

**1.0 Scope**

This document explains how to set up Modbus communications on Cyberex SS4 units.

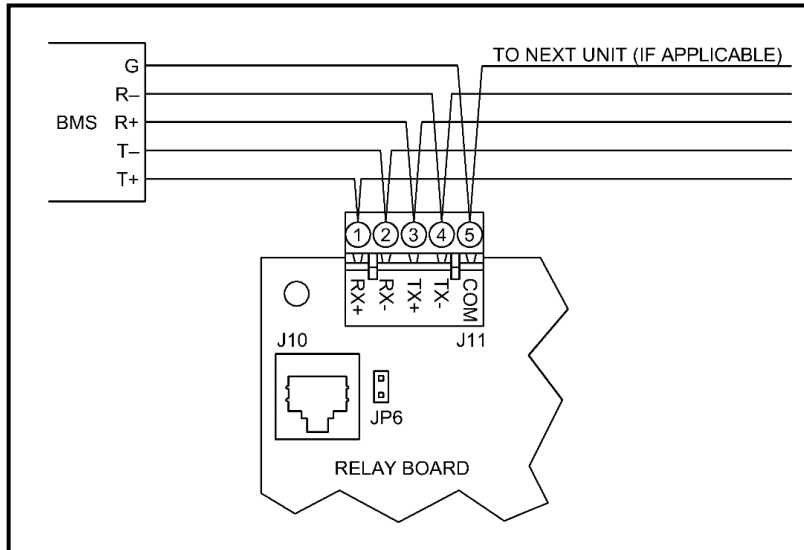
**2.0 Supported Platforms**

Modbus TCP and Modbus RTU (RS-485 2-Wire or 4-Wire) are supported. Regarding Modbus TCP, the SS4 can be accessed by up to four clients (masters) simultaneously.

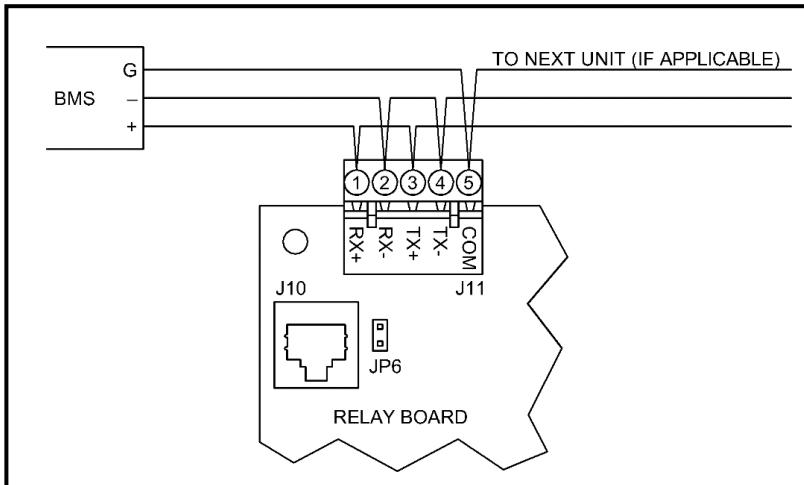
**3.0 Physical Connections**

The connectors for the user’s BMS are located on the User Interface Board aka Relay Board. On this board, J10 (an RJ45 jack) is provided for the Modbus TCP connection, and J11 is provided for the Modbus RTU connections. These connectors are shown below in Figure 3-1 and Figure 3-2.

The wiring for the two different Modbus RTU configurations (4-wire and 2-wire) are also shown below in Figure 3-1 and Figure 3-2. Also, note that the termination resistor jumper block, JP6, (also shown below) should usually be installed on the last unit on the bus, if needed. Pullup (to +3.3VDC) and pulldown resistors (2.7KΩ) are also provided on the FX-2G board on the display module, if needed. These are connected/disconnected by Jumper Blocks, JP4 (pullup) and JP5 (pulldown).



**Figure 3-1: Modbus RTU (RS-485) 4-Wire Wiring**



**Figure 3-2: Modbus RTU (RS-485) 2-Wire Wiring**

#### 4.0 The Modbus Configuration Screen

The Modbus configuration (Comm > Modbus) screen is shown below. To access this screen, you must be logged in as “admin” or higher, or the Security feature must be disabled.

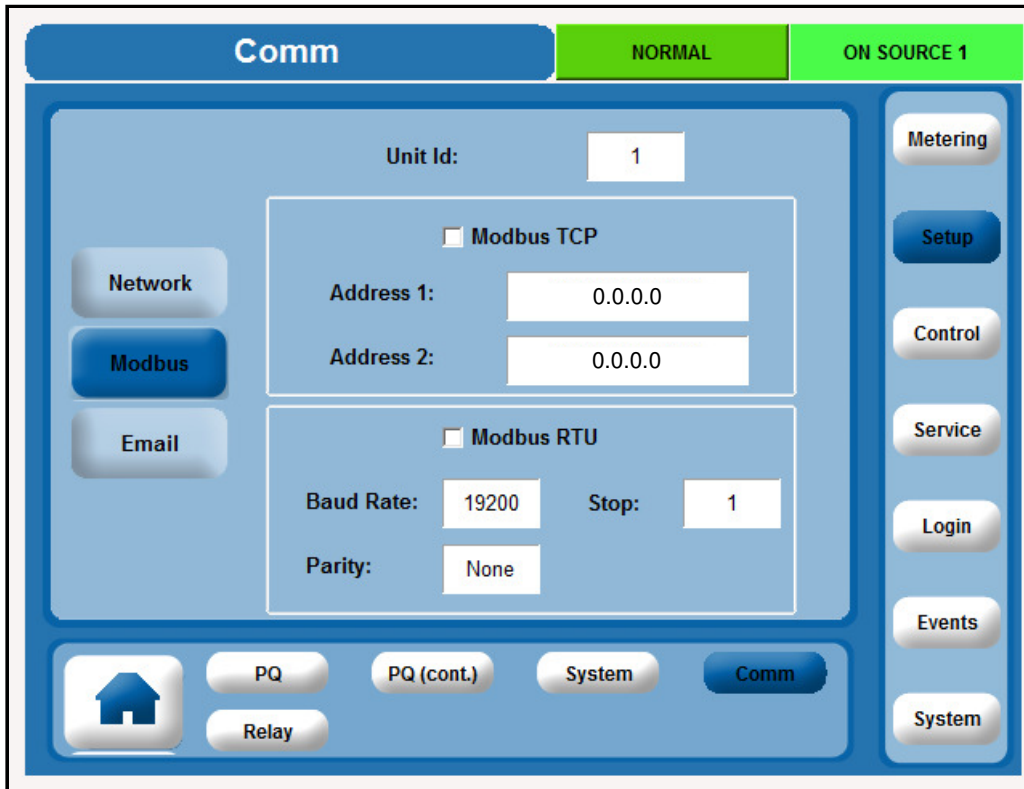


Figure 4-1: Modbus Configuration (Comm>Modbus) Screen

#### 4.1 Modbus TCP Configuration

When setting up for Modbus TCP communications, all you would need to do on this screen is to tick the “Modbus TCP” checkbox and press the “Save” button in the popup box that will appear. Another dialog box will then appear, stating that the display will now reboot.

Also, note that for Modbus TCP, the Unit ID is normally left at the default setting of “1”. The “Address 1” and “Address 2” settings are optional IP address settings that can be used for limiting Modbus TCP access to only one or two clients. If both settings are set to the default (0.0.0.0), then the unit can be accessed by up to four clients, regardless of their IP addresses (if they are on the same subnet as the SS4). If any one or both settings are not set to “0.0.0.0”, then the SS4 can be accessed only by clients with an IP address that matches the IP address in either of these two boxes (if they are on the same subnet as the SS4). To enter IP addresses in these boxes, press the box and enter the IP address in the popup keypad, which will appear.

#### 4.2 Modbus RTU Configuration

The following Modbus configuration parameters are configurable via the GUI.

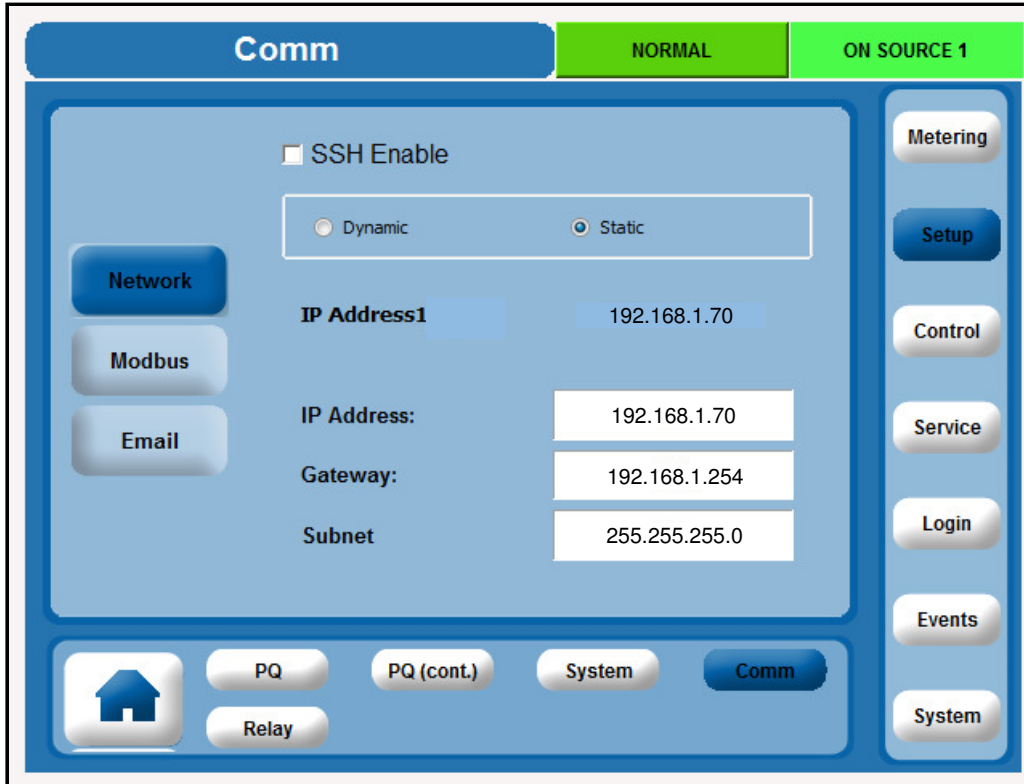
##### Configuration Settings

Parameter	Available Settings	Default
Baud	9600, 19200, 38400, 57600	19200
Parity	None, Even, Odd	None
Stop Bits	1, 2	1
Unit ID (Modbus Slave ID)	1-255	1

**5.0 Network Configuration (Comm>Network) Screen**

The network configuration (Comm > Network) screen is shown below. To access this screen, you must be logged in as “admin” or higher, or the Security feature must be disabled.

When using Modbus TCP, you should configure the SS4 with a static IP address in the screen below by selecting the “Static” radio button and entering the IP Address, Gateway, and Subnet settings that will work on the specific network. Note that the display does not need to reboot after the settings on this screen are changed.



**Figure 5-1: Network Configuration (Comm>Network) Screen**

**6.0 SS4 Modbus Register Map**

These registers are allocated as Modbus Holding Registers (4X references).

All registers are for read-only access, except for Registers 1305 thru 1307 and 1411 thru 1417, which have read/write access. (These registers are labeled as "R/W" in the table.) There is no security on these parameters.

The Modbus commands supported are “03” Read Holding Registers and “16” (10 Hex) Preset Multiple Holding Registers.

Data types that are indicated as "int16" in the register tables may be either signed or unsigned integers, except for Register No. 1009 (Phase Angle), which must be treated as a signed integer, since its value may be a negative number.

Items in the table below designated as the "float" data type are floating-point registers, which require reading two (2) registers. Floating-point numbers are expressed in the IEEE-754 (32-bit) format. The low-order 16-bit word is placed at the lower Modbus address and the high-order 16-bit word is placed at the higher Modbus address. For example, a reading of 60.0 Hz on Source 1 would be expressed as follows.

Reg. No.	Data (hex)
1007	0000
1008	4270

## Standard SS4 Modbus Registers

Reg. No.	Data Type	Description	Unit	Details
1001	int16 array	S1 Voltage, $\phi$ A-B	Volts	
1002	int16 array	S1 Current, $\phi$ A	Amps	
1003	int16 array	S1 Voltage, $\phi$ B-C	Volts	
1004	int16 array	S1 Current, $\phi$ B	Amps	
1005	int16 array	S1 Voltage, $\phi$ C-A	Volts	
1006	int16 array	S1 Current, $\phi$ C	Amps	
1007	float array	S1 Frequency	Hz	
1009	int16 (signed)	Phase Angle	Deg.	Can go positive and negative.
1010	int16	Output Voltage, $\phi$ A-B	Volts	
1011	int16	Output Voltage, $\phi$ B-C	Volts	
1012	int16	Output Voltage, $\phi$ C-A	Volts	
1019	float array	S1 kVA, $\phi$ A	kVA	
1021	float array	S1 kVA, $\phi$ B	kVA	
1023	float array	S1 kVA, $\phi$ C	kVA	
1025	int16 array	S1 Peak Current, $\phi$ A	Amps	
1027	int16 array	S1 Peak Current, $\phi$ B	Amps	
1029	int16 array	S1 Peak Current, $\phi$ C	Amps	
1035	float array	S1 kW, $\phi$ A	kW	
1037	float array	S1 kW, $\phi$ B	kW	
1039	float array	S1 kW, $\phi$ C	kW	
1041	int16	Cabinet Temperature	Flag	0 = Normal, 1 = Over
1042	int16 array	Heatsink #1 Temperature	Flag	0 = Normal, 1 = Over
1043	int16 array	S1 Input CB State	Flag	0 = Open, 1 = Closed
1044	int16	Load A CB State	Flag	0 = Open, 1 = Closed
1045	int16	Load B CB State	Flag	0 = Open, 1 = Closed
1046	int16 array	S1 Bypass CB State	Flag	0 = Open, 1 = Closed
1047	int16	Current Source	Flags	Bits 0-1: (00 = STS on S1, 01 = STS on S2, 11 = STS not on S1 or S2) * Bit 4: (Set = Gate Lock) Bit 5: (Set = Gate Hold) Bit 6: (Set = Overload Inhibit)
1048	int16	Output State	Flag	1 = Normal 2 = Output is Unavailable (< 25%) 3 = Output Voltage Low (< 70%) *
1049	float	Display Module Temperature	°C	
1051	int16 array	Fan State (The number of fans may vary between models.) *	Flags	Bit 0: Set = Fan #1 Failure Bit 1: Set = Fan #2 Failure Bit 2: Set = Fan #3 Failure Bit 3: Set = Fan #4 Failure Bit 4: Set = Fan #5 Failure Bit 5: Set = Fan #6 Failure

## Standard SS4 Modbus Registers

Reg. No.	Data Type	Description	Unit	Details
1052	int16 array	S1 SCR State	Flags	Bit 0: (0 = Off, 1 = On) Bit 4: (Set = Shorted) Bit 5: (Set = Open)
1053	int16 array	S1 Available	N/A	0 = Red, 1 = Amber, 2 = Green
1054	int16	Source Sync	N/A	0 = Out of Sync, 1 = In Sync
1055	int16	Door State (Not used on all units.)	Flag	0 = Closed, 1 = Open
1063	float array	S1 Power Factor, $\phi$ A	N/A	
1065	float array	S1 Power Factor, $\phi$ B	N/A	
1067	float array	S1 Power Factor, $\phi$ C	N/A	
1069	int16 array	S1 Voltage, $\phi$ A-N	Volts	
1070	int16 array	S1 Voltage, $\phi$ B-N	Volts	
1071	int16 array	S1 Voltage, $\phi$ C-N	Volts	
1073	float array	S1 kVA, Total	kVA	
1075	float array	S1 kW, Total	kW	
1077	float array	S1 Power Factor, Total	N/A	
1079	float	Output kVA, $\phi$ A	kVA	
1081	float	Output kVA, $\phi$ B	kVA	
1083	float	Output kVA, $\phi$ C	kVA	
1085	float	Output kVA, Total	kVA	
1087	float	Output kWh, Total	kWh	
1089	float	Output kVA Demand, $\phi$ A	kVA	
1091	float	Output kVA Demand, $\phi$ B	kVA	
1093	float	Output kVA Demand, $\phi$ C	kVA	
1095	float	Output kVA Demand, Total	kVA	
1097	int16	Output Voltage, $\phi$ A-N	Volts	
1098	int16	Output Voltage, $\phi$ B-N	Volts	
1099	int16	Output Voltage, $\phi$ C-N	Volts	
1101	float array	S1 Voltage THD, $\phi$ A-B	%	
1103	float array	S1 Voltage 3rd Harmonic, $\phi$ A-B	%	
1105	float array	S1 Voltage 5th Harmonic, $\phi$ A-B	%	
1107	float array	S1 Voltage 7th Harmonic, $\phi$ A-B	%	
1109	float array	S1 Voltage 9th Harmonic, $\phi$ A-B	%	
1111	float array	S1 Voltage 11th Harmonic, $\phi$ A-B	%	
1113	float array	S1 Voltage 13th Harmonic, $\phi$ A-B	%	
1115	float array	S1 Voltage THD, $\phi$ B-C	%	
1117	float array	S1 Voltage 3rd Harmonic, $\phi$ B-C	%	
1119	float array	S1 Voltage 5th Harmonic, $\phi$ B-C	%	
1121	float array	S1 Voltage 7th Harmonic, $\phi$ B-C	%	
1123	float array	S1 Voltage 9th Harmonic, $\phi$ B-C	%	
1125	float array	S1 Voltage 11th Harmonic, $\phi$ B-C	%	
1127	float array	S1 Voltage 13th Harmonic, $\phi$ B-C	%	

## Standard SS4 Modbus Registers

Reg. No.	Data Type	Description	Unit	Details
1129	float array	S1 Voltage THD, $\phi$ C-A	%	
1131	float array	S1 Voltage 3rd Harmonic, $\phi$ C-A	%	
1133	float array	S1 Voltage 5th Harmonic, $\phi$ C-A	%	
1135	float array	S1 Voltage 7th Harmonic, $\phi$ C-A	%	
1137	float array	S1 Voltage 9th Harmonic, $\phi$ C-A	%	
1139	float array	S1 Voltage 11th Harmonic, $\phi$ C-A	%	
1141	float array	S1 Voltage 13th Harmonic, $\phi$ C-A	%	
1143	float array	S1 Current THD, $\phi$ A	%	
1145	float array	S1 Current 3rd Harmonic, $\phi$ A	%	
1147	float array	S1 Current 5th Harmonic, $\phi$ A	%	
1149	float array	S1 Current 7th Harmonic, $\phi$ A	%	
1151	float array	S1 Current 9th Harmonic, $\phi$ A	%	
1153	float array	S1 Current 11th Harmonic, $\phi$ A	%	
1155	float array	S1 Current 13th Harmonic, $\phi$ A	%	
1157	float array	S1 Current THD, $\phi$ B	%	
1159	float array	S1 Current 3rd Harmonic, $\phi$ B	%	
1161	float array	S1 Current 5th Harmonic, $\phi$ B	%	
1163	float array	S1 Current 7th Harmonic, $\phi$ B	%	
1165	float array	S1 Current 9th Harmonic, $\phi$ B	%	
1167	float array	S1 Current 11th Harmonic, $\phi$ B	%	
1169	float array	S1 Current 13th Harmonic, $\phi$ B	%	
1171	float array	S1 Current THD, $\phi$ C	%	
1173	float array	S1 Current 3rd Harmonic, $\phi$ C	%	
1175	float array	S1 Current 5th Harmonic, $\phi$ C	%	
1177	float array	S1 Current 7th Harmonic, $\phi$ C	%	
1179	float array	S1 Current 9th Harmonic, $\phi$ C	%	
1181	float array	S1 Current 11th Harmonic, $\phi$ C	%	
1183	float array	S1 Current 13th Harmonic, $\phi$ C	%	
1190	int16	Fan 1 Speed	RPM	
1191	int16	Fan 2 Speed	RPM	
1192	int16	Fan 3 Speed	RPM	
1193	int16	Fan 4 Speed	RPM	
1194	int16	Fan 5 Speed	RPM	
1195	int16	Fan 6 Speed	RPM	
1301	int16	Input Voltage Rating	Volts	Range: 120-600
1302	int16	Current Rating	Amps	Range: 0-10000
1303	float	Frequency Rating	Hz	Range: 50-60
1305	int16 (R/W)	Preferred Source **	N/A	0 = Source 1 1 = Source 2
1306	int16 (R/W)	Automatic Transfer **	Flag	0 = Disable 1 = Enable

## Standard SS4 Modbus Registers

Reg. No.	Data Type	Description	Unit	Details
1307	int16 (R/W)	Retransfer **	Flag	0 = Disable 1 = Enable
1308	int16	System Status	Flags	Bit 0: (Set = Summary Alarm) Bit 1: (Set = Summary Warning) Bit 2: (Set = Unacknowledged Events) Bit 8: (Set = STS on Alternate)
1309	int16	Output Voltage Rating	Volts	Range: 120-600
1310	int16	Transfer Count	N/A	
1311	int16	Transfer Count User	N/A	
1312	int16	Power Supply Failure	Flags	Bit 0: (Set = 24V) Bit 1: (Set = DC) Bit 2: (Set = AC) Bit 3: (Set = PS2) Bit 4: Not Used * Bit 5: (Set = 28v1) Bit 6: (Set = 28v2) Bit 7: (Set = 5v1) Bit 8: (Set = 5v2) Bit 9: (Set = 3.85V1) Bit 10: (Set = 3.85V2)
1313	int16	RMS Overload Inhibit	Flag	Bit 0: (Set = Overload Inhibit)
1314	int16	TVSS Fault	Flags	Bit 0: (Set = Fault on Source 1) Bit 1: (Set = Fault on Source 2)
1315	int16	Phase CT Scale	Amps	
1316	int16	Neutral CT Scale	Amps	
1411	int16 (R/W)	Month (1-12)	N/A	
1412	int16 (R/W)	Day (1-31)	N/A	
1413	int16 (R/W)	Year (1970-2030)	N/A	
1414	int16 (R/W)	Hours (0-23)	N/A	
1415	int16 (R/W)	Minutes (0-59)	N/A	
1416	int16 (R/W)	Seconds (0-59)	N/A	
1417	int16 (R/W)	Milliseconds (0-999)	N/A	
2001	int16 array	S2 Voltage, $\phi$ A-B	Volts	
2002	int16 array	S2 Current, $\phi$ A	Amps	
2003	int16 array	S2 Voltage, $\phi$ B-C	Volts	
2004	int16 array	S2 Current, $\phi$ B	Amps	
2005	int16 array	S2 Voltage, $\phi$ C-A	Volts	
2006	int16 array	S2 Current, $\phi$ C	Amps	
2007	float array	S2 Frequency	Hz	
2019	float array	S2 kVA, $\phi$ A	kVA	
2021	float array	S2 kVA, $\phi$ B	kVA	
2023	float array	S2 kVA, $\phi$ C	kVA	
2025	int16 array	S2 Peak Current, $\phi$ A	Amps	
2027	int16 array	S2 Peak Current, $\phi$ B	Amps	
2029	int16 array	S2 Peak Current, $\phi$ C	Amps	

## Standard SS4 Modbus Registers

Reg. No.	Data Type	Description	Unit	Details
2035	float array	S2 kW, $\phi$ A	kW	
2037	float array	S2 kW, $\phi$ B	kW	
2039	float array	S2 kW, $\phi$ C	kW	
2043	int16 array	S2 Input CB State	Flag	0 = Open, 1 = Closed
2046	int16 array	S2 Bypass CB State	Flag	0 = Open, 1 = Closed
2052	int16 array	S2 SCR State	Flags	Bit 0: (0 = Off, 1 = On) Bit 4: (Set = Shorted) Bit 5: (Set = Open)
2053	int16 array	S2 Available	N/A	0 = Red, 1 = Amber, 2 = Green
2063	float array	S2 Power Factor, $\phi$ A	N/A	
2065	float array	S2 Power Factor, $\phi$ B	N/A	
2067	float array	S2 Power Factor, $\phi$ C	N/A	
2069	int16 array	S2 Voltage, $\phi$ A-N	Volts	
2070	int16 array	S2 Voltage, $\phi$ B-N	Volts	
2071	int16 array	S2 Voltage, $\phi$ C-N	Volts	
2073	float array	S2 kVA, Total	kVA	
2075	float array	S2 kW, Total	kW	
2077	float array	S2 Power Factor, Total	N/A	
2101	float array	S2 Voltage THD, $\phi$ A-B	%	
2103	float array	S2 Voltage 3rd Harmonic, $\phi$ A-B	%	
2105	float array	S2 Voltage 5th Harmonic, $\phi$ A-B	%	
2107	float array	S2 Voltage 7th Harmonic, $\phi$ A-B	%	
2109	float array	S2 Voltage 9th Harmonic, $\phi$ A-B	%	
2111	float array	S2 Voltage 11th Harmonic, $\phi$ A-B	%	
2113	float array	S2 Voltage 13th Harmonic, $\phi$ A-B	%	
2115	float array	S2 Voltage THD, $\phi$ B-C	%	
2117	float array	S2 Voltage 3rd Harmonic, $\phi$ B-C	%	
2119	float array	S2 Voltage 5th Harmonic, $\phi$ B-C	%	
2121	float array	S2 Voltage 7th Harmonic, $\phi$ B-C	%	
2123	float array	S2 Voltage 9th Harmonic, $\phi$ B-C	%	
2125	float array	S2 Voltage 11th Harmonic, $\phi$ B-C	%	
2127	float array	S2 Voltage 13th Harmonic, $\phi$ B-C	%	
2129	float array	S2 Voltage THD, $\phi$ C-A	%	
2131	float array	S2 Voltage 3rd Harmonic, $\phi$ C-A	%	
2133	float array	S2 Voltage 5th Harmonic, $\phi$ C-A	%	
2135	float array	S2 Voltage 7th Harmonic, $\phi$ C-A	%	
2137	float array	S2 Voltage 9th Harmonic, $\phi$ C-A	%	
2139	float array	S2 Voltage 11th Harmonic, $\phi$ C-A	%	
2141	float array	S2 Voltage 13th Harmonic, $\phi$ C-A	%	
2143	float array	S2 Current THD, $\phi$ A	%	
2145	float array	S2 Current 3rd Harmonic, $\phi$ A	%	
2147	float array	S2 Current 5th Harmonic, $\phi$ A	%	



## Standard SS4 Modbus Registers

Reg. No.	Data Type	Description	Unit	Details
2149	float array	S2 Current 7th Harmonic, $\varnothing A$	%	
2151	float array	S2 Current 9th Harmonic, $\varnothing A$	%	
2153	float array	S2 Current 11th Harmonic, $\varnothing A$	%	
2155	float array	S2 Current 13th Harmonic, $\varnothing A$	%	
2157	float array	S2 Current THD, $\varnothing B$	%	
2159	float array	S2 Current 3rd Harmonic, $\varnothing B$	%	
2161	float array	S2 Current 5th Harmonic, $\varnothing B$	%	
2163	float array	S2 Current 7th Harmonic, $\varnothing B$	%	
2165	float array	S2 Current 9th Harmonic, $\varnothing B$	%	
2167	float array	S2 Current 11th Harmonic, $\varnothing B$	%	
2169	float array	S2 Current 13th Harmonic, $\varnothing B$	%	
2171	float array	S2 Current THD, $\varnothing C$	%	
2173	float array	S2 Current 3rd Harmonic, $\varnothing C$	%	
2175	float array	S2 Current 5th Harmonic, $\varnothing C$	%	
2177	float array	S2 Current 7th Harmonic, $\varnothing C$	%	
2179	float array	S2 Current 9th Harmonic, $\varnothing C$	%	
2181	float array	S2 Current 11th Harmonic, $\varnothing C$	%	
2183	float array	S2 Current 13th Harmonic, $\varnothing C$	%	

\* Changes since the previous rev. (09/07/17)

\*\* When writing to Registers 1305, 1306, or 1307, the new settings are not automatically saved in memory, so they may be lost if the display module is rebooted.

## Date and Time Registers (1411 – 1417)

This SS4's Data and Time Modbus Registers implementation provides for a BMS "broadcast" capability for synchronizing the system clocks on all connected SS4 units. The broadcast command will be "Preset Multiple Registers" of seven (7) contiguous Modbus holding registers, beginning at 1411, with a Unit ID of "0". No response will be issued back from the switches for this packet. The switch will then use that data for its real-time clock until new data is received.

**Note:** There will be an indeterminate delay between the time the host starts to send the message and the time the message transmission is complete and the unit responds to set the clock. Due to the complexity of time and calendar calculations, the unit will not attempt to correct this deviation, which shall not be more than one (1) second.