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MODBUS MESSAGING to the S5 BATTERY VALIDATION SYSTEM

Users Guide

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1.0 Description

This feature of the S5 allows a plant computer (DCS) to monitor the measurements taken by the S5. The DCS communicates with the S5 over an Ethernet connection using the MODBUS over TCP/IP protocol. The plant DCS can read and display the following measurements taken by the S5:

- 1) System voltages
- 2) System current
- 3) String Currents/Voltages
- 4) Ambient temperature
- 5) Unit float voltage
- 6) Unit temperature
- 7) Unit Impedance

As soon as the MODBUS Master connects, the MODBUS holding registers for measurements numbered 1 through 7 are the values taken at the last impedance read. Then measurements numbered 1 through 7 are updated to the MODBUS holding registers every minute. This update happens even when the S5 is in discharge mode. Unit Impedance is updated to the MODBUS holding registers at a rate configured by the user. During an impedance measurement, measurements numbered 1 through 6 are not updated. There are a couple of MODBUS registers that indicate when the last impedance measurement was taken.

All data values are supplied to the registers pre-scaled.

Logged Discharge data is not but reported via MODBUS.

All MODBUS holding registers are **read only**, meaning the DCS can only interrogate the S5 and not configure the S5. The DCS, via MODBUS, cannot clear alarms in the S5. All configurations and alarm resets are done with the BVM software through another connection to the S5. The DCS can examine a couple of MODBUS registers that indicate how the S5 was configured. They are location, number of strings, and units per string.

In addition to the above measurements, the S5 also lets the DCS obtain status of the S5 through output coil registers. The status coils are:

- 1) Maintenance Alarm
- 2) Critical Alarm
- 3) Equipment error

- 4) In Discharge
- 5) Discharge detect enabled
- 6) In Standby
- 7) Impedance measure in progress
- 8) Discharge memory full
- 9) Load plate connected
- 10) Alarm network connect
- 11) BVM network connect

The S5 updates a set of registers if an alarm occurred. The last 32 alarms can be monitored by the DCS. Once the 32 alarm registers are filled, the S5 can accept no more alarms. These can only be cleared by using the BVM software. The S5 can still report an alarm to an OBSERVER that is connected to the network. The socket connection to the MODBUS master remains open during the conversation from S5 to OBSERVER. The registers can be read but are not updated until OBSERVER closes the network connection.

The BVM software can connect to the S5 while the MODBUS master is connected to the S5. The socket connection to the MODBUS master remains open during the conversation from the S5 to BVM software. The registers can be read but are not updated till BVM software closes the network connection.

2.0 Configuration

The S5 IP address is set up with the BVM Software. It can be a fixed IP address or can obtain an IP address from a server using DHCP. The S5 has a fixed port address for MODBUS and is 502. The MODBUS slave address is 1. On power-up the S5 opens two sockets for either the BVM software or the DCS. Whichever connects first will have sole control of the S5 and the other will have to wait till that session is closed.

MODBUS REGISTERS

Name	Address	Type	Comment
Location	40001	Integer	
Number of Strings	40002	Integer	
Number Units per String	40003	Integer	
System Voltage	40004	Float	(volts)
System Current	40006	Float	(a)
Ambient Temperature	40008	Float	(deg c)
String Current 1	40010	Float	(a)
String Current 2	40012	Float	(a)
String Current 3	40014	Float	(a)
String Current 4	40016	Float	(a)
String Current 5	40018	Float	(a)
String Current 6	40020	Float	(a)
String Current 7	40022	Float	(a)
Unit Float Voltage 1	40024	Float	(volts)
Unit Float Voltage 2	40026	Float	(volts)
Unit Float Voltage 3	40028	Float	(volts)
Unit Float Voltage 4	40030	Float	(volts)
...			
Unit Float Voltage 498	41018	Float	(volts)
Unit Float Voltage 499	41020	Float	(volts)
Unit Float Voltage 500	41022	Float	(volts)

Unit Temperature 1	41024	Float	(deg c)
Unit Temperature 2	41026	Float	(deg c)
Unit Temperature 3	41028	Float	(deg c)
Unit Temperature 4	41030	Float	(deg c)
...			
Unit Temperature 496	42016	Float	(deg c)
Unit Temperature 498	42018	Float	(deg c)
Unit Temperature 499	42020	Float	(deg c)
Unit Temperature 500	42022	Float	(deg c)
Impedance Measure Year	42024	Integer	Last done
Impedance Measure Month	42025	Integer	
Impedance Measure Day	42026	Integer	
Impedance Measure Hour	42027	Integer	Time in UTC
Impedance Measure Minute	42028	Integer	Time in UTC
Unit Impedance 1	42029	Float	(milliohms)
Unit Impedance 2	42031	Float	(milliohms)
Unit Impedance 3	42033	Float	(milliohms)
Unit Impedance 4	42035	Float	(milliohms)
...			
Unit Impedance 498	43023	Float	(milliohms)
Unit Impedance 499	43025	Float	(milliohms)
Unit Impedance 500	43027	Float	(milliohms)

Alarm 1 Year	43029	Integer	
Alarm 1 Month	43030	Integer	
Alarm 1 Day	43031	Integer	
Alarm 1 Hour	43032	Integer	
Alarm 1 Minute	43033	Integer	
Alarm 1 Seconds	43034	Integer	
Alarm 1 String	43035	Integer	
Alarm 1 Unit	43036	Integer	
Alarm 1 Type	43037	Integer	See Chart Below
Alarm 1 Number	43038	Integer	See Chart Below
Alarm 1 Value	43039	float	See Chart Below
...			
Alarm 32 Year	43401	Integer	
Alarm 32 Month	43402	Integer	
Alarm 32 Day	43403	Integer	
Alarm 32 Hour	43404	Integer	Time in UTC
Alarm 32 Minute	43405	Integer	Time in UTC
Alarm 32 Seconds	43406	Integer	
Alarm 32 String	43407	Integer	
Alarm 32 Unit	43408	Integer	
Alarm 32 Type	43409	Integer	See Chart Below
Alarm 32 Number	43410	Integer	See Chart Below
Alarm 32 Value	43411	float	See Chart Below

Maintenance Alarm	00001	(1or 0)	
Critical Alarm	00002	(1or 0)	
Equipment Error	00003	(1or 0)	
In Discharge	00004	(1or 0)	
Discharge Detect Enable	00005	(1or 0)	
In Standby	00006	(1or 0)	
Initial Impedance Mode	00007	(1or 0)	
Measuring Impedance	00008	(1or 0)	
Discharge Memory Full	00009	(1or 0)	
Load Plate Connected	00010	(1or 0)	
Watch Dog	00011	(1or 0)	When set by DCS, S5 resets
Alarm Connect	00012	(1 or 0)	No Updates during Alarm Connect
BVM Connect	00013	(1 or 0)	No Updates during BVM connect

3.0 Alarm Definitions

Alarm	Type	Number	Value	Notes
Discharge	1	Blank	Blank	
System Voltage	2	Blank	Voltage	
Ambient Temperature	3	Blank	Temp	
Ground Fault	4	Blank	Value	
Unit Voltage – Critical	5	Blank	Voltage	String, Unit
Unit Voltage - Maintenance	6	Blank	Voltage	String, Unit
Unit Impedance Average - Critical	7	Blank	Impedance	String, Unit
Unit Impedance Average - Maintenance	8	Blank	Impedance	String, Unit
Unit Impedance Initial - Critical	9	Blank	Impedance	String, Unit
Unit Impedance Initial - Maintenance	10	Blank	Impedance	String, Unit
Unit Temperature	11	Blank	Temp	String, Unit
Unit Temperature - Differential	12	Blank	Temp Difference	String, Unit
String Voltage	13	Blank	Voltage	String #
Aux Alarm 1	14	Blank	Blank	
Aux Alarm 2	15	Blank	Blank	
Aux Alarm 3	16	Blank	Blank	
Aux Alarm 4	17	Blank	Blank	
Wrong Number of Voltage Modules	18	Number	Blank	
Wrong Number of Discharge Current Modules	19	Number	Blank	
Communication Error with Voltage Module	20	Module #	Blank	
Communication Error with Current Module	21	Module #	Blank	
Unknown Type of Module	22	Module #	Blank	
Corrupted Configuration	23	Reason	Blank	1 = Bad checksum 2 = Value out of limits
Hardware Failure	24	Serial port	Blank	1 = Network or front panel 2 = Modem 3 = Module port
Backup Battery	25	Blank	Voltage	
Module Initialization Failure	26	Physical probe position		
Modem Failure	27			
Modem Line Failure	28			
Invalid Communication's Configuration	29			
Network controller is missing	30			
Number of units found is not equal to the amount specified. (voltage modules)	31	Module #	# of Voltages found	
Number of temperatures found is not equal to the amount specified. (voltage and temp module)	32	Module #	# of Temperatures found	
Temperature Sensor	33	Sensor Number	Temperature	
Temperature Sensor – Differential	34	Sensor Number	Temperature Difference	
Module Relearn Connection Failure	35	Module #		
Impedance measurement aborted due to high voltage on positive half string.	101		Voltage	
Impedance measurement aborted due to low voltage on positive half string.	102		Voltage	
Impedance measurement aborted due to high voltage on negative half string.	103		Voltage	
Impedance measurement aborted due to low voltage on negative half string.	104		Voltage	
Impedance measurement aborted due to high load plate temperature.	105		Temp	
Impedance measurement aborted due to discharge	106			

