	0x05e8	DB_ANNUNCIATOR_STATE	R	R	Enumerated Annunciator State
1513	0x05e9	DB_ANNUNCIATOR_3_MODE*	NV	R	Enumerated Annunciator Mode
1516	0x05ec	DB_ANNUNCIATOR_STATE	R	R	Enumerated Annunciator State
1517	0x05ed	DB_ANNUNCIATOR_4_MODE*	NV	R	Enumerated Annunciator Mode
Data Comm - USB					
1536	0x0600	USB_PROTOCOL*	NV	R	Enumerated Comm Mode
1537	0x0601	USB_RECOGNITION_CHARACTER*	NV	R	Recognition character
1538	0x0602	USB_DATA_FLOW*	NV	R	Enumerated Data Flow (Omega mode)
1539	0x0603	USB_ECHO_MODE*	NV	R	Enumerated Toggle value
1540	0x0604	USB_CONTINUOUS_DATA_PERIOD*	NV	F	Time interval in continuous mode (0.1 sec)
1542	0x0606	USB_DATA_FORMAT_STATUS*	NV	R	Enumerated Toggle value
1543	0x0607	USB_DATA_FORMAT_READING*	NV	R	Enumerated Toggle value
1544	0x0608	USB_DATA_FORMAT_PEAK*	NV	R	Enumerated Toggle value
1545	0x0609	USB_DATA_FORMAT_VALLEY*	NV	R	Enumerated Toggle value
1546	0x060a	USB_DATA_FORMAT_UNIT*	NV	R	Enumerated Toggle value
1547	0x060b	USB_SEPARATION_CHAR*	NV	R	Enumerated Separation character
1548	0x060c	USB_LINE_FEED*	NV	R	Enumerated Toggle value
1549	0x060d	USB_DEVICE_ADDRESS*	NV	R	Byte address (0..255)
1550	0x060e	USB_MODBUS_MODE*	NV	R	Enumerated Modbus mode
1551	0x060f	USB_MODBUS_EOL*	NV	R	2 character EOL character string (CR/LF)
Data Comm - Ethernet					
1568	0x0620	ETH_PROTOCOL*	NV	R	

Index		Mnemonic	NV	Type	Description
1569	0x0621	ETH_RECOGNITION_CHARACTER*	NV	R	
1570	0x0622	ETH_DATA_FLOW*	NV	R	
1571	0x0623	ETH_ECHO_MODE*	NV	R	
1572	0x0624	ETH_CONTINUOUS_DATA_PERIO*	NV	F	
1574	0x0626	ETH_DATA_FORMAT_STATUS*	NV	R	
1575	0x0627	ETH_DATA_FORMAT_READING*	NV	R	
1576	0x0628	ETH_DATA_FORMAT_PEAK*	NV	R	
1577	0x0629	ETH_DATA_FORMAT_VALLEY*	NV	R	
1578	0x062a	ETH_DATA_FORMAT_UNIT*	NV	R	
1579	0x062b	ETH_LINE_FEED*	NV	R	
1580	0x062c	ETH_SEPARATION_CHAR*	NV	R	
1581	0x062d	ETH_DEVICE_ADDRESS*	NV	R	
1582	0x062e	ETH_MODBUS_MODE*	NV	R	
1583	0x062f	ETH_MODBUS_EOF*	NV	R	
Data Comm - Serial					
1600	0x0640	SERIAL_PROTOCOL*	NV	R	
1601	0x0641	SERIAL_RECOGNITION_CHARAC*	NV	R	
1602	0x0642	SERIAL_DATA_FLOW*	NV	R	
1603	0x0643	SERIAL_ECHO_MODE*	NV	R	
1604	0x0644	SERIAL_CONTINUOUS_DATA_PE*	NV	F	
1606	0x0646	SERIAL_DATA_FORMAT_STATUS*	NV	R	
1607	0x0647	SERIAL_DATA_FORMAT_READIN*	NV	R	
1608	0x0648	SERIAL_DATA_FORMAT_PEAK*	NV	R	
1609	0x0649	SERIAL_DATA_FORMAT_VALLEY*	NV	R	
1610	0x064a	SERIAL_DATA_FORMAT_UNIT*	NV	R	
1611	0x064b	SERIAL_LINE_FEED*	NV	R	
1612	0x064c	SERIAL_SEPARATION_CHAR*	NV	R	
1613	0x064d	SERIAL_DEVICE_ADDRESS*	NV	R	
1614	0x064e	SERIAL_MODBUS_MODE*	NV	R	
1615	0x064f	SERIAL_MODBUS_EOF*	NV	R	
1616	0x0650	SERIAL_232_485*	NV	R	Enumerated serial interface type
1617	0x0651	SERIAL_BAUD_RATE*	NV	R	Enumerated baud rate value
1618	0x0652	SERIAL_PARITY*	NV	R	Enumerated parity value
1619	0x0653	SERIAL_DATABITS*	NV	R	Enumerated data bits value
1620	0x0654	SERIAL_STOPBITS*	NV	R	Enumerated stop bits value
Linearization					
1792	0x0700	DB_LINEARIZATION_MANUAL_ LIVE*	NV	R	Enumerated Linearization mode
1793	0x0701	DB_NUMBER_LINEARIZATION_POI NTS	NV	R	Number of active points
1794	0x0702	DB_POINT_1_ READING_1*	NV	F	Linearization reading value 1
1796	0x0704	DB_POINT_1_ INPUT_1*	NV	F	Linearization input value 1
1798	0x0706	DB_POINT_1_ READING_2*	NV	F	Linearization reading value 2

Index		Mnemonic	NV	Type	Description
1800	0x0708	DB_POINT_1_ INPUT_2*	NV	F	Linearization input value 2
1802	0x070a	DB_POINT_1_ READING_3*	NV	F	Linearization reading value 3
1804	0x070c	DB_POINT_1_ INPUT_3*	NV	F	Linearization input value 3
1806	0x070e	DB_POINT_1_ READING_4*	NV	F	Linearization reading value 4
1808	0x0710	DB_POINT_1_ INPUT_4*	NV	F	Linearization input value 4
1810	0x0712	DB_POINT_1_ READING_5*	NV	F	Linearization reading value 5
1812	0x0714	DB_POINT_1_ INPUT_5*	NV	F	Linearization input value 5
1814	0x0716	DB_POINT_1_ READING_6*	NV	F	Linearization reading value 6
1816	0x0718	DB_POINT_1_ INPUT_6*	NV	F	Linearization input value 6
1818	0x071a	DB_POINT_1_ READING_7*	NV	F	Linearization reading value 7
1820	0x071c	DB_POINT_1_ INPUT_7*	NV	F	Linearization input value 7
1822	0x071e	DB_POINT_1_ READING_8*	NV	F	Linearization reading value 8
1824	0x0720	DB_POINT_1_ INPUT_8*	NV	F	Linearization input value 8
1826	0x0722	DB_POINT_1_ READING_9*	NV	F	Linearization reading value 9
1828	0x0724	DB_POINT_1_ INPUT_9*	NV	F	Linearization input value 9
1830	0x0726	DB_POINT_1_ READING_10*	NV	F	Linearization reading value 10
1832	0x0728	DB_POINT_1_ INPUT_10*	NV	F	Linearization input value 10

3.2 Enumerated Values

The following define the Enumerated values.

3.2.1 Control/System Parameters

Toggle		
0	DISABLE	Feature or option is disabled
1	ENABLE	Feature or option is enabled
Control		
0	STOP	Control is stopped
1	START	Control is started
2	CANCEL	Control is cancelled
3	AUTO_ON	Control is immediately started
4	CONTINUOUS	Control is continuously (repeatedly) enabled
Control Action		
0	ACTION_REVERSE	Output active if P.V. < Setpoint
1	ACTION_DIRECT	Output active if P.V. > Setpoint
System State		
0	LOAD	File transfer in progress
1	IDLE	Idle, no control
2	INPUT_ADJUST	Adjusting input value
3	CONTROL_ADJUST	Adjusting output value
4	MODIFY	Modify parameter in OPER mode
5	WAIT	Waiting for RUN condition

6	RUN	System is running
7	STANDBY	Standby mode
8	STOP	Stopped mode
9	PAUSE	Paused mode
10	FAULT	Fault detected
11	SHUTDOWN	Shutdown condition detected
12	AUTOTUNE	Autotune in progress

3.2.2 Display & Formatting

Time Format		
0	MINUTE_SECOND	MM.SS displayed
1	HOUR_MINUTE	HH.MM displayed
2	MILLISECONDS	S.MMM displayed
3	HOUR_MINUTE_SECONDS	HH:MM:SS display (6 digit only)
Decimal Point		
0	DECIMAL_POINT_NONE	Display as XXXX
1	DECIMAL_POINT_3	Display as XXX.X
2	DECIMAL_POINT_2	Display as XX.XX
3	DECIMAL_POINT_1	Display as X.XXX
Units		
0	UNIT_NONE	No units applied
1	UNIT_CELCIUS	Values converted to °C
2	UNIT_FARENHEIT	Values converted to °F
Color		
0	COLOR_OFF	No color
1	COLOR_GREEN	GREEN
2	COLOR_RED	RED
3	COLOR_AMBER	AMBER
4	COLOR_NO_CHANGE	Do not change color (internal use)
Brightness		
0	BRIGHTNESS_LOW	33% duty cycle
1	BRIGHTNESS_MEDIUM	66% duty cycle
2	BRIGHTNESS_HIGH	100% duty cycle

3.2.3 Ramp and Soak Parameters

Ramp & Soak State (bit mapped)		
0x00	INACTIVE	Ramp & Soak is inactive
0x01	RAMPING	Ramp time and RE bit set
0x02	SOAKING	Soak time and SE bit set
0x04	RAMP_ACTIVE	Ramp time
0x08	SOAK_ACTIVE	Soak time
0x10	RAMP_SOAK_PAUSED	Ramp & Soak is in PAUSE condition
0x80	RAMP_SOAK_ERROR	Ramp & Soak error condition

Ramp & Soak Tracking		
0	FIXED_RAMP	Fixed RAMP time
1	FIXED_SOAK	Fixed SOAK time
2	FIXED_CYCLE	Fixed CYCLE time
Ramp & Soak Link Action		
0	STOP_PROCESS	Stop at end of profile
1	HOLD_PROCESS	Hold last SOAK level at end of profile
2	LINK_PROFILE	Link to Profile defined in LINK field
Ramp & Soak Control		
0	RAMP_SOAK_DISABLED	Disabled
1	RAMP_SOAK_ENABLED	Enabled by RUN button
2	RAMP_SOAK_REMOTE	Enabled by RUN button or Digital Input

3.2.4 Input Parameters

Sensor Type			
0	SENSOR_TC	Thermocouple	
1	SENSOR_RTD	RTD	
2	SENSOR_PROCESS	Process Input	
3	SENSOR_THERMISTOR	Thermistor	
4	SENSOR_REMOTE	Remote	
Thermocouple Types			
0	J	6	R
1	K	7	S
2	T	8	B
3	E	9	C
4	N	10	<RESERVED>
5	<RESEREVED>	11	<RESERVED>
RTD ACRV OHM Types			
0	385_100	385 Curve, 100 ohms	
1	385_500	385 Curve, 500 ohms	
2	385_1000	385 Curve, 1000 ohms	
3	392_100	392 Curve, 100 ohms	
4	3916_100	3916Curve, 100 ohms	
RTD Wire types			
0	2_WIRE		
1	3_WIRE		
2	4_WIRE		
Thermistor Type			
0	THERMISTOR_2_25_K	2.25 K	
1	THERMISTOR_5_K	5K	
2	THERMISTOR_10_K	10K	
Process Input Types			
0	PROCESS_4_20	4 – 20 mA	
1	PROCESS_0_24	0 – 24 mA	
2	PROCESS_0_10	0 – 10 Vdc (No Support)	

3	PROCESS_0_1	0 – 1.0 Vdc (No Support)
2	PROCESS_0_POINT_1	0 – 0.1 Vdc (No Support)
5	PROCESS_PLUS_MINUS_10	+/– 10 Vdc – Single Ended Only
6	PROCESS_PLUS_MINUS_1	+/ – 1.0 Vdc – Single Ended, Diff, Ratiometric
7	PROCESS_PLUS_MINUS_POINT_1	+/ – 0.1 Vdc – Singled Ended, Diff., Ratiometric
8	PROCESS_PLUS_MINUS_POINT_05	+/ – 0.05 Vdc – Differential, Ratiometric only
Process Type		
0	Single Ended	Single Ended Inputs, +/- 10, +/- 1.0 and +/- 0.1 only
1	Differential	Differential inputs, +/- 1.0, +/- 0.1 and +/- 0.05 only
2	Ratiometric	Ratiometric inputs, +/- 1.0, +/- 0.1 and +/- 0.05 only

Range \ Type	Single Ended	Differential	Ratiometric
+/- 10 Vdc	X		
+/- 1.0 Vdc	X	X	X
+/- 0.1 Vdc	X	X	X
+/- 0.05 Vdc		X	X

Process Live_Manual mode		
0	LIVE_MODE	
1	MANUAL_MODE	
Input Filtering		
0	FILTER_CONSTANT_1	No filtering (1 X rate)
1	FILTER_CONSTANT_2	X 2 filtering
2	FILTER_CONSTANT_4	X 4 filtering
3	FILTER_CONSTANT_8	X 8 filtering
4	FILTER_CONSTANT_16	X 16 filtering
5	FILTER_CONSTANT_32	X 32 filtering
6	FILTER_CONSTANT_64	X 64 filtering
7	FILTER_CONSTANT_128	X 128 filtering

3.2.5 Setpoint Parameters

Setpoint Modes		
0	SETPOINT_ABSOLUTE	Setpoint value given as fixed constant
1	SETPOINT_DEVIATION	Setpoint value is deviation (+/-) Setpoint 1 value
2	SETPOINT_REMOTE	Setpoint 1 set by Remote Setpoint
3	SETPOINT_EXTERNAL	Setpoint value set externally
4	SETPOINT_RAMP_SOAK	Setpoint value set by Ramp & Soak process

3.2.6 Alarm Parameters

Alarm Mode		
0	ALARM_ABSOLUTE	Alarm setpoint is fixed constant
1	ALARM_DEVIATION_1	Alarm is offset from Setpoint 1
2	ALARM_DEVIATION_2	Alarm is offset from Setpoint 2
Alarm Type		
0	ALARM_DISABLED	Alarm not active
1	ALARM_ABOVE	Alarm triggered if PV > ALM.H

2	ALARM_BELOW	Alarm trigger if PV < ALM.L
3	ALARM_HI_LO	Alarm trigger if PV > ALM.H or PV < ALM.L
4	ALARM_BAND	Alarm trigger if PV > ALM.L and PV < ALM.H
Alarm Latch Control		
0	ALARM_UNLATCH	Alarm does not latch
1	ALARM_LATCH	Alarm state will be latched, clear by front panel
2	ALARM_LATCH_REMOTE	Alarm state will be latched, clear by digital input
3	ALARM_HI_LO	Alarm state latched, clear by front panel or input

3.2.7 Output Parameters

Output Types		
0x00	OUTPUT_NONE	No output available
0x01	OUTPUT_STR	Single Poll Relay
0x02	OUTPUT_SSR	SSR output
0x04	OUTPUT_DTR	Double Poll Relay
0x08	OUTPUT_DCP	DC Pulse output
0x10	OUTPUT_ANG	Analog Output
0x20	OUTPUT_IANG	Isolated Analog Output
0x40	OUTPUT_IDC	Isolated DC Pulse Output
Output Polarity		
0	NORMALLY_OPEN	Contacts OPEN until activated
1	NORMALLY_CLOSED	Contacts CLOSED until activated
Output Type		
0	VOLTAGE	Voltage range
1	CURRENT	Current range
Output Mode		
0	OUTPUT_OFF	Output maintained in OFF state
1	OUTPUT_PID	Output control by PID control function
2	OUTPUT_ON_OFF	Output controlled by ON-OFF control function
3	OUTPUT_RETRANSMISSION	Output retransmits the scaled process variable
4	OUTPUT_ALARM_1	Output set by ALARM 1 state
5	OUTPUT_ALARM_2	Output set by ALARM 2 state
6	OUTPUT_RAMP_EVENT	Output set by Ramp & Soak RE.ON control bit
7	OUTPUT_SOAK_EVENT	Output set by Ramp & Soak SE.ON control bit
Output Process Range		
0	OUTPUT_0_10	0-10 Vdc
1	OUTPUT_0_5	0-5 Vdc
2	OUTPUT_0_20	0-20 mA
3	OUTPUT_4-20	4-20 mA
4	OUTPUT_0_24	0-24 mA

3.2.8 Annunciator Parameters

Annunciator Mode		
0	ANNUN_NONE	Disable Annunciator
1	ANNUN_ALARM_1	Annunciator activated by Alarm 1
2	ANNUN_ALARM_2	Annunciator activated by Alarm 2

3	ANNUN_OUTPUT_1	Annunciator activated by Output 1
4	ANNUN_OUTPUT_2	Annunciator activated by Output 2
5	ANNUN_OUTPUT_3	Annunciator activated by Output 3
6	ANNUN_OUTPUT_4	Annunciator activated by Output 4
6	ANNUN_RE_ON	Annunciator activated by RE.ON bit
8	ANNUN_SE_ON	Annunciator activated by SE.ON bit
9	ANNUN_RAMP_ACTIVE	Annunciator activated during any RAMP cycle
10	ANNUN_SOAK_ACTIVE	Annunciator activated during any SOAK cycle

3.2.9 Communication Parameters

Protocol		
0	PROTOCOL_OMEGA	Omega Protocol
1	PROTOCOL_MODBUS	Modbus Protocol
Data Flow (Omega Protocol)		
0	DATA_FLOW_COMMAND	Interactive command mode
1	DATA_FLOW_CONTINUOUS	Continuous mode
Separation Character (Omega Protocol)		
0	SEPARATION_SPACE	Use <space> character between records
1	SEPARATION_CR	Use <CR> between records
Modbus Protocol (Modbus Protocol)		
0	MODBUS_RTU	ASCII formatted records
1	MODBUS_ASCII	RTU formatted records
2	MODBUS_PDU	PDU formatted records
Serial Mode		
0	SERIAL_RS232	
1	SERIAL_RS485	
Serial Baud Rate		
0	BAUD_300	
1	BAUD_600	
2	BAUD_1200	
3	BAUD_2400	
4	BAUD_4800	
5	BAUD_9600	
6	BAUD_19200	
7	BAUD_38400	
8	BAUD_57600	
9	BAUD_115200	
Parity		
0	PARITY_NONE	
1	PARITY_ODD	
2	PARITY_EVEN	
Data Bits		
0	BITS_7	
1	BITS_8	

3.2.10 Excitation Parameters

Excitation		
0	EXCITATION_0_VOLTS	
1	EXCITATION_5_VOLTS	
2	EXCITATION_10_VOLTS	
3	EXCITATION_12_VOLTS	
4	EXCITATION_24_VOLTS	

3.2.11 Calibration Parameters

Calibration Mode		
0	CAL_NONE	
1	CAL_1_POINT	
2	CAL_2_POINT	
3	CAL_ICE_POINT	

3.2.12 Input / Output Scaling

Scaling operations allow translating source (input) signals to scaled output signal using a linear translation defined by a SLOPE (or gain) and an OFFSET. As shown below, (X1,Y1) and (X2,Y2) define two points on a line that has a certain SLOPE and OFFSET. Knowing the SLOPE and OFFSET allows determining the OUTPUT value for any given INPUT value using the equation:

Output = Input X SLOPE + OFFSET, where

GAIN = (Y2 - Y1) / (X2 - X1)

OFFSET = Y1 - (GAIN * X1).

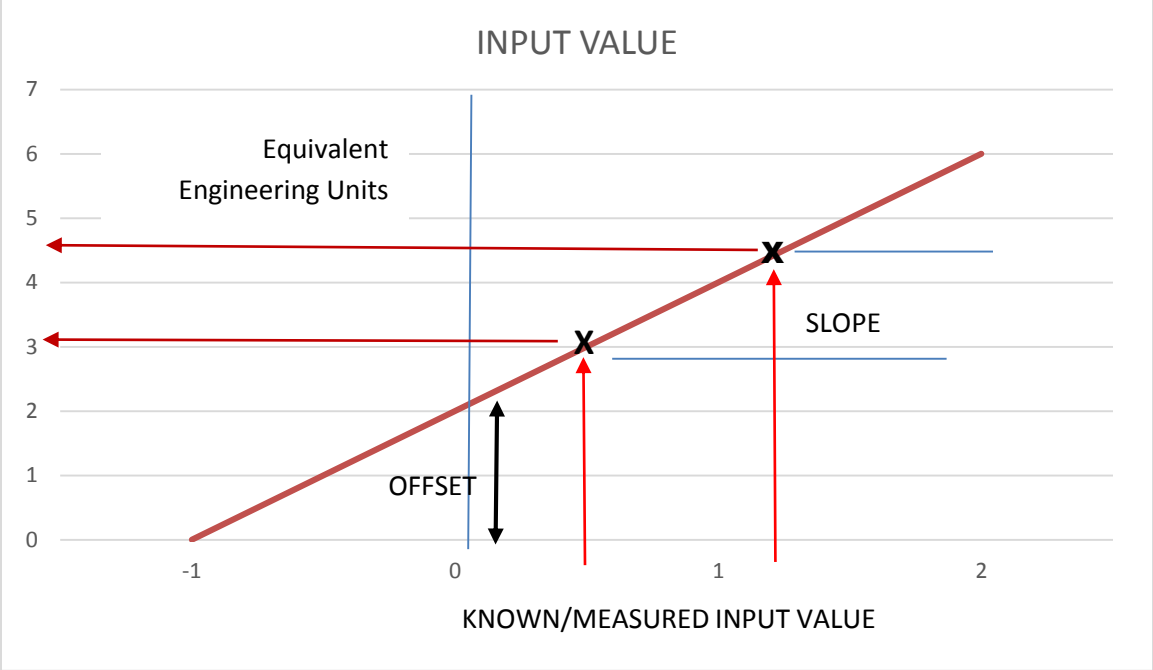

Figure 1 I/O Scaling.

If (X2 - X1) == 0, the GAIN is set to 1 and the OFFSET is set to 0.

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **61 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the **normal five (5) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

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RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR WARRANTY RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR NON-WARRANTY REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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