SureSine-300 Modbus Specification
Morningstar Corporation

V03
29 October 2008

History

V02	Public Release
V03	Error in voltage scaling. 2^-15 → 2^-16

Parameters

The SureSine-300 supports communication via its RJ-11 meter (MeterBus) interface uses the industry standard MODBUS application protocol. A Morningstar *PC Meterbus Adapter*** is required to convert the meter port signals to valid RS-232 signals. This document assumes the user is familiar with the MODBUS protocol and its terminology. Please refer to the documents listed in the References section for more information.

**** The MeterBus Adapater (model: MSC) is a Morningstar accessory available through your local dealer.**

The TriStar supports RTU mode only.
16bit MODBUS addresses (per the modbus.org spec)
The serial communication parameters are

- BPS: 9600 baud
- Parity: None
- Data bits: 8
- Stop bits: 2
- Flow control: None

All addresses listed are for the request PDU.
The TriStar defaults to server address of 0x01.

Supported Modbus Functions

Read Holding Registers (0x03), Read Input Registers (0x04), Write Single Register (0x06)

RAM

PDU Addr	Logical Addr	Variable name	Variable description	Units	Scaling or Range
0x0000	1	adc_vb	Battery voltage, unfiltered	V	$n \cdot 16.92 \cdot 2^{-16}$
0x0001	2	adc_iac	AC output current, unfiltered **	A	$n \cdot (6.4 \text{ or } 17) \cdot 2^{-15}$
0x0002	3	adc_ths	Heatsink thermistor voltage, unfiltered	-	
0x0003	4	adc_remon	Remote on terminal voltage, unfiltered	-	
0x0004	5	Vb	Battery voltage, slow filter ($\tau \approx$?s)	V	$n \cdot 16.92 \cdot 2^{-16}$
0x0005	6	Iac	AC output current, filtered		$n \cdot (6.4 \text{ or } 17) \cdot 2^{-15}$
0x0006	7	Ths	Heatsink temperature	ºC	-128 to +127
0x0007	8	fault	fault bitfield	-	
0x0008	9	alarm	alarm bitfield	-	
0x0009	10	*Not Used*	*Not Used*	-	
0x000A	11	dip_switch	dip switch settings at power on switch[1..8] in bits[0..7]	-	
0x000B	12	load_state	Load state	-	
0x000C	13	mod_index	Modulation index (slow) (0xFF = 100%)	%	$n \cdot 100 \cdot 2^{-8}$
0x000D	14	volts	Output voltage setting	V	n
0x000E	15	Hz	Output frequency setting	Hz	n
0x000F	16	m_disconnect	(writeable) non-zero value will turn off control	-	
0x0010	17	modbus_reset	(writeable) writing non-zero value will reset the control	-	

** Iac full scale is 6.4 A for 220V, 17A for 115/127V versions

EEPROM

Any write to EEPROM will set an "EEPROM changed" fault. The control must be reset to clear this fault.

Note: No verify is performed on the write.

PDU Addr	Logical Addr	Variable name	Variable description	Write allowed	Units	Scaling or Range
0xE000	57345	EVb_min	Minimum battery voltage		V	$n \cdot 16.92 \cdot 2^{-16}$
0xE001	57346	EVb_maxn	Maximum battery voltage		V	$n \cdot 16.92 \cdot 2^{-16}$
0xE002	57347	Emodbus_id	Suresine modbus ID	✓	-	1-247
0xE003	57348	Emeter_id	Suresine meter ID	✓	-	1-15
0xE004	57349	Ev_lvd2	Low Voltage Disconnect 2	✓	V	$n \cdot 16.92 \cdot 2^{-16}$
0xE005	57350	Ev_lvr2	Low Voltage Reconnect 2	✓	V	$n \cdot 16.92 \cdot 2^{-16}$
0xE006	57351	Ev_hvd2	High Voltage Disconnect 2	✓	V	$n \cdot 16.92 \cdot 2^{-16}$
0xE007	57352	Ev_hvr2	High Voltage Reconnect 2	✓	V	$n \cdot 16.92 \cdot 2^{-16}$
0xE008	57353	Et_lvd_warn2	LVD warning timer 2	✓	S	n/10.0
0xE009	57354	Ev_lvdwarn_beep2	LVD beeper limit 2	✓	V	$n \cdot 16.92 \cdot 2^{-16}$
0xE00A	57355	Ev_lvrwarn_beep2	LVD beeper reset limit 2	✓	V	$n \cdot 16.92 \cdot 2^{-16}$
0xE00B	57356	Ev_startlvd2	Start LVD setting 2	✓	V	$n \cdot 16.92 \cdot 2^{-16}$
0xE02D-0xE03F	57390-57408	reserved	read or write not allowed			
0xE040	57409	Ehourmeter			hr	
0xE041-0xE043		Reserved				
0xE044-0xE047-	57413-57416	Eserial_no			-	

Read Device Identification (0x2B, subcode 0x0E)

Only supports "basic device identification (stream access)" (ID code 0x01)

Object Id	Object Name/Description	Typical Value
0x00	VendorName	"Morningstar Corp."
0x01	Product Code	"SureSine300"
0x02	MajorMinorRevision (hardware major.minor. software revision)	"v01.01.01"

Variables and Definitions

Variable_name
[Logical Address][PDU Address] (Units). Short description.
Definition.

adc_vb
[00001][0x0000] (V). Battery Voltage, unfiltered.
DC input voltage.

adc_iac
[00002][0x0001] (A). AC output current, unfiltered.
Total AC output current supplied to AC loads.

adc_ths
[00003][0x0002] (V). Heatsink thermistor voltage, unfiltered.
Voltage output from heatsink temperature circuit. Not reported heatsink temperature, see Ths variable.

adc_remon
[00004][0x0003] (V). Remote On/Off terminal voltage.
Voltage across Remote On/Off terminals. 0V = AC On or Standby.

Vb
[00005][0x0004] (V). Battery Voltage, filtered.
DC input voltage with slow filter.

Iac
[00006][0x0005] (A). AC output current, filtered.
Total AC output current supplied to AC loads, with slow filter.

Ths
[00007][0x0006] (C). Heatsink temperature.
Internal heatsink temperature used for over-temperature protection. Reported in degrees C.

Fault
[00008][0x0007] (bitfield). SureSine Faults.
Each bit in the fault bitfield corresponds to a fault as outlined in the table below. A fault is a critical error that ceases inverter operation.
0 = no fault. 1 = fault condition.

Bit	Fault
0 (LSB)	Reset
1	Over-current
2	*not used*

3	Software
4	HVD
5	Hot (heatsink temp. over 95 C)
6	DIP switch
7	Settings Edit

Alarm

[00009][0x0008] (bitfield). SureSine Alarms.
Each bit in the alarm bitfield corresponds to an alarm as outlined in the table below. An alarm is a non-critical error that does not cease inverter operation.
0 = no alarm. 1 = alarm condition.

Bit	Alarm
0 (LSB)	Heatsink temp. sensor open
1	Heatsink temp. sensor shorted
2	*not used*
3	Heatsink hot (above 80 C)

dip_switch

[00011][0x000A] (bitfield). Dip Switch Configuration.
Each bit in the dipswitch bitfield indicates the position of one of the four DIP switches. A "0" value indicates Down or Off postion, a "1" indicates Up or On position. LSB = DIP switch #1.

load_state

[00012][0x000B] (unitless). Load State.
Reports a decimal number that corresponds to the operating state as follows:

load_state value	Operating State
0	Start-up
1	Load On
2	LVD Warning
3	LVD (Low voltage Disconnect)
4	Fault State
5	Load Disconnected *
6	Load Off
7	*not used*
8	Standby

*Disconnect state only entered by meter or modbus command. See *m_disconnect* register.

mod_index

[00013][0x000C] (%). Modulation Index.

volts

[00014][0x000D] (V). Output Voltage rating.

Nominal output voltage setting. Note: does not report actual output voltage.

hertz
[00014][0x000D] (Hz). Output Frequency rating.
Nominal AC output frequency setting. Note: does not report actual AC frequency.

m_disconnect
[00015][0x000E] (unitless). Modbus Disconnect register.
Writing a non-zero value to this register places the SureSine in *Disconnect* load state. AC output is disabled until a “0” value is written to the register.

modbus_reset
[00015][0x000E] (unitless). Modbus Reset register.
Writing a non-zero value to this register resets the SureSine (software reset). After reset, the register value is automatically returned to “0” value.

EVb_min
[57345][0xE000] (V). Minimum battery voltage.
Reports lowest battery input voltage since last reset. Ah reset command also resets battery min/max values.

EVb_max
[57346][0xE001] (V). Maximum battery voltage.
Reports highest battery input voltage since last reset. Ah reset command also resets battery min/max values.

Emodbus_id
[57347][0xE002] (unitless). Modbus Address.
Modbus Address / ID. Factory default = 1.

Emeter_id
[57348][0xE003] (unitless). MeterBus Address.
Morningstar MeterBus address. Factory default = 1.

EV_lvd2
[57349][0xE004] (V). Custom LVD.
Stores custom Low Voltage Disconnect setpoint. Set to “0” to disable.

EV_lvr2
[57349][0xE004] (V). Custom LVR.
Stores custom Low Voltage Reconnect setpoint.

EV_hvd2
[57350][0xE005] (V). Custom HVD.
Stores custom High Voltage Disconnect setpoint.

EV_hvr2
[57351][0xE006] (V). Custom HVR.
Stores custom High Voltage Reconnect setpoint.

EV_lvd_warn2
[57352][0xE007] (V). Custom LVD Warning threshold.
Custom low voltage disconnect warning threshold.

EV_lvd_warn_beep2
[57353][0xE008] (V). Custom LVD Beeper Warning threshold.
Custom low voltage beeper warning threshold. Set to “0” to disable.

EV_lvr_warn_beep2
[57354][0xE009] (V). Custom Reset Beeper Warning threshold.
Custom threshold voltage at which the beeper warning timer will be reset. Set to “0” to disable.

EV_startlvd2
[57355][0xE00A] (V). Custom Start LVD threshold.
Custom start-up low voltage disconnect setpoint. Voltage at which the SureSine will start directly into the LVD state. (should be less than or equal to the normal operation LVD setpoint) Set to “0” to disable.

Ehourmeter
[57356][0xE00B] (hr). Hour-meter
Counts hours of operation. Not writable.

Eserial_no
[57357][0xE00C] (unitless). Serial Number.
Factory serial number. Not writable.

References

- Modbus Protocol Reference Guide, Modicon, June 1996, PI-MODBUS-300 Rev.J
- Modbus Application Protocol Specification, modbus.org, 8May02, Modbus_application_protocol_v1