

## Modbus Protocol

# Register Declarations for the KAYDEN Classic 800 Series

## Introduction

The KAYDEN Classic can be monitored and configured remotely.

The physical layer is RS-485 half duplex at 9600 baud with 8 bits, no parity and 1 stop bit.

The data link layer is Modbus with device dependant declarations as described in this document.

## Function Codes

The listing below shows the function codes supported by Kayden Classic.

<b>Code</b>	<b>Name</b>
01	Read Coil Status
03	Read Holding Registers
04	Read Input Registers
06	Preset Single Register
07	Read Exception Status
08	Diagnostics
16	Preset Multiple Registers
17	Report Slave ID

## 01 Read Coil Status

Coils refer to digital outputs. By definition only single bit outputs can be supported as Coils. Since the switch itself controls the outputs of the switches, the 'Force Single Coil' and 'Force Multiple Coils' commands are not supported. The 'Read Coil Status' command is used to monitor the state of these outputs. A '0' indicates that the output is not energized or in its powered off state. In the case of mechanical relays a '0' indicating that the coil is not energized means that the N.C. contacts are in their Normally Closed state and the N.O. contacts are in their Normally Open state.

All sixteen coil bits are also available by reading holding register 40528 Bcoils.

The declaration of outputs to coils is shown in the listing below.

<b>Coil #</b>	<b>Address (Hex)</b>	<b>Coil Function</b>
1	0000	Relay 1
2	0001	Relay 2
3	0002	Run Mode
4	0003	Fault Mode
5	0004	By-pass Mode
6	0005	Loop Status
7	0006	-
8	0007	-
9	0008	Relay 1 Timer
10	0009	Relay 2 Timer
11	000A	Relay 1 Timer
12	000B	Relay 2 Timer
13	000C	-
14	000D	-
15	000E	-
16	000F	-

### 03 Read Holding Registers

Reads the binary 16 bit contents of the holding registers (4x reference). Holding registers are read/write but care should be taken when writing to registers. Most variables have a default value stored in the switches' non-volatile memory and the operational variable stored in random access memory.

Modbus Registers	Address (Hex)	Register Name	Description
40001	0000	PIDC	Product ID in high byte and Software revision in low byte
40002	0001	Unit #	Modbus slave address from 1 thru 247 decimal 0 is reserved for broadcast commands 248-255 are reserved by the Modbus standard Upper byte must equal 0
40003-40004	0002-0003	ESN	Electronic Serial number formatted as a double word
40005	0004	Last Error Code	Code of last error detected by self test
40006	0005	Bypass Delay	Number of 5 second delays from 0 to 20 (0 to 100 seconds)
40007	0006	4-20 Error Mode	Loop current while in error mode, 00FFh = 21mA, 0000h = 3mA
40008	0007	E-Lock	Front panel lock, 00E5h = locked
40009	0008	NPWR	Number of Power Ons
40010	0009	NWDT	Number of Watch Dog Resets
40011	000A	NBOD	Number of Brown Out Detects
40012	000B	NERR	Number of Self Test Errors
40013	000C	NCOM	Number of Communication Errors
40014	000D	NOVR	Number of Overflow Errors
40015	000E	NFRM	Number of Framing Errors
40016	000F	NCRC	Number of CRC Errors
40017-40024	0010-0017	CTAG	Custom Ascii Tag, 16 chars, 8 words
40025	0018	Diag Disable Bits	Used to disable individual self tests for troubleshooting
40026	0019	Error Mode Recovery Timer	Defaults value is 012Ch (300 seconds)
40027	001A	Relay Energized Mode	Upper byte for Relay 1, Lower byte for Relay 2 00 = On Lower than set point, FF = On Higher than set point
40028	001B	PIDC/SREV	Backup copy of register 40001
40029	001C	4-20 Forward Reverse Mode	0000 = 4 to 20mA 00FF = 20 to 4mA
40030	001D	Relay Flow/Temperature Mode	Upper byte for Relay 1, Lower for Relay 2 00 = Flow, FF = Temperature
40031	001E	Temperature Setpoint 1	16 bit word, temperature in degrees Celsius 16 bit 'inverted signed' value e.g. 8001 = 1, 8000 = 0, 7FFF = -1
40032	001F	Temperature Setpoint 1	16 bit word, temperature in degrees Celsius 16 bit 'inverted signed' value e.g. 8001 = 1, 8000 = 0, 7FFF = -1
40033	0020	Thermal (Flow) Setpoint 1	Thermal Alarm Setpoint 1 in 5 % steps 0 thru 20 decimal = 0% thru 100%

40034	0021	Thermal (Flow) Setpoint 2	Thermal Alarm Setpoint 2 in 5 % steps 0 thru 20 decimal = 0% thru 100%
40035	0022	Dead band 1	Reserved
40036	0023	Dead band 2	Reserved
40037	0024	Delay Timer R1 OFF to ON	Delay in seconds from 0 to FEFF (65279) Values of FF00 (65280) and up equal infinity
40038	0025	Delay Timer R2 OFF to ON	Delay in seconds from 0 to FEFF (65279) Values of FF00 (65280) and up equal infinity
40039	0026	Range	N/A
40040	0027	Heater Power	Default Heater Power 0 thru 20 decimal = 0% thru 100%
40041	0028	LED Pointer 100%	Index to LED100 pointer 0 thru 20 decimal = 0% thru 100%
40042	0029	LED Pointer 0%	Index to LED0 pointer 0 thru 20 decimal = 0% thru 100%
40043	002A	Error Log Pointer	Reserved
40044	002B	Delay Timer R1 ON to OFF	Delay in seconds from 0 to FEFF (65279) Values of FF00 (65280) and up equal infinity
40045	002C	Delay Timer R2 ON to OFF	Delay in seconds from 0 to FEFF (65279) Values of FF00 (65280) and up equal infinity
40046	002D	Number of Error Log Entries	Reserved
40047	002E	Reserved	Reserved
40048	002F	Reserved	Reserved

Holding registers from 40513 and above are 'run time' variables that reflect the operating condition of the unit. These registers should be treated as 'read only' with the exception of the Mode register 40517. Writing a value of '00F5h' to the Mode register forces the unit to perform a soft reboot. A soft reboot should be performed after writing to certain configuration registers.

40513	0200	AD0	Thermal Delta, 16 bit unsigned word, Inverse of Thermal Signal Thermal Delta of zero (0000h) = 100% Thermal Signal Thermal Delta of 60,000 (EA60h) = 0% Thermal Signal
40514	0201	AD1	Reserved
40515	0202	AD2	Reserved
40516	0203	Current Heater Power	Heater Power, indexed in 5% steps. 0 thru 20 decimal = 0% thru 100%
40517	0204	Mode  Should be treated as a read only register but writing a 00F5 will force a reboot.	0000 - Reset 0001 - Led Self Test 0002 - Soft Reset 0003 - Startup heater and ADC 0004 - Bypass timer active 0005 - Run Mode  00F0 - Diagnostic mode 00F1 - Self Test mode 00F2 - Manual mode 00F5 - Reboot 00FE - Stop mode, (Heater Error) 00FF - Stop mode
40518	0205	Actual Temperature	Actual Process Temperature from Reference RTD in degrees Celsius, 16 bit signed word
40519	0206	LEDa0	Absolute value of LED00 pointer
40520	0207	LEDa1	Absolute value of LED100 pointer
40521	0208	LEDi0	Index to value of 00% LED 0 thru 20 decimal = 0% thru 100%
40522	0209	LEDi1	Index to value of 00% LED 0 thru 20 decimal = 0% thru 100%
40523	020A	ABS1P	Absolute Set Point Alarm 1 + hysteresis
40524	020B	ABS1M	Absolute Set Point Alarm 1 - hysteresis
40525	020C	ABS2P	Absolute Set Point Alarm 2 + hysteresis
40526	020D	ABS2M	Absolute Set Point Alarm 2 - hysteresis
40527	020E	LEDaSPAN	Absolute value of span between LED00 and LED100 pointers
40528	020F	BCoils	Output Coil status bits, as per 'Read Coil Status'
40529-40530	0210-0211	AT1	Raw 32 bit output from ADC
40531-40532	0212-0213	AT2	Raw 32 bit output from ADC
40533	0214	RTD1	RTD 1 in ohms
40534	0215	RTD2	RTD 2 in ohms
40535	0216	Delta	Delta in ohms