User's Manual - BACnet
EMX-IP – User Interface and BACnet Communications Guide

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Rev.	Release Date	By	Description of Change	ECR
0A	10/14/2024	CJL	Initial Release	01350

Table of Contents

See Also:

152-0430   *EMX-IP Installation Instructions*

154-0050   *EMX-IP Modbus Protocol Guide*

154-0051   *EMX-IP Navigation Guide*

Protocol Implementation Conformance Statement

Vendor Name	Senva Inc.
Vendor Identifier	665
Product Name	EMX-IP Advanced Energy Meter
Product Model Number	EMX-IP
Firmware Revision	v19.01
Application Software Version	1.0. Version may be higher
BACnet Protocol Revision	19
Product Description	Advanced Energy Meter with IP
BACnet Standardized Device Profile	BACnet Application Specific Controller (B-ASC)
List of BACnet Interoperability Building Blocks Supported	DS-RP-B, DS-RPM-B, DS-WP-B, DS-WPM-B DM-DDB-B, DM-DOB-B, DM-DCC-B, DM-RD-B
Segmentation Capability	No Support
Standard Object Types Supported	Device, Network Port, Analog Input, Analog Value, Large Analog Value, and Multi-State Value
Data Link Layer Options	BACnet IP
Device Address Binding	No Support
Networking Options	No Support
Character Sets Supported	ISO 10646 (UTF-8)
Communications Gateway	No Support
Network Security Options	Non-Secure Device

Configuration

The *BACnet Protocol Guide* assumes the first stage of installation is complete, with the EMX connected to your local Ethernet network and powered.

See "EMX Installation Manual" for setup.

Device information can be configured or referenced using the below table.

| Property	Min/Max	Default	Read
OBJECT_IDENTIFIER (DEVICE INSTANCE)	0 / 4194302	1	R/W
DEVICE_NAME	N/A	EMX-IP	R/W
DESCRIPTION	N/A	Device Description	R/W
LOCATION	N/A	Device Location	R/W
PROFILE_NAME	N/A	665-Device-EMXIP	read only
MODEL_NAME	N/A	EMX-IP	read only
VENDOR_NAME	N/A	Senva Inc.	read only
APPLICATION_SOFTWARE_VERSION	N/A	Varies	read only
FIRMWARE_REVISION	N/A	Varies	read only
VENDOR_IDENTIFIER	N/A	665	read only
PROTOCOL_VERSION	N/A	1	read only
PROTOCOL_REVISION	N/A	19	read only

Display Navigation

Congratulations on installing your new Senva EMX energy meter! This *BACnet Protocol Guide* assumes the first stage of installation is complete, with the meter and any CTs connected and powered.   The OLED display should show the home screen when any button is pressed. If not, refer to the separate *Installation Instructions* before continuing. Now, only the network configuration remains between you and the data.

From any screen, press the ENTER button to access the settings menu.

You can make selections using the UP and DOWN arrows and then pressing ENTER to proceed to that menu or setting.
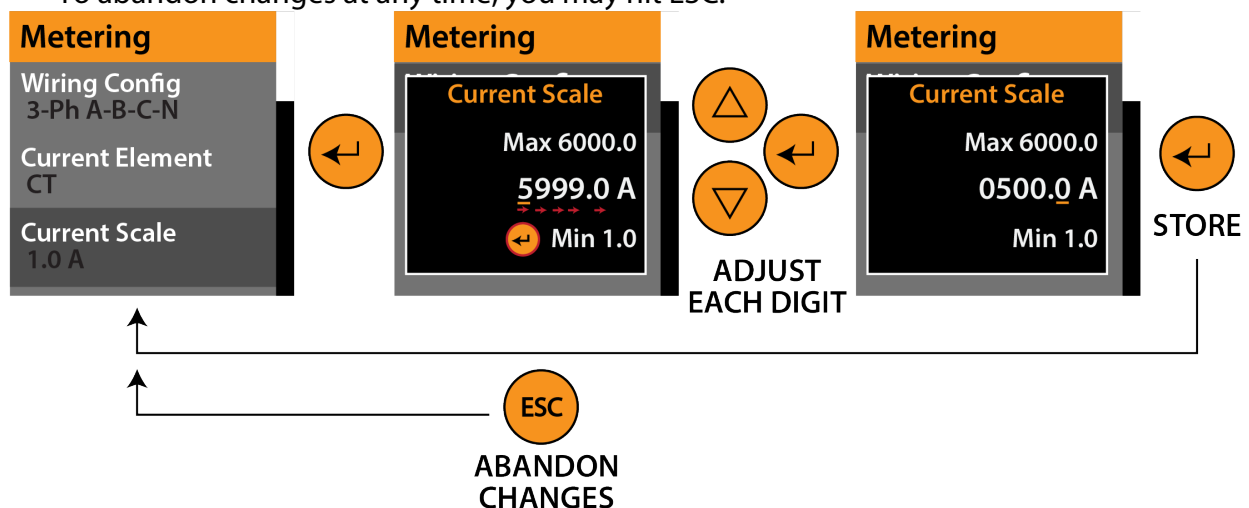
From any menu, press the ESC button to go back one menu.
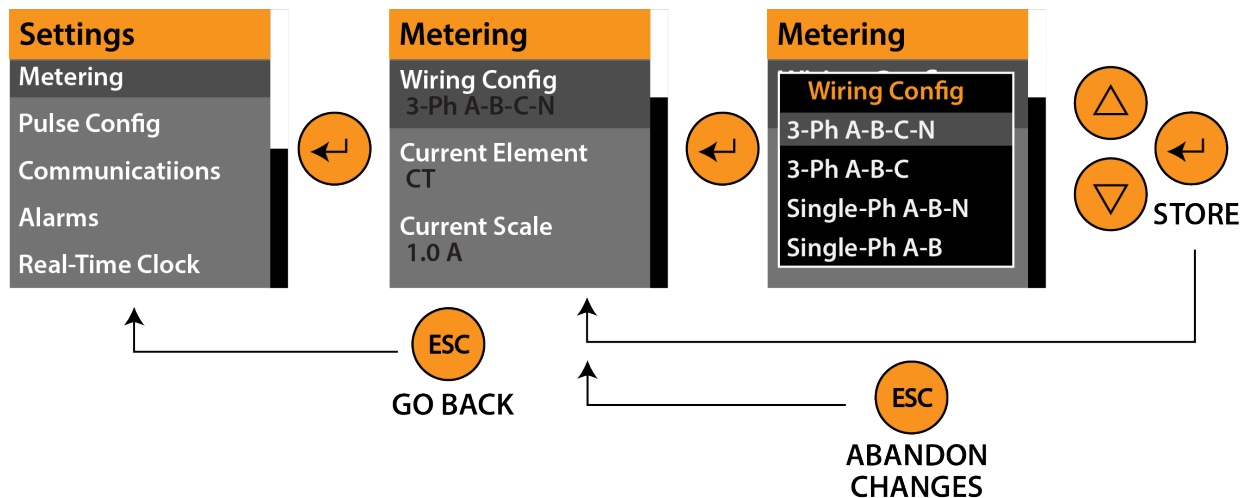
To change a value, use the UP and DOWN arrows to set each digit and the ENTER button to move the cursor left.

Once each digit has been set, hit ENTER a final time to return to the previous menu.

To abandon changes at any time, you may hit ESC.

Setup Registers and Parameters

Setup registers and parameters are available in 6 groups in the settings menu using the display or they may also be accessed using BACnet communications.

Settings

Settings are available in the following groups on the display.   A parameter list is provided in the following sections.

- **Metering** – Adjust metering parameters such as voltage and current scaling, phase sequencing, and display units.

- **Pulse Config** – Read the count of the two pulse inputs.

- **Communications** – See IPv4 and IPv6 values.

- **Alarms** - Enable or disable alarms and set trip points.

- **Real-Time Clock** – Set the date and time.

- **Logging** – Enable or disable logging as well as setting trigger source and what is logged.

- **Passcode** – Choose a passcode to lock device.

- **Advanced** – View firmware versions or initiate a factory reset.

R/W:
R = Readable Only
R/W = Read and writeable

Multi State Values

Register	Description	Min/Max	Units	Default Value	Read	Functionality
MSV1	Phase Configuration	1-3Ph ABCN, 2-3Ph ABC, 3-1Ph ABN, 4-1Ph AB 5-SplitPH ABN	None	1	R/W	Sets the wiring configuration of the meter based on the phases connected.
MSV2	Current Element	1-Current Transformer, 2-Rogowski Coil	None	1	R/W	Select if the current input is a 0.33V CT or Rogo Coil
MSV3	Current Orientation	1- +++ 2- ++- 3- +-+ 4- +-- 5- -++ 6- -+- 7- --+ 8- ---	None	1	R/W	Polarity of CT, phase ordering is ABC
MSV10	Alarm - Voltage Range	1- Disable 2- Enable	None	1	R/W	Sets the state of the Voltage Range alarm, default is set to disable the alarm.
MSV11	Alarm - Current Range	1- Disable 2- Enable	None	1	R/W	Sets the state of the Current Range alarm, default is set to disable the alarm.
MSV12	Alarm - Neutral Current Range	1- Disable 2- Enable	None	1	R/W	Sets the state of the Neutral Current Range alarm, default is set to disable the alarm.
MSV13	Alarm - Frequency Range	1- Disable 2- Enable	None	2	R/W	Sets the state of the Frequency Range alarm, default is set to disable the alarm.
MSV14	Alarm - Phase Loss	1- Disable 2- Enable	None	2	R/W	Sets the state of the Phase Loss alarm, default is set to enable the alarm.
MSV15	Alarm - Phase Unbalance	1- Disable 2- Enable	None	2	R/W	Sets the state of the Phase Unbalance alarm, default is set to enable the alarm.
MSV16	Alarm - Low Power Factor	1- Disable 2- Enable	None	2	R/W	Sets the state of the Low Power Factor alarm, default is set to enable the alarm.

Analog Inputs

Register	Description	Min/Max	Units	Read	Functionality
AI1	Average L-N Voltage	0/65535	V(rms)	Read only	Returns the average rms line to neutral voltage, for all phases.
AI2	Average L-L Voltage	0/65535	V(rms)	Read only	Returns the average rms line to line voltage.
AI3	Average Current	0/65535	A(rms)	Read only	Returns the phase average RMS Current.
AI4	Current Sum	0/65535	A(rms)	Read only	Returns the total RMS sum for all valid phases.
AI5	Total Real Power	-90071992/ 90071992	W	Read only	Returns the absolute sum of the Real Power of all the valid phases.
AI6	Total Reactive Power	-90071992/ 90071992	VAR	Read only	Returns the absolute sum of the Reactive Power of all the valid phases.
AI7	Total Apparent Power	-90071992/ 90071992	VA	Read only	Returns the absolute sum of the Apparent Power of all the valid phases.
AI8	Total Real Energy	-90071992/ 90071992	Wh	Read only	Returns the absolute sum of the Real Energy of all the valid phases.
AI9	Total Reactive Energy	-90071992/ 90071992	VARh	Read only	Returns the absolute sum of the Reactive Energy of all the valid phases.
AI10	Total Apparent Energy	-90071992/ 90071992	VAh	Read only	Returns the absolute sum of the Apparent Energy of all the valid phases.
AI11	A-N Voltage	0/65535	V(rms)	Read only	Returns RMS Voltage of Line A to neutral voltage.
AI12	B-N Voltage	0/65535	V(rms)	Read only	Returns RMS Voltage of Line B to neutral voltage.
AI13	C-N Voltage	0/65535	V(rms)	Read only	Returns RMS Voltage of Line C to neutral voltage.
AI14	A-B Voltage	0/65535	V(rms)	Read only	Returns RMS Voltage of Line A to line B voltage.
AI15	B-C Voltage	0/65535	V(rms)	Read only	Returns RMS Voltage of Line B to Line C voltage.

AI16	C-A Voltage	0/65535	V(rms)	Read only	Returns RMS Voltage of Line C to Line A voltage.
AI17	A Current	0/65535	A(rms)	Read only	Returns the RMS Current of Phase A.
AI18	B Current	0/65535	A(rms)	Read only	Returns the RMS Current of Phase B.
AI19	C Current	0/65535	A(rms)	Read only	Returns the RMS Current of Phase C.
AI20	A Power Factor	-100/100		Read only	Returns the power factor of the given phase.
AI21	B Power Factor	-100/100		Read only	
AI22	C Power Factor	-100/100		Read only	
AI23	A Frequency	480/ 620	Hz	Read only	Returns the Frequency of Phase A.
AI24	A Real Power	-90071992/ 90071992	W	Read only	Returns the Phase real Power in W, negative values indicate export power.
AI25	B Real Power	-90071992/ 90071992	W	Read only	
AI26	C Real Power	-90071992/ 90071992	W	Read only	
AI27	A Reactive Power	-90071992/ 90071992	VAR	Read only	Returns reactive power in VAR. A negative value indicates a capacitive load.
AI28	B Reactive Power	-90071992/ 90071992	VAR	Read only	
AI29	C Reactive Power	-90071992/ 90071992	VAR	Read only	
AI30	A Apparent Power	-90071992/ 90071992	VA	Read only	Returns apparent power in VA. Values are always positive.
AI31	B Apparent Power	-90071992/ 90071992	VA	Read only	
AI32	C Apparent Power	-90071992/ 90071992	VA	Read only	

AI42	Alarm Status Bitfield	0/65535		Read only	Bit 0: Pulse configuration error Bit 1: Pulse overrun error Bit 2: Voltage out of range Bit 3: Current out of range Bit 4: Current sum (neutral current) out of range Bit 5: Frequency out of range Bit 6: Voltage phase loss Bit 7: Voltage phase unbalance Bit 8: Power factor low Bit 9: Accumulator Loss Bit 10: RTC communication Bit 11: Logs full Bit 12: Meter settings error Bit 13 - 15: Reserved
AI43	Load Status	0/1		Read only	0: No load detected 1: Load above threshold
AI44	Power On Time	0/ 4294967295	Seconds	Read only	How long in seconds since the last power cycle.
AI45	Load Active Time	0/ 4294967295	Seconds	Read only	Total time in seconds the device has been powered.
AI46	Power Loss Count	0/ 4294967295		Read only	The amount of times that the device has lost power.
AI47	Pulse Count 1	0/ 4294967295		Read only	Total amount of input pulses on channel 1.
AI48	Pulse Count 2	0/ 4294967295		Read only	Total amount of input pulses on channel 2.
AI68	RTC - Year	2022/2060 (Default:2022)	Years	Read only	Real Time Clock year
AI69	RTC - Month	1/12	Months	Read only	Real Time Clock Month
AI70	RTC - Day of Month	1/31	Days	Read only	Real Time Clock day of the month
AI71	RTC - Day of Week	0/6		Read only	Real Time Clock day of the week, 0 = Sunday, 6 = Saturday
AI72	RTC - Hours	0/23	Hours	Read only	Real Time Clock Hours
AI73	RTC - Minutes	0/59	Minutes	Read only	Real time Clock Minutes
AI74	RTC - Seconds	0/59	Seconds	Read only	Real Time Clock seconds

AI75	RTC - AM/PM Flag	0/3		Read only	If in 24-hour mode, will return 0, if in 12 hour mode: 1 = AM, 2 = PM

Analog Values

Register	Description	Min/Max	Units	Read	Functionality
AV1	Current Scale	1.0/6000.0	Amps	Read/ Write	Sets the scaling of the Current
AV2	Voltage Scale	0.01/320.00	Volts	Read/ Write	Sets the scaling of the Voltage
AV3	Phase Angle Compensation	-768/768		Read/ Write	Manually adjust metered phase angle
AV5	Alarm - Nominal Voltage	1.0/6000.0	Volts	Read/ Write	Sets the alarm level for the Nominal Voltage
AV6	Alarm - Voltage Threshold	1/20	%	Read/ Write	Sets the threshold for the voltage alarm
AV7	Alarm - Nominal Current	1.0/6000.0	Amps	Read/ Write	Sets the alarm level for the Nominal Current
AV8	Alarm - Current Threshold	1/20	%	Read/ Write	Sets the threshold for the current alarm
AV9	Alarm - Nominal Neutral Current	1.0/6000.0	Amps	Read/ Write	Sets the alarm level for the nominal neutral current
AV10	Alarm - Neutral Current Threshold	1/20	%	Read/ Write	Sets the threshold for the neutral current alarm
AV11	Alarm - Nominal Frequency	45.0/65.0	Hz	Read/ Write	Sets the alarm level for the nominal frequency
AV12	Alarm - Frequency Threshold	1/20	%	Read/ Write	Sets the threshold for the frequency alarm
AV13	Alarm - Phase Loss Threshold	1/20	%	Read/ Write	Sets the threshold for the Phase Loss alarm
AV14	Alarm - Phase Unbalance Threshold	1/20	%	Read/ Write	Sets the threshold for the Phase Unbalance alarm
AV15	Alarm - Low Power Factor	1/99		Read/ Write	Sets the threshold for Low Power Factor alarm
AV16	Set Passcode	0/65535		Read/ Write	Sets the device passcode.

AV17	Reset Wh	0/1		Read/ Write	Resets the Wh
AV18	Reset Runtime	0/1		Read/ Write	Resets the device runtime
AV19	Reset Pulse Counts	0/1		Read/ Write	Resets the device pulse counters
AV20	Reset Log Contents	0/1		Read/ Write	Write a 1 to reset all log data
AV21	RTC - Year	2022/2060	Years	Read/ Write	Set the real time clock Year
AV22	RTC - Month	1/12	Months	Read/ Write	Set the real time clock hours
AV23	RTC - Day of Month	0/31	Days	Read/ Write	Set the real time clock hours
AV24	RTC - Day of Week	0/6		Read/ Write	Set the real time clock hours
AV25	RTC - Hours	0/23	Hours	Read/ Write	Set the real time clock hours
AV26	RTC - Minutes	0/59	Minutes	Read/ Write	Set the real time clock minutes
AV27	RTC - Seconds	0/59	Seconds	Read/ Write	Set the real time clock seconds
AV28	RTC - Commit Time	0/1		Read/ Write	Set to 1 to commit clock time changes and update PCF85263 RTC module

Logging Registers

EMX-IP Logging:

Log Source 1 through Log source 12 sets the source for the logging. Set log sources using Modbus address of 1-190 to the desired source to log that point. Modbus addresses are used in setting log source when BACnet is used. If a log source register has multiple registers all registers need to be set. For example, if Real Net Energy total is desired to be logged all four registers need to be set.

To trigger a log event AV29 (Log – Trigger Mode) needs to be set to the desired trigger mode, by default it is set to be disabled. Logging can be triggered with the timer, set on AV30 (Log – Interval) in seconds from 15-3600. Triggering can be set over COMMS by writing a '1' to AV44 (Log – Create Entry), or Pulse In 1 or 2 can be set to trigger a log whenever a pulse is detected.

Analog Values

Register	Description	Min/Max	Units	Read	Functionality
AV29	Log - Trigger Mode	0/3		Read/ Write	0: Timer 1: Comms 2: Pulse In 1 3: Pulse In 2
AV30	Log - Interval	15/3600 (default:300)	Seconds	Read/ Write	Sets the interval in seconds that the logging will trigger will "Log – Tigger Mode" is set to timer.
AV31	Log - Logging Mode	0/1		Read/ Write	0: "One Shot" - once full, stop logging and throw alarm 1: "Continuous" - circle back to first entry and overwrite after final entry
AV32	Log - Source 1	1/190		Read/ Write	Log - Source 1- Log - Source 12 will set which data point is being logged. 12 different sources can be set for logging. Use Modbus addresses for setting log source.
AV33	Log - Source 2	1/190		Read/ Write	
AV34	Log - Source 3	1/190		Read/ Write	
AV35	Log - Source 4	1/190		Read/ Write	
AV36	Log - Source 5	1/190		Read/ Write	
AV37	Log - Source 6	1/190		Read/ Write	
AV38	Log - Source 7	1/190		Read/ Write	

Register	Description	Min/Max	Units	Read	Functionality
AV39	Log - Source 8	1/190		Read/ Write	
AV40	Log - Source 9	1/190		Read/ Write	
AV41	Log - Source 10	1/190		Read/ Write	
AV42	Log - Source 11	1/190		Read/ Write	
AV43	Log - Source 12	1/190		Read/ Write	
AV44	Log - Create Entry	0/1		Read/ Write	Create an entry at current index
AV45	Log - Get Entry at Index	0/4096		Read/ Write	Read a log entry from specific index in EEPROM

Analog Values

Register	Description	Min/Max	Units	Read	Functionality
AI49	Log - Data 1	0/65535	Log source	Read only	Output of log sources for selected entry
AI50	Log - Data 2	0/65535	Log source	Read only	
AI51	Log - Data 3	0/65535	Log source	Read only	
AI52	Log - Data 4	0/65535	Log source	Read only	
AI53	Log - Data 5	0/65535	Log source	Read only	
AI54	Log - Data 6	0/65535	Log source	Read only	
AI55	Log - Data 7	0/65535	Log source	Read only	
AI56	Log - Data 8	0/65535	Log source	Read only	
AI57	Log - Data 9	0/65535	Log source	Read only	

AI58	Log - Data 10	0/65535	Log source	Read only	
AI59	Log - Data 11	0/65535	Log source	Read only	
AI60	Log - Data 12	0/65535	Log source	Read only	
AI61	Log - CRC	0/65535		Read only	CRC for reported log entry, includes timestamp
AI62	Log - Year	0/6153		Read only	Year portion of the timestamp for the selected log entry
AI63	Log - Month	0/5919		Read only	Month portion of the timestamp for the selected log entry
AI64	Log - Day	0/15163		Read only	Day portion of the timestamp for the selected log entry
AI65	Log – Hours	0/6153		Read only	Hours portion of the timestamp for the selected log entry
AI66	Log - Minutes	0/5919		Read only	Minutes portion of the timestamp for the selected log entry
AI67	Log - Seconds	0/15163		Read only	Seconds portion of the timestamp for the selected log entry