c UL us LISTED CE BTL *E51H5 only*

E51H2, E51H5

Bi-Directional Compact Power and Energy Meter with BACnet MS/TP Support

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Follow safe electrical work practices. See NFPA 70E in the USA, or applicable local codes.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Read, understand and follow the instructions before installing this product.
- Turn off all power supplying equipment before working on or inside the equipment.
- Any covers that may be displaced during the installation must be reinstalled before powering the unit.
- Use a properly rated voltage sensing device to confirm power is off. DO NOT DEPEND ON THIS PRODUCT FOR VOLTAGE INDICATION

Failure to follow these instructions will result in death or serious injury.

A qualified person is one who has skills and knowledge related to the construction and operation of this electrical equipment and the installation, and has received safety training to recognize and avoid the hazards involved. NEC Article 100

No responsibility is assumed by Veris Industries for any consequences arising out of the use of this material.

The safety of any system incorporating this equipment is the responsibility of the assembler of the system.

Control system design must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to acheive a safe state during and after a path failure. Examples of critical control functions are emergency stop and over-travel stop.

⚠ WARNING

LOSS OF CONTROL

- Assure that the system will reach a safe state during and after a control path failure.
- Separate or redundant control paths must be provided for critical control functions.
- Test the effect of transmission delays or failures of communication links.[1]
- Each implementation of equipment using communication links must be individually and thoroughly tested for proper operation before placing it in service.

Failure to follow these instructions may cause injury, death or equipment damage.

[1]For additional information about anticipated transmission delays or failures of the link, refer to NEMA ICS 1.1 (latest edition). *Safety Guidelines for the Application, Installation, and Maintenance of Solid-State Control* or its equivalent in your specific country, language, and/or location.

NOTICE

- **This product is not intended for life or safety applications.**
- **Do not install this product in hazardous or classified locations.**
- **The installer is responsible for conformance to all applicable codes.**
- **Mount this product inside a suitable fire and electrical enclosure.**

FCC PART 15 INFORMATION

NOTE: This equipment has been tested by the manufacturer and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

Modifications to this product without the express authorization of the manufacturer nullify this statement.

For use in a Pollution Degree 2 or better environment only. A Pollution Degree 2 environment must control conductive pollution and the possibility of condensation or high humidity. Consider the enclosure, the correct use of ventilation, thermal properties of the equipment, and the relationship with the environment. Installation category: CAT II or CAT III. Provide a disconnect device to disconnect the meter from the supply source. Place this device in close proximity to the equipment and within easy reach of the operator, and mark it as the disconnecting device. The disconnecting device shall meet the relevant requirements of IEC 60947-1 and IEC 60947-3 and shall be suitable for the application. In the US and Canada, disconnecting fuse holders can be used. Provide overcurrent protection and disconecting device for supply conductors with approved current limiting devices suitable for protecting the wiring. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the device may be impaired.

Product Overview

The E51H2 and E51H5 DIN rail power meters provide a solution for measuring energy data with a single device. Inputs include control power, CT, and 3-phase voltage. Both models support BACnet MS/TP protocol. The E51H2 has one pulse contact input and a phase loss alarm output. The E51H5 has data logging capability and two pulse contact inputs. The LCD screen on the faceplate allows instant output viewing.

The E51 meters are capable of bidirectional metering. Power is monitored in both directions (upstream and downstream from the meter). The meter is housed in a plastic enclosure suitable for installation on T35 DIN rail according to EN 50022. The E51 can be mounted either on a DIN rail or in a panel. **Observe correct CT orientation when installing the device.**

Product Identification

Model	BACnet MS/TP Protocol Output	Alarm Output	Full Data Set	Data Logging	Pulse Input
E51H2	•	•	•		•
E51H5	•		•	•	• (2 pulses)

Specifications

MEASUREMENT ACCURACY	
Real Power and Energy	IEC 62053-22 Class 0.2S, ANSI C12.20 0.2%
Reactive Power and Energy	IEC 62053-23 Class 2, 2%
Current	0.2% (+0.005% per °C deviation from 25°C) from 1% to 5% of range; 0.1% (+0.005% per °C deviation from 25°C) from 5% to 100% of range
Voltage	0.1% (+0.005% per °C deviation from 25°C) from 90 Vac_{L-N} to 600 Vac_{L-L}
Sample Rate	2520 samples per second; no blind time
Data Update Rate	1 sec.
Type of Measurement	True RMS; one to three phase AC system
INPUT VOLTAGE CHARACTERISTICS	
Measured AC Voltage	Minimum 90 V_{L-N} (156 V_{L-L}) for stated accuracy; UL Maximums: 600 V_{L-L} (347 V_{L-N}); CE Maximum: 300 V_{L-N}
Metering Over-Range	+20%
Impedance	2.5 $M\Omega_{L-N}$ /5 $M\Omega_{L-L}$
Frequency Range	45 to 65 Hz
INPUT CURRENT CHARACTERISTICS	
CT Scaling	Primary: Adjustable from 5 A to 32,000 A
Measurement Input Range	0 to 0.333 Vac or 0 to 1.0 Vac (+20% over-range), rated for use with Class 1 voltage inputs
Impedance	10.6 kΩ (1/3 V mode) or 32.1 kΩ (1 V mode)

Specifications (cont.)

CONTROL POWER	
AC	5 VA max.; 90V min.; UL Maximums: 600 V_{L-L} (347 V_{L-N}); CE Maximum: 300 V_{L-N}
DC*	3 W max.; UL and CE: 125 to 300 Vdc
Ride Through Time	100 msec at 120 Vac
INPUT	
Pulse	Solid-state or mechanical contacts (current less than 1 mA) E51H2: 1 pulse input; E51H5: 2 pulse inputs
Minimum Pulse Width	20 msec
OUTPUT	
Alarm Contacts (E51H2 only)	N.C., static output (30 Vac/dc, 100 mA max. @ 25 °C, derate 0.56 mA per °C above 25 °C)
RS-485 Port	2-wire, 9600 to 115.2 kbaud, BACnet MS/TP
MECHANICAL CHARACTERISTICS	
Weight	0.62 lb (0.28 kg)
IP Degree of Protection (IEC 60529)	IP40 front display; IP20 meter
Display Characteristics	Back-lit blue LCD
Terminal Block Screw Torque	0.37 to 0.44 ft-lb (0.5 to 0.6 N·m)
Terminal Block Wire Size	24 to 14 AWG (0.2 to 2.1 mm^2)
Rail	T35 (35mm) DIN Rail per EN 50022
OPERATING CONDITIONS	
Operating Temperature Range	-30 to 70 °C (-22 to 158 °F)
Storage Temperature Range	-40 to 85 °C (-40 to 185 °F)
Humidity Range	<95% RH non-condensing
Altitude of Operation	3000 m
Mounting Location	Not suitable for wet locations. For indoor use only.
COMPLIANCE INFORMATION	
US and Canada	CAT III, Pollution Degree 2; for distribution systems up to 347V_{L-N} /600Vac_{L-L}
CE	CAT III, Pollution Degree 2; for distribution systems up to 300V_{L-N}
Dielectric Withstand	Per UL 508, IEC/EN 61010-1
Conducted and Radiated Emissions	FCC part 15 Class B, EN 55011/EN 61000 Class B (residential and light industrial)
Conducted and Radiated Immunity	EN 61000 Class A (heavy industrial)
US and Canada (cULus)	UL 508 (open type device)/CSA 22.2 No. 14-05
Europe (CE)	IEC/EN 61010-1

** External DC current limiting is required, see fuse recommendations.*

Legend

R/W	R=read only; R/W=read or write
NV	Value is stored in non-volatile memory. The value are still available if the meter experiences a power loss and reset.
Units	Lists the physical units that a register holds.

Device Object

Property	R/W	NV	Value Returned	Additional information
Object_Identifier	R/W	NV	Device<n>	n is the 7 digit ID # set in the ID1 & ID2 setup screens on the meter. The BACnet Device ID is a decimal number from 1 to 4,193,999 that can be entered or viewed on the user screens or through this property. The default value set at the factory is a psuedo-random number from 1,000,000 to 3,097,151 to reduce the likelihood of conflicts if multiple units are installed using their default IDs.
Object_Type	R	NV	Device (8)	
Object_Name	R	NV	Veris E51 Series Energy Meter - S/N: <serial number>	
Vendor_Name	R	NV	Veris Industries, LLC	
Vendor_Identifier	R	NV	133	
Model_Name	R	NV	E51Hx Energy Meter	
Firmware_Revision	R	NV	<Current Revision #>	"xyyy". This is the BACnet processor firmware version in the format <xyyy>, with an implied decimal point between the first two digits (x.yyy)
Application_Software_ Version	R	NV	<Current version #>	"RS= xyyy, OS=xyyy, BACnet Gateway=xyyy" The format <xyyy> has an implied decimal point between the first two digits (x.yyy)
Location	R/W	NV	<Location>	Limted to 64 Characters - Default value is "Installed location not yet identified"
Description	R	NV	Veris E51Hx DIN-Rail Energy Meter S/N: <serial number>	
Protocol_Version	R	NV	1	BACnet Protocol Version 1
Protocol_Revsion	R	NV	4	BACnet Protocol Revision 4
Local_Date	R		Date	Set via BACnet Time Synchronization only - reverts to Jan 1, 2000 if control power drops
Local_Time	R		Time	Set via BACnet Time Synchronization only - reverts to 12:00:00 AM if control power drops
Segmentation_Supported	R	NV	NO_SEGMENTATION (3)	Segmentation is not supported
Max_Master	R/W	NV	1-127 (Factory Default is 127)	Highest possible MAC Address for Master nodes on the local MS/TP network
Max_Info_Frames	R	NV	1	Maximum number of information frames allowed before passing the MS/TP token
Max_APDU_Length_Accepted	R	NV	480	
APDU_Timeout	R	NV	60000	
Number_of_APDU_Retries	R	NV	0	
System_Status	R	NV	Operational (0)	
Protocol_Sevices_Supported	R	NV	0b00000000000010110100000000000000 011110000	
Protocol_Object_Types_Supported	R	NV	0b10110000100000000000010000000000	

Device Object (cont.)

Property	R/W	NV	Value Returned	Additional information
Object_List	R	NV	DE1,AI1,AI2,AI3,AI4,AI5,AI6,AI7,AI8,AI9,AI10,AI11,AI12,AI13,AI14,AI15,AI16,AI17,AI18,AI19,AI20,AI21,AI22,AI23,AI24,AI25,AI26,AI27,AI28,AI29,AI30,AI31,AI32,AI33,AI34,AI35,AI36,AI37,AI38,AI39,AI40,AI41,AI42,AI43,AI44,AI45,AI46,AI47,AI48,AI49,AI50,AI51,AI52, AI53, AI54, AI55, AI56, AI57, AI58, AI59, AI60, AI61, AI62, AI63, AI64, AI65, AI66, AI67, AI68, AI69, AI70, AI71, AI72, AI73, AI74, AI75, AI76, AI77, AI78, AI79, AI80, AI81, AI82, AI83, AV1,AV2,AV3, AV4,AV5,AV6,AV7,AV8,AV9,AV10,AV11,BI1,BI2,BI3,BI4,BI5,BI6,BI7,BI8,BI9,BI10,BI11, BI12,BI13,BI14,BI15,TL1,TL2,TL3	BI15, TL1, TL2, and TL3 are present on the E51H5 only.
Device_Address_Binding	R	NV	{}	
Database_Revsion	R	NV	0	

Analog_Value Objects

Use the Present_Value property of the Analog_Value object for all writable variables in the meter other than those used specifically for BACnet configuration, Time Synchronization (in the Device Object), or Data Logging (in the Trend_Log objects).

Values are checked when written, and errors are returned for invalid entries. This table describes how the meter uses those variables, what values are valid, and what their defaults are. When writing values to the Present_Value properties of Analog_Value BACnet objects, there is a delay of up to about two seconds to validate and store the new value. An immediate read of the same property before that delay has elapsed can return the prior value (even if the new value was accepted). To read a value immediately after writing it, check the Reliability property first. When it reports a No_Fault_Detected status, the Present_Value of the object is current.

These objects support the Description and Reliability object properties and all required Analog_Value object properties, but Present_Value is the only writable property.

#	Name	Description	R/W	NV	Units	Range	Factory Default Value	Additional information
AV1	Config	Configuration	R/W		n/a	n/a	Always returns "0" when read	Command Register: - Write 30078 (0x757E) to clear all energy accumulators to 0 (All). - Write 21211 (0x52DB) to begin new Demand Sub-Interval calculation cycle and log another data value on Trend_Log objects TL1-TL3 (when the meter is in Manual "Sync-to Comms" mode). This takes effect at the end of the next 1 second calculation cycle. Write no more frequently than every 10 seconds. Trend_Log values are only present on the E51H5 model. - Write 21212 (0x52DC) to reset Max Demand values to Present Demand Values. Takes effect at the end of the next 1 second calculation cycle. Write no more frequently than every 10 seconds. - Write 16498 (0x4072) to clear pulse counters to 0.
AV2	System_Type	System Type	R/W	NV	n/a	40, 31, 12, 11, 10	40	System_Type: - Write 10 for Single-Phase: A + N - Write 11 for Single-Phase: A + B - Write 12 for Split-Phase: A + B + N - Write 31 for 3-Phase Δ: A + B + C, no N - Write 40 for 3-Phase Y: A + B + C + N
AV3	CT_Ratio_ Primary	CT Ratio - Primary	R/W	NV	Amps	5-32000	100	Current Transducer Size - Primary Current Range (Default is set for 100 A CTs)
AV4	CT_Ratio_ Secondary	CT Ratio - Secondary	R/W	NV	1/Volts	1,3	1	Current Transducer Type – Secondary Interface - Enter 1 for CTs with 1V outputs (Default) - Enter 3 for CTs with 1/3V outputs

Analog_Value Objects (cont.)

#	Name	Description	R/W	NV	Units	Range	Factory Default Value	Additional information
AV5	PT_Ratio	PT Ratio	R/W	NV	Value	0.01 - 320.0	1	Potential Transformer Ratio - The default is 1.00 (1:1), which is no PT attached. Set this value before setting the System Voltage (below).
AV6	System_ Voltage	System Voltage	R/W	NV	Volts	from 82 (times the PT_Ratio in AV5) to 660 (times the PT_Ratio in AV5 - absolute limits are 82-32000)	600	System Voltage – This voltage is Line to Line unless in System Type 10 (in object AV2), in which case it is Line to Neutral. This value is used to by the meter to calculate the full scale power for the analog outputs and pulse configuration (see below), and as full scale for phase loss (in object AV8). Do not set the meter to voltages outside the range of 82-660 volts times the PT Ratio in object AV5.
AV7	Display_ Units	Display Units	R/W	NV	n/a	0,1	1	Display Units: 0 = IEC (U, V, P, Q, S), 1 = IEEE (default: VLL, VLN, W, VAR, VA)
AV8	Phase_Loss_ Voltage_ Threshold	Phase Loss Voltage Threshold	R/W	NV	Percent	1-99	10	Phase Loss Voltage Threshold in percent of System Voltage (in object AV6). Default is 10 (10%). Any phase (as configured in AV2) whose level drops below this threshold triggers a Phase Loss alert - i.e. if the System voltage is set to 480 V L-L, the L-N voltage for each phase should be 277 V. When the threshold is set to 10%, if any phase drops more than 10% below 277 V, (less than 249 V), or if any L-L voltage drops more than 10% below 480 V (less than 432 V) the corresponding phase loss alarm bit will be true.
AV9	Phase_Loss_ Imbalance_ Threshold	Phase Loss Imbalance Threshold	R/W	NV	Percent	1-99	25	Phase Loss Imbalance Threshold in Percent. Default is 25% phase to phase difference. For a 3-phase Y (3 + N) system type (40 in object AV2), both Line to Neutral and Line to Line voltages are tested. In a 3-phase Δ System type (31 in object AV2), only Line to Line voltages are examined. In a single split-phase (2 + N) system type (12 in object AV2), only the line to neutral voltage are compared.
AV10	Subintervals	Number of Subintervals Per Demand Interval	R/W	NV		1-6	1	Number of Sub-Intervals per Demand Interval. Sets the number of sub-intervals that make a single demand interval. For block demand, set this to 1. Default is 1. When Sub-Interval Length (in object AV11) is set to 0 (sync-to-comms mode), the meter ignores this value.
AV11	Subinterval_ Length	Subinterval Length	R/W	NV	hundreths of a second	0, 10-32767	90000	Sub-Interval Length in hundredths of a second. For sync-to-comms mode, which allows manual triggerring of demand intervals and the logging of another Trend_Log record, set this value to 0 and write 21211 to the reset register (object AV1) each time the sub-interval must be externally reset. Default is 90000 (15 minutes). This variable is tied directly to the Log_Interval property of all three Trend_Log objects (their value is always the same as this one). Changing any of these four properties changes all of them. Trend_Log values are only used on the E51H5 model.

Analog_Input Objects

Use the Present_Value property of the Analog_Input objects for all read-only numeric variables in the meter other than those used specifically for device configuration (in the Device Object) or data logging (in the Trend_Log objects). Only the E51H5 supports the data logging capability.

These objects support the Description and Reliability object properties and all required Analog_Input object properties. None of them are writable. The values that are not instantaneous (i.e., Accumulated Energy, Max Demand, Pulse Input Counts) are non-volatile. They are not updated while control power is inactive, but their past values are retained when power is restored. The Present_Value of the accumulated data objects (AI1-AI10 and AI31-AI54) use floating-point data types (all AI objects use floating point data points). The resolution of the accumulated values decreases as the value grows larger over time and more of the significant digits precede the decimal point. If the size of the value limits the resolution unacceptably, read and store the current value offline and reset the accumulators to restore finer resolution.

For complete assurance, check the Reliabilty property for a No_Fault_Detected status before reading the Present_Value. If the line voltage or input frequency of the system being monitored falls out of the supported range, the corresponding alert bits (BI1-BI7) are set and the reliability property of any values that cannot be accurately measured under those conditions returns Unreliable_Other.

#	Object Name	Description	R/W	NV	Units	Range	Additional Information
AI1	KWh_Net	Accumulated Real Energy: Net (Import - Export)	R	NV	kWh	-3.4+E38 - 3.4+E38	
AI2	KWh_Import	Real Energy Import	R	NV	kWh	0 - 3.4+E38	
AI3	KWh_Export	Real Energy Export	R	NV	kWh	0 - 3.4+E38	
AI4	KVARh_Q1	Reactive Energy Quadrant 1	R	NV	kVARh	0 - 3.4+E38	The Units property of object AI4 reports that these units are kWh because there is no unit type in the BACnet standard for KVARh
AI5	KVARh_Q2	Reactive Energy Quadrant 2	R	NV	kVARh	0 - 3.4+E38	The Units property of object AI5 reports that these units are kWh because there is no unit type in the BACnet standard for kVARh
AI6	KVARh_Q3	Reactive Energy Quadrant 3	R	NV	kVARh	0 - 3.4+E38	The Units property of object AI6 reports that these units are kWh because there is no unit type in the BACnet standard for kVARh
AI7	KVARh_Q4	Reactive Energy Quadrant 4	R	NV	kVARh	0 - 3.4+E38	The Units property of object AI7 reports that these units are kWh because there is no unit type in the BACnet standard for kVAh
AI8	Net_KVAh	Apparent Energy: Net (Import - Export)	R	NV	kVAh	-3.4+E38 - 3.4+E38	The Units property of object AI8 reports that these units are kWh because there is no unit type in the BACnet standard for kVAh
AI9	KVAh_Import	Apparent Energy Import	R	NV	kVAh	0 - 3.4+E38	The Units property of object AI9 reports that these units are kWh because there is no unit type in the BACnet standard for kVAh
AI10	KVAh_Export	Apparent Energy Export	R	NV	kVAh	0 - 3.4+E38	The Units property of object AI10 reports that these units are kWh because there is no unit type in the BACnet standard for kVAh
AI11	KW_Total	Total Instantaneous Real Power	R		kW	0 - Max_Power (AI76)	
AI12	KVAR_Total	Total Instantaneous Reactive Power	R		kVAR	0 - Max_Power (AI76)	
AI13	KVA_Total	Total Instantaneous Apparent Power	R		kVA	0 - Max_Power (AI76)	
AI14	PF_Total	Total Power Factor	R			-1.00 - 1.00	
AI15	Volts_LL_Avg	Voltage, L-L, Average of Active Phases	R		Volts		
AI16	Volts_LN_Avg	Voltage, L-N, Average of Active Phases	R		Volts		
AI17	Current Average	Current, Average of Active Phases	R		Amps		
AI18	Frequency	Frequency	R		Hz	45.0 - 65.0	Returns QNAN if frequency is out of range (or no voltage input present on Phase A)

Analog_Input Objects (cont.)

#	Object Name	Description	R/W	NV	Units	Range	Additional Information
AI19	KW_Present_ Demand	Total Real Power Present Demand	R		kW	0 - Max_Power (AI76)	
AI20	KVAR_ Present_ Demand	Total Reactive Power Present Demand	R		kVAR	0 - Max_Power (AI76)	
AI21	KVA_Present_ Demand	Total Apparent Power Present Demand	R		kVA	0 - Max_Power (AI76)	
AI22	KW_Max_ Demand_ Import	Total Real Power Max Demand Import	R	NV	kW	0 - Max_Power (AI76)	
AI23	KVAR_Max_ Demand_ Import	Total Reactive Power Max Demand Import	R	NV	kVAR	0 - Max_Power (AI76)	
AI24	KVA_Max_ Demand_ Import	Total Apparent Power Max Demand Import	R	NV	kVA	0 - Max_Power (AI76)	
AI25	KW_Max_ Demand_ Export	Total Real Power Max Demand Export	R	NV	kW	0 - Max_Power (AI76)	
AI26	KVAR_Max_ Demand_ Export	Total Reactive Power Max Demand Export	R	NV	kVAR	0 - Max_Power (AI76)	
AI27	KVA_Max_ Demand_ Export	Total Apparent Power Max Demand Export	R	NV	kVA	0 - Max_Power (AI76)	
AI28	Reserved_ AI28	(Reserved_AI28)	R				Returns QNAN or any value
AI29	E51H2: Pulse Count E51H5: Pulse_ Count_1	E51H2: Pulse Count E51H5: Pulse Count 1	R			0 - 4294967040	Running count of contact closures on Pulse Input 1 since last reset. Write 16498 (0x4072) to Present_Value of AV1 to reset both pulse counters to 0 (not used on the E51H5).
AI30	E51H2: Reserved E51H5: Pulse_ Count_2	E51H2: Reserved E51H5: Pulse Count 2	R			0 - 4294967040	E51H2: Reserved E51H5: Pulse Count 2; Running count of contact closures on Pulse2 input since last reset. Write 16498 (0x4072) to the Present_Value property of Analog_ Value object AV1 to reset both Pulse Counters to 0.
AI31	KWh_ Import_A	Real Energy Import Phase A	R	NV	kWh	0 - 3.4+E38	
AI32	KWh_ Import_B	Real Energy Import Phase B	R	NV	kWh	0 - 3.4+E38	
AI33	KWh_ Import_C	Real Energy Import Phase C	R	NV	kWh	0 - 3.4+E38	
AI34	KWh_ Export_A	Real Energy Export Phase A	R	NV	kWh	0 - 3.4+E38	
AI35	KWh_ Export_B	Real Energy Export Phase B	R	NV	kWh	0 - 3.4+E38	
AI36	KWh_ Export_C	Real Energy Export Phase C	R	NV	kWh	0 - 3.4+E38	
AI37	KVARh_Q1_A	Reactive Energy Q1 Phase A	R	NV	kVARh	0 - 3.4+E38	The Units property of object AI37 reports that these units are kWh because there is no unit type in the BACnet standard for kVARh
AI38	KVARh_Q1_B	Reactive Energy Q1 Phase b	R	NV	kVARh	0 - 3.4+E38	The Units property of object AI38 reports that these units are kWh because there is no unit type in the BACnet standard for kVARh

Analog_Input Objects (cont.)

#	Object Name	Description	R/W	NV	Units	Range	Additional Information
AI39	KVARh_Q1_C	Reactive Energy Q1 Phase C	R	NV	kVARh	0 - 3.4+E38	The Units property of object AI39 reports that these units are kWh because there is no unit type in the BACnet standard for kVARh
AI40	KVARh_Q2_A	Reactive Energy Q2 Phase A	R	NV	kVARh	0 - 3.4+E38	The Units property of object AI40 reports that these units are kWh because there is no unit type in the BACnet standard for kVARh
AI41	KVARh_Q2_B	Reactive Energy Q2 Phase B	R	NV	kVARh	0 - 3.4+E38	The Units property of object AI41 reports that these units are kWh because there is no unit type in the BACnet standard for kVARh
AI42	KVARh_Q2_C	Reactive Energy Q2 Phase C	R	NV	kVARh	0 - 3.4+E38	The Units property of object AI42 reports that these units are kWh because there is no unit type in the BACnet standard for kVARh
AI43	KVARh_Q3_A	Reactive Energy Q3 Phase A	R	NV	kVARh	0 - 3.4+E38	The Units property of object AI43 reports that these units are kWh because there is no unit type in the BACnet standard for kVARh
AI44	KVARh_Q3_B	Reactive Energy Q3 Phase B	R	NV	kVARh	0 - 3.4+E38	The Units property of object AI44 reports that these units are kWh because there is no unit type in the BACnet standard for kVARh
AI45	KVARh_Q3_C	Reactive Energy Q3 Phase C	R	NV	kVARh	0 - 3.4+E38	The Units property of object AI45 reports that these units are kWh because there is no unit type in the BACnet standard for kVARh
AI46	KVARh_Q4_A	Reactive Energy Q4 Phase A	R	NV	kVARh	0 - 3.4+E38	The Units property of object AI46 reports that these units are kWh because there is no unit type in the BACnet standard for kVARh
AI47	KVARh_Q4_B	Reactive Energy Q4 Phase b	R	NV	kVARh	0 - 3.4+E38	The Units property of object AI47 reports that these units are kWh because there is no unit type in the BACnet standard for kVARh
AI48	KVARh_Q4_C	Reactive Energy Q4 Phase C	R	NV	kVARh	0 - 3.4+E38	The Units property of object AI48 reports that these units are kWh because there is no unit type in the BACnet standard for kVARh
AI49	KVAh_ Import_A	Apparent Energy Import Phase A	R	NV	kVAh	0 - 3.4+E38	The Units property of object AI49 reports that these units are kWh because there is no unit type in the BACnet standard for kVAh
AI50	KVAh_ Import_B	Apparent Energy Import Phase B	R	NV	kVAh	0 - 3.4+E38	The Units property of object AI50 reports that these units are kWh because there is no unit type in the BACnet standard for kVAh
AI51	KVAh_ Import_C	Apparent Energy Import Phase C	R	NV	kVAh	0 - 3.4+E38	The Units property of object AI51 reports that these units are kWh because there is no unit type in the BACnet standard for kVAh
AI52	KVAh_ Export_A	Apparent Energy Export Phase A	R	NV	kVAh	0 - 3.4+E38	The Units property of object AI52 reports that these units are kWh because there is no unit type in the BACnet standard for kVAh
AI53	KVAh_ Export_B	Apparent Energy Export Phase B	R	NV	kVAh	0 - 3.4+E38	The Units property of object AI53 reports that these units are kWh because there is no unit type in the BACnet standard for kVAh
AI54	KVAh_ Export_C	Apparent Energy Export Phase C	R	NV	kVAh	0 - 3.4+E38	The Units property of object AI54 reports that these units are kWh because there is no unit type in the BACnet standard for kVAh
AI55	KW_A	Real Power Phase A	R		kW	0 - Max_Power (AI76)	
AI56	KW_B	Real Power Phase B	R		kW	0 - Max_Power (AI76)	
AI57	KW_C	Real Power Phase C	R		kW	0 - Max_Power (AI76)	
AI58	KVAR_A	Reactive Power Phase A	R		kVAR	0 - Max_Power (AI76)	
AI59	KVAR_B	Reactive Power Phase B	R		kVAR	0 - Max_Power (AI76)	
AI60	KVAR_C	Reactive Power Phase C	R		kVAR	0 - Max_Power (AI76)	
AI61	KVA_A	Apparent Power Phase A	R		kVA	0 - Max_Power (AI76)	
AI62	KVA_B	Apparent Power Phase B	R		kVA	0 - Max_Power (AI76)	
AI63	KVA_C	Apparent Power Phase C	R		kVA	0 - Max_Power (AI76)	
AI64	PF_A	Power Factor Phase A	R			-1.00 - 1.00	

Analog_Input Objects (cont.)

#	Object Name	Description	R/W	NV	Units	Range	Additional Information
AI65	PF_B	Power Factor Phase B	R			-1.00 - 1.00	
AI66	PF_C	Power Factor Phase C	R			-1.00 - 1.00	
AI67	Volts_AB	Voltage Phase A-B	R		Volts		
AI68	Volts_BC	Voltage Phase B-C	R		Volts		
AI69	Volts_AC	Voltage Phase A-C	R		Volts		
AI70	Volts_AN	Voltage Phase A-N	R		Volts		
AI71	Volts_BN	Voltage Phase B-N	R		Volts		
AI72	Volts_CN	Voltage Phase C-N	R		Volts		
AI73	Current_A	Current Phase A	R		Amps		
AI74	Current_B	Current Phase B	R		Amps		
AI75	Current_C	Current Phase C	R		Amps		
AI76	Max_Power	Max Power	R	NV	kW		
AI77	Reserved_ AI77	(Reserved AI77)	R				Returns QNAN or any value
AI78	Energy_Resets	Count of Energy_ Resets	R	NV			
AI79	Reserved_ AI79	(Reserved AI79)	R				Returns QNAN or any value
AI80	Reserved_ AI80	(Reserved AI80)	R				Returns QNAN or any value
AI81	Power_Up_ Count	Count of Power Up Cycles	R	NV			
AI82	Output_ Config	Output Configuration	R	NV		0-15	E51H2 returns "11" E51H5 returns "10"
AI83	Alarm_Bitmap	Alarm Bitmap (all of BI1-BI15)	R	NV			

Binary_Input Objects

Use the Present_Value properties of the Binary_Input objects as alerts for conditions of potential concern regarding to the system measurement. These values are dynamic and are not latched, so if the condition is resolved, the alert will go inactive, whether it has been read or not.

These objects support the Description and Reliability object properties and all required Binary_Input object properties. None of them are writable. For complete assurance, check the Reliabilty property for a No_Fault_Detected status before reading the Present_Value.

To test the meter's alert status, read the Present_Value of each of the Binary_Input objects representing the alert bits of interest, or read the Present_Value of AI52, which combines all 15 bits into a single decimal value. AI52 represents the status of all 15 Binary_Object alert values in one number that can be read without having to access mulitple objects. The bit value of Object BI1 is the least significant bit and BI15 is the most significant bit (BI15 is only present on the E51H5).

#	Name	Description	R/W	Range	Additional information
BI1	Volts_Error_A	Voltage Out of Range Phase A	R	0=INACTIVE, 1=ACTIVE	Phase A Input Voltage exceeds meter's measurement range
BI2	Volts_Error_B	Voltage Out of Range Phase B	R	0=INACTIVE, 1=ACTIVE	Phase B Input Voltage exceeds meter's measurement range
BI3	Volts_Error_C	Voltage Out of Range Phase C	R	0=INACTIVE, 1=ACTIVE	Phase C Input Voltage exceeds meter's measurement range
BI4	Current_Error_A	Current Out of Range Phase A	R	0=INACTIVE, 1=ACTIVE	Phase A Current out of range
BI5	Current_Error_A	Current Out of Range Phase B	R	0=INACTIVE, 1=ACTIVE	Phase B Current out of range
BI6	Current_Error_A	Current Out of Range Phase C	R	0=INACTIVE, 1=ACTIVE	Phase C Current out of range
BI7	Frequency_Error	Frequency Error	R	0=INACTIVE, 1=ACTIVE	Phase A Frequency out of range
BI8	Reserved_BI8	Reserved	R	0=INACTIVE, 1=ACTIVE	Returns "INACTIVE"
BI9	Phase_Loss_A	Phase Loss Phase A	R	0=INACTIVE, 1=ACTIVE	Phase Loss - Phase A voltage dropped below the Phase Loss Threshold set by user
BI10	Phase_Loss_B	Phase Loss Phase B	R	0=INACTIVE, 1=ACTIVE	Phase Loss - Phase B voltage dropped below the Phase Loss Threshold set by user
BI11	Phase_Loss_C	Phase Loss Phase C	R	0=INACTIVE, 1=ACTIVE	Phase Loss - Phase C voltage dropped below the Phase Loss Threshold set by user
BI12	Power_Factor_A	Low Power Factor Phase A	R	0=INACTIVE, 1=ACTIVE	Phase A Power Factor less than 50% (commonly due to mis-wiring of CTs/PTs to meter)
BI13	Power_Factor_B	Low Power Factor Phase B	R	0=INACTIVE, 1=ACTIVE	Phase B Power Factor less than 50% (commonly due to mis-wiring of CTs/PTs to meter)
BI14	Power_Factor_C	Low Power Factor Phase C	R	0=INACTIVE, 1=ACTIVE	Phase C Power Factor less than 50% (commonly due to mis-wiring of CTs/PTs to meter)
BI15	RTC_Reset (E51H5 only)	RTC Reset	R	0=INACTIVE, 1=ACTIVE	Real-Time Clock reset. This activates when the meter is powered after an interruption (since it does not use a battery backup). It indicates that the real-time clock has re-initialized to a default setting (00:00:00:00 on Jan 1, 2000) and should not be relied upon. The clock runs, the meter operates and even logs data (E51H5 oly), but the date and time are not correct until a Time_Synchronization occurs.

