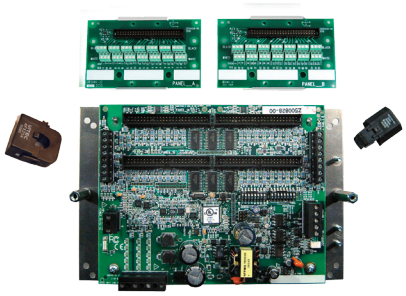
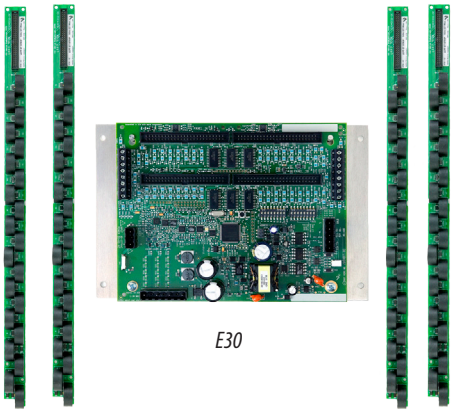
E3X

Commissioning Guide



E31



E30

⚠ 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.
- Use a properly rated voltage sensing device to confirm power is off.
  DO NOT DEPEND ON THIS PRODUCT FOR VOLTAGE INDICATION
- Only install this product on insulated conductors.

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

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 A 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 commercial 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. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Modifications to this product without the express authorization of Veris Industries nullify this statement.

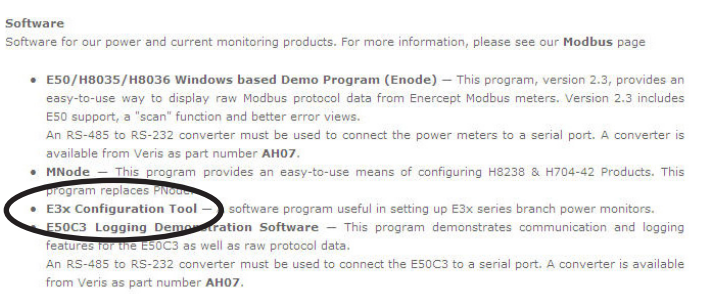
This guide is intended to help the user commission the E3x Panelboard Monitoring System for operation. It is assumed that the user has already installed the E3x meter according to the instructions in the E3x Installation Guide.

TABLE OF CONTENTS

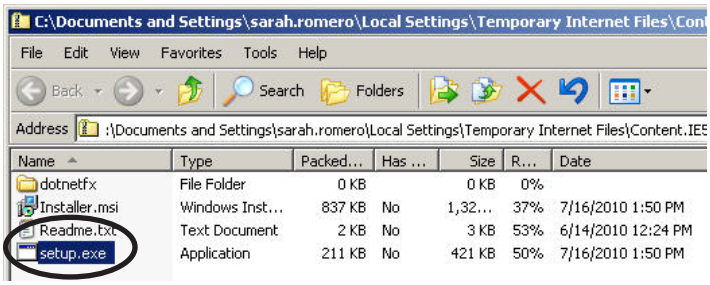
DOWNLOAD THE CONFIGURATION TOOL

1. Go to the Veris Industries website (www.veris.com). Click on Design Resources and navigate to the Software option:

2. Choose the E3x Configuration tool from the list of available software.

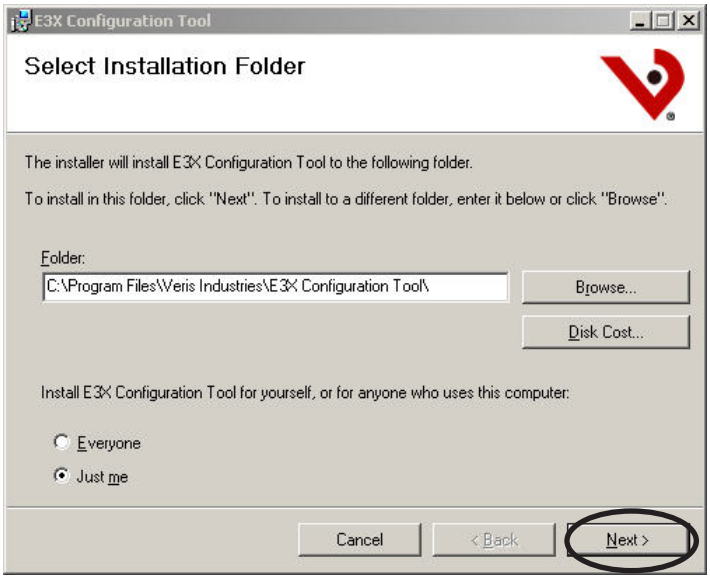


3. Open the executable file.

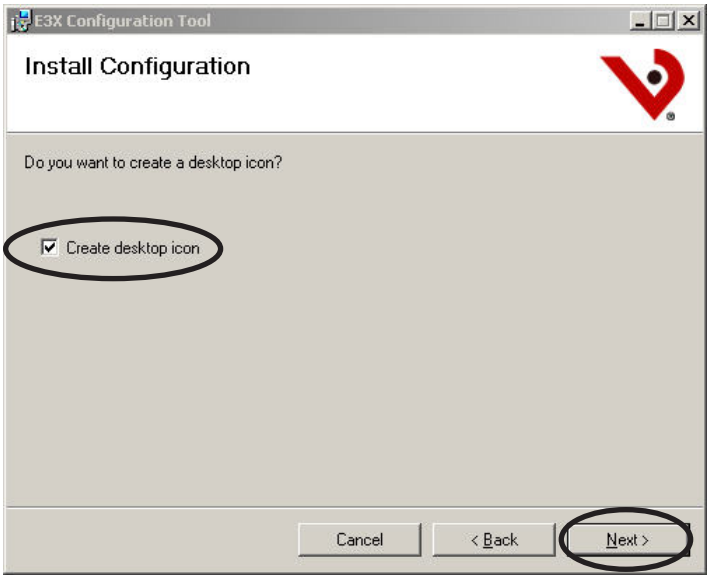


4. The configuration tool Welcome window appears. Choose Next.

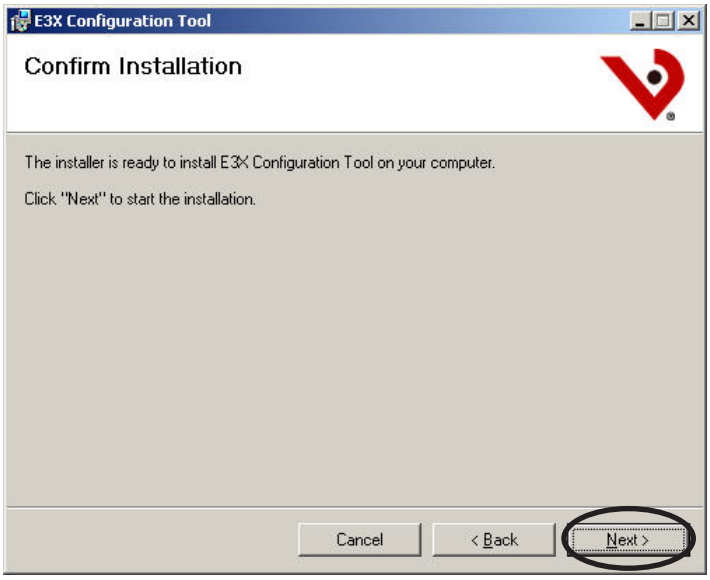
5. Select a destination on the computer to store the configuration tool. Click Next.



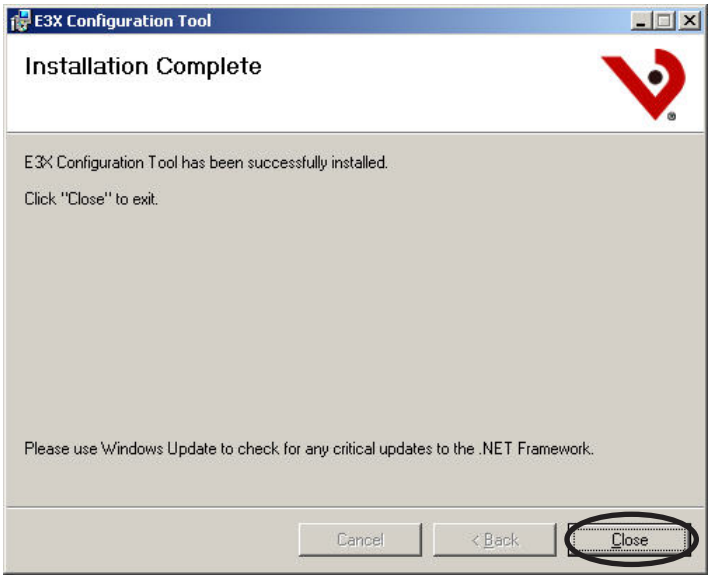
6. If desired, check the option to create a desktop shortcut to open the configuration tool. Then click Next.



7. The tool is now ready to install on the computer. Choose Next to confirm installation.



8. When installation is complete, choose Close to exit the software.

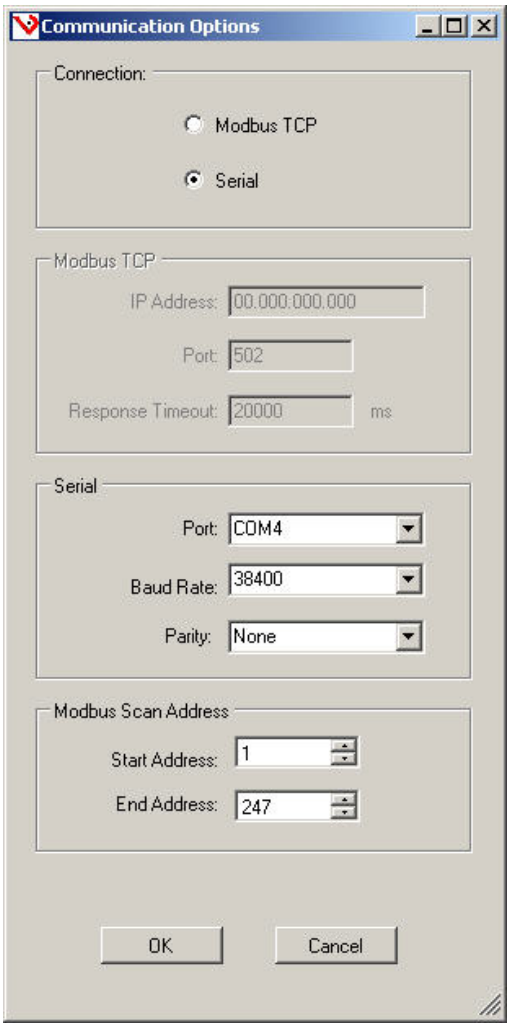


The E3x configuration is now successfully installed on your computer. You are ready to begin commissioning the E3x monitoring system for operation.

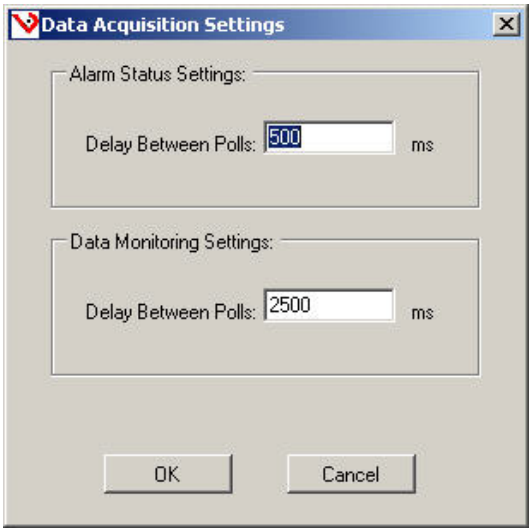
USING THE CONFIGURATION SOFTWARE

Open the software using either the desktop icon (if selected) or by navigating to the location chosen previously.

In the toolbar at the top of the window, use the Options button to adjust your communication and data acquisition settings. Default settings appear in the window; changes these as needed.

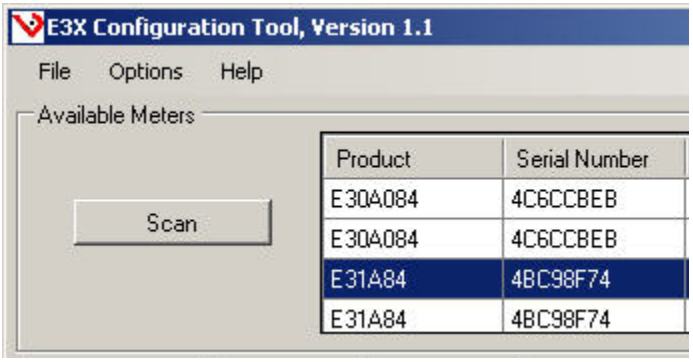


Adjust Modbus Scan Address settings to a tighter range to decrease scan time.



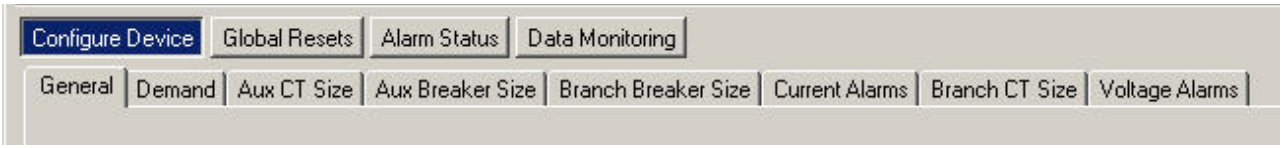
Click the Scan button to have the software locate available devices on the system.

All devices located in the scan will appear in the box adjacent to the Scan button. Click on the device you wish to configure.



Each main board with four ribbon cable connections uses two Modbus addresses.

Below the Scan window is a row of buttons: Configure Device, Global Resets, Alarm Status, and Data Monitoring.



When each button is selected, a unique row of tabs appears below. The information in these tabs must be configured to the system requirements. Every setting has a default value programmed in. The next sections describe the settings found within each tab.

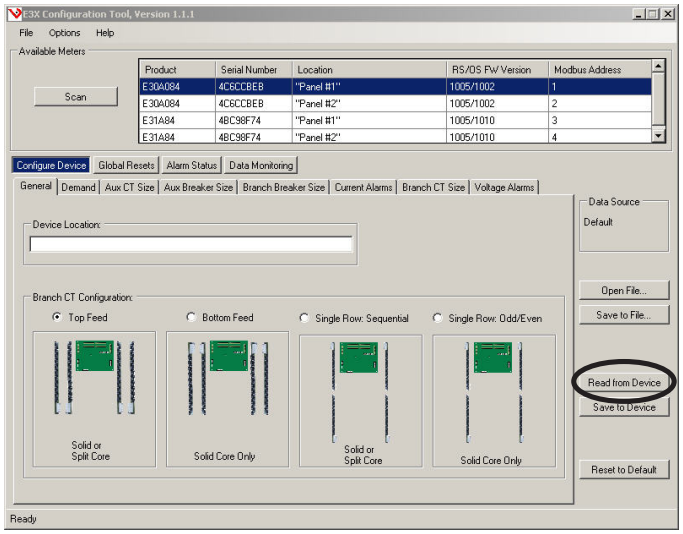
Configure Device Button

After scanning for devices, the tool locates all E3x meters connected to the system. Select a meter from the list and click the Read From Device button to configure.

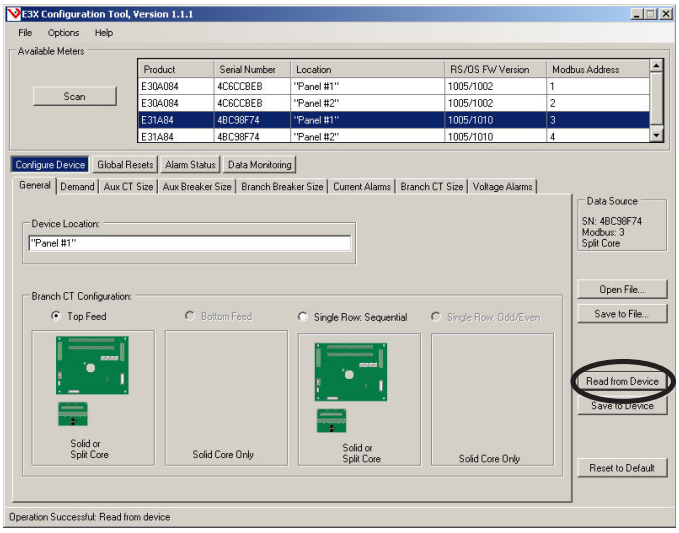
1. **General.**

   Select the CT configuration used in the installation. This tab looks different for the E30 and E31 devices, with only the options for the selected device appearing as options. The Device Location is an optional description the installer can enter to specify the location of each device on the network. **Note: If the configuration tool is opened on a computer not connected to a meter, the tool defaults to the E30 General tab.**

E30 General Tab

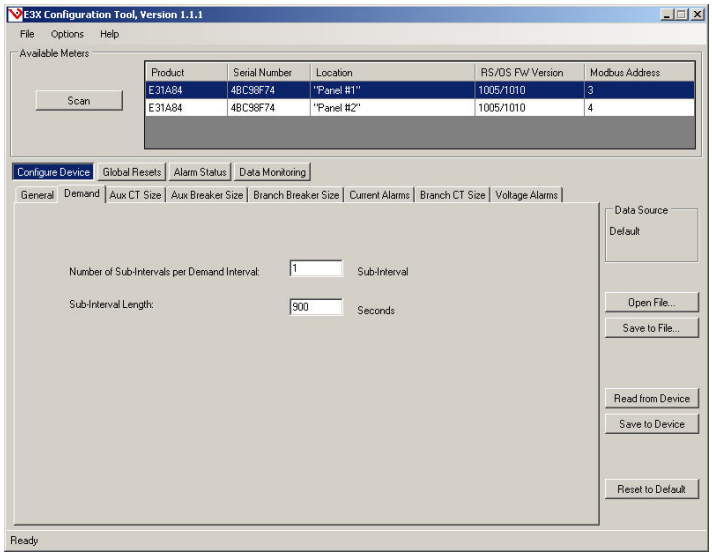


E31 General Tab



2. **Demand.**

   Select the number of sub-intervals and the sub-interval length to be used in data collection.

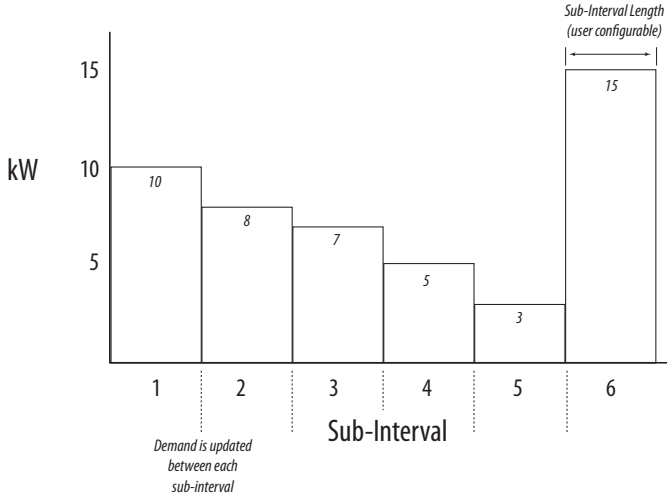


These settings apply to current demand (registers 269-272, 1462 - 1503) and power demand (registers 277, 1378-1419).

Configure the number of sub intervals. The default is 1, but it can be set for 1-6 sub-interval windows.

Configure sub-interval length (register 72). The default is 900 sec (15 minutes), but it can be set from 10 – 32767 (in seconds). For Sync to Comms, set to 0. Sync to Comms mode will start demand calculations based on writes to Modbus register 295 with a value of 26012 (decimal).

Calculate Demand by continuously summing the subinterval averages and dividing by the number of subintervals. The subinterval average is recalculated every second from the RMS values for current and power. The Demand register will update at the end of each subinterval. See the example below. For Block mode, set the number of subintervals to 1 (Reg 71).

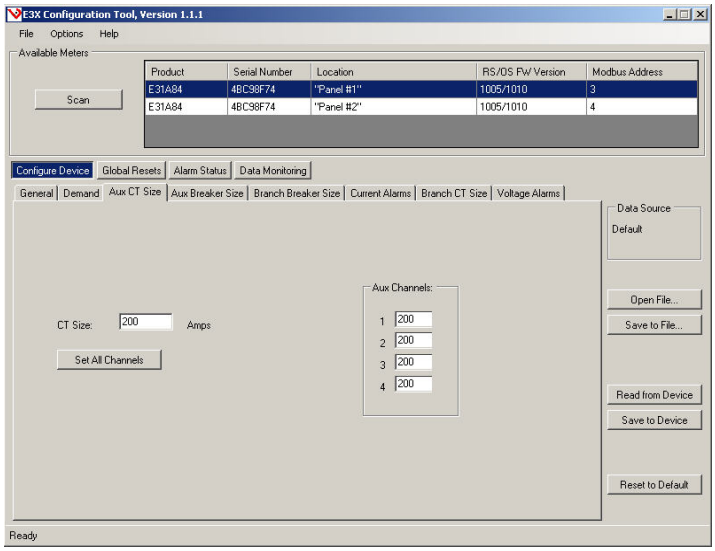


$$\text{Demand} = \sum_{n=1}^{6} \frac{\text{subinterval average (N) (kW)}}{6}$$

$$8\,\text{kW} = \frac{10}{6} + \frac{8}{6} + \frac{7}{6} + \frac{5}{6} + \frac{3}{6} + \frac{15}{6}$$

3. **Aux CT Size.**

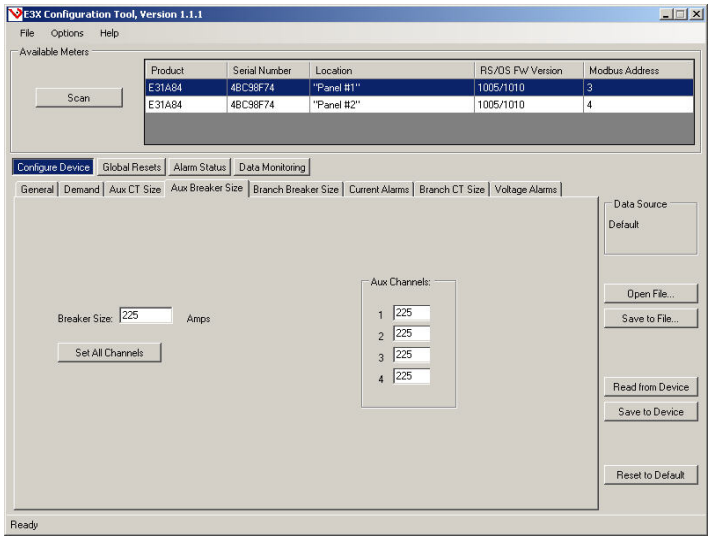
Set the CT size for each channel. Enter the value for each channel separately, or enter one value and click Set All Channels. Auxiliary #1 (register 115) to Auxiliary #4 (register 118) define the auxiliary or "mains" CT size (typically 200 A). Type the appropriate numeric value for each auxiliary CT installed in the panel. CT size must be 1-32,767. Set this value for each panel on the E3x.



4. **Aux. Breaker Size.**

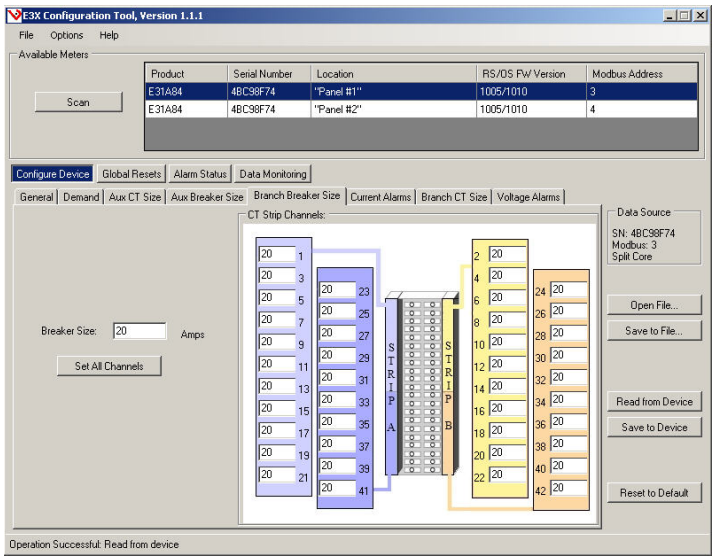
Set the breaker size for each channel. This value is used for alarm calculations. Enter the value for each channel separately, or enter one value and click Set All Channels.

Auxiliary #1 (register 161) to Auxiliary #4 (register 164) define the auxiliary or "mains" breaker size (typically 225 A). Type the appropriate numeric value for each auxiliary breaker in the panel. **For unused breakers, set the value to zero to disable alarms for those channels.** Set this value for each panel on the E3x (i.e. 225 (decimal) = 225A; range 0-32,767).

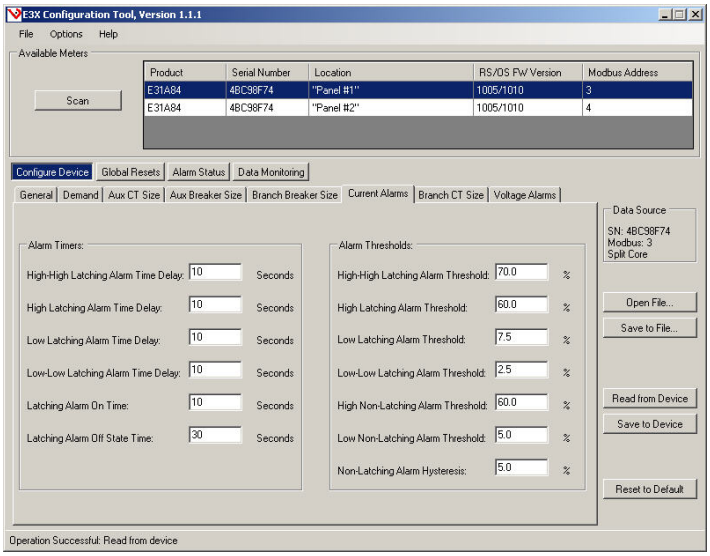


5. **Branch Breaker Size.**

Set the size of each branch circuit breaker. The default for each circuit is 20 Amps. The Breaker Size box and the Set All Channels button can be used to set all circuits to the same value, or each circuit can be set separately to the necessary value. Channel #1 (register 119) to Channel #42 (register 160) define the channel or "branch" breaker size (typically 20 A). Type the appropriate numeric value for each channel breaker in the panel. **For unused breakers, set the value to zero to disable alarms for those channels.**



6. **Current Alarms.**



The instantaneous current alarm setup parameters define the maximum (high alarm) and minimum (low alarm) limits for all branch and main circuits monitored by the E3x. Instantaneous current alarms are ON only if the alarm conditions are met. These alarms are reset automatically (alarm is turned OFF or cleared when circuit current is within the normal range).

High Alarm Thresholds

Type the instantaneous current value, expressed as a percentage of the breaker size (default = 60%). When the circuit current exceeds that value, the high current alarm is activated. To disable any alarms, set the specific high alarm threshold to zero.

Example: If the threshold is set to 60%, the high alarm would be activated when instantaneous current for a 20 A breaker exceeds 12 A (i.e. 20 A x 0.60).

Low Alarm Thresholds

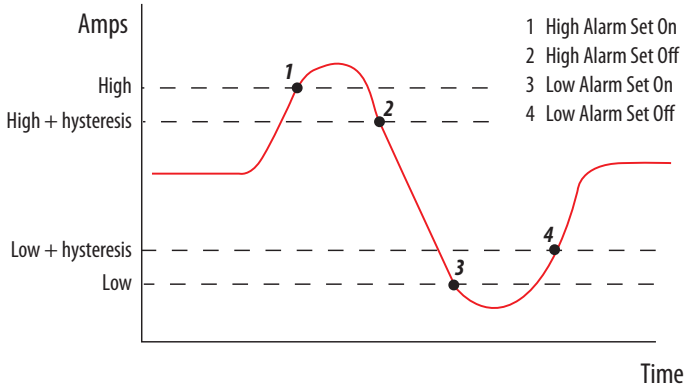
Type the instantaneous current value, expressed as a percentage of the breaker size (default = 5%). When the circuit current falls below that value, the low current alarm is activated. To disable any alarms, set the specific low alarm threshold to zero.

Example: If the threshold is set to 5%, the low alarm would be activated when instantaneous current for a 20 A breaker drops below 1 A (i.e. 20 A x 0.05).

Hysteresis

Type the value, expressed as a percentage of the alarm threshold, that defines how much the circuit current must fall below the High alarm threshold or rise above the Low alarm threshold, to determine the alarm's "OFF" state (default = 5%; non-latching only).

Example: If hysteresis is set to 5%, the "OFF" state for a high alarm threshold of 12 A would be at 11.4 A and below (i.e. 12 A minus (12 A x 0.05)), while the "OFF" state for a low alarm threshold of 1 A would be at 1.05 A and above (i.e. 1 A plus (1 A x 0.05)).



There are two types of alarms, Latching and Non-Latching.

Latching Alarm Settings Defined

High-High Alarm Delay (s): Number of seconds the current in a circuit needs to be continuously above the High-High Alarm Threshold before the High-High alarm is activated (default = 10 s).

High Alarm Delay (s): Number of seconds the current in a circuit needs to be continuously above the High Alarm Threshold before the High alarm is activated (default = 10 s).

Low Alarm Delay (s): Number of seconds the current in a circuit needs to be continuously below the Low Alarm Threshold before the Low alarm is activated (default = 10 s).

Low-Low Alarm Delay (s): Number of seconds the current in a circuit needs to be continuously below the Low-Low Alarm Threshold before the Low-Low alarm is activated (default = 10 s).

Latching Alarm On Time (s): Number of seconds the current in a circuit needs to stay above the low-low alarm threshold level before the latching alarms are armed/enabled for that channel (default = 10 s).

Latching Alarm Off Time (s): Number of seconds the current in a circuit needs to be below the Low-Low Alarm Threshold level before the latching alarm is de-activated (default = 30 s). After this point, on this channel, all latching alarms are disabled.

High-High Alarm Threshold (%): Limit for the High-High current alarm state, expressed as a percentage of the breaker size (default = 70%). For example, the High-High alarm threshold for a 20 A breaker is 14 A (i.e., 20 x 0.70). To disable this alarm (for all channels) set its threshold value to 0%.

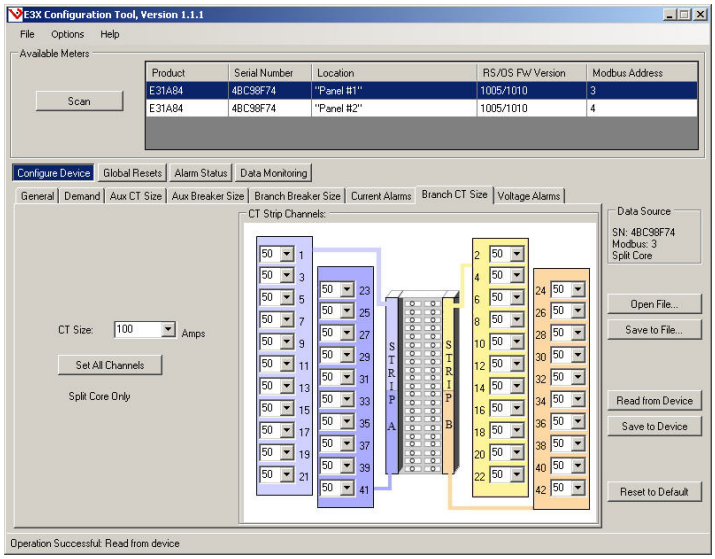
High Alarm Threshold (%): Limit for the High current alarm state, expressed as a percentage of the breaker size (default = 60%). For example, the High alarm threshold for a 20 A breaker is 12 A (i.e., 20 x 0.60). To disable this alarm (for all channels) set its threshold value to 0%.

Low Alarm Threshold (%): Limit for the Low current alarm state, expressed as a percentage of the breaker size (default = 7.5%). For example, the Low alarm threshold for a 20 A breaker is 1.5 A (i.e., 20 x 0.075). To disable this alarm (for all channels) set its threshold value to 0%.

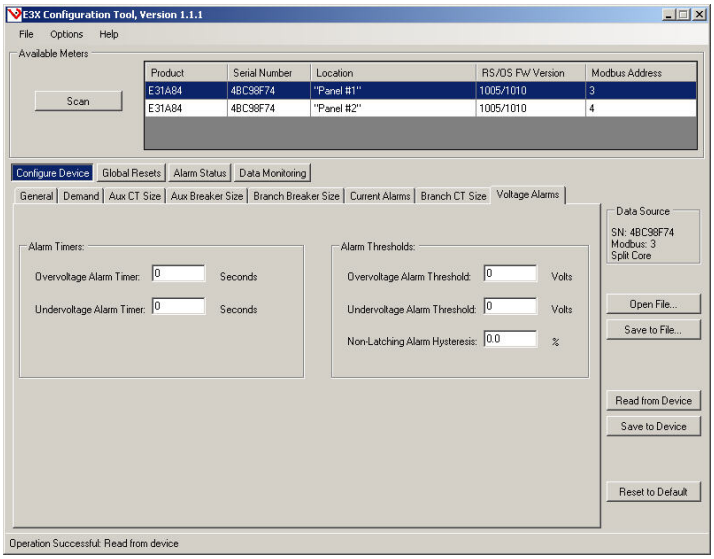
Low-Low Alarm Threshold (%): Limit for the Low-Low current alarm state, expressed as a percentage of the breaker size (default = 2.5%). For example, the Low-Low alarm threshold for a 20 A breaker is 0.5 A (i.e., 20 x 0.025). To disable this alarm (for all channels) set its threshold value to 0%.

7. **Branch CT Size.**

Set the size of each CT monitoring the branch circuit breakers. For the E30 solid-core products, the CT size for each branch circuit is automatically set and locked at 100 Amps. For the E31 split-core products, select the appropriate CT size per channel from the drop down menu. If all channels must be set to the same CT size, the Set All Channels button can be used for convenience.



8. **Voltage Alarms.**



Line-to-Line Voltage Alarms Defined

The Voltage Alarm setup parameters define the alarm delay (timer) and threshold (limit) for the voltage inputs monitored by the E3x (E3x model A & B Only). **Voltage alarms are global; settings and alarms are shared between both panels for main boards with four ribbon cable connections.**

The alarm timer settings define the length of time that a voltage input must be in an alarm state (i.e. exceeds the overvoltage alarm threshold or falls below the undervoltage alarm threshold) before activating the latching alarm. A return to normal (non-alarm) state is instantaneous, so the alarm timer is reset if the voltage returns to the normal state before the timer expires. The voltage alarms are always enabled unless the threshold is set to zero, unlike the current alarms there is no On-Time Delay.

The latching and non-latching voltage alarms share overvoltage and undervoltage thresholds.

The non-latching voltage alarm is set as soon as the voltage inputs are in an alarm state (i.e. exceeds the overvoltage alarm threshold or falls below the undervoltage alarm threshold) and are cleared as soon as the voltage inputs are out of an alarm state plus the hysteresis setting (i.e. below the overvoltage alarm threshold minus hysteresis or exceeds the undervoltage alarm threshold plus hysteresis).

Overvoltage Alarm Timer: Enter the number of seconds the voltage can exceed Over Voltage Threshold level before activating the Over Voltage Latching alarm.

Undervoltage Alarm Timer: Enter the number of seconds the voltage can drop below the Under Voltage Threshold level before activating the Under Voltage Latching alarm.

Overvoltage Alarm Threshold (V): Type the limit for the Over Voltage alarm state in Volts. To disable this alarm (for all voltage inputs) set its threshold value to 0 Volts. Threshold for both Latching and Non-Latching alarm.

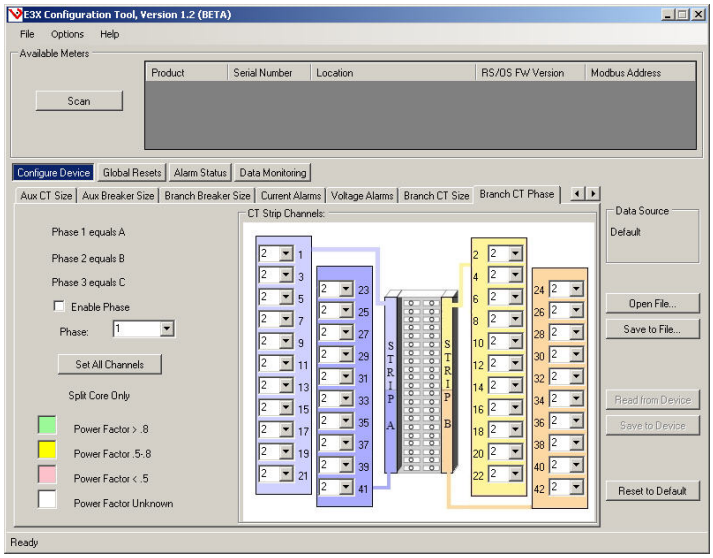
Undervoltage Alarm Threshold (V): Type the limit for the Under Voltage alarm state in Volts. To disable this alarm (for all voltage inputs) set its threshold value to 0

Volts. Threshold for both Latching and Non-Latching alarm.

Non-Latching Alarm Hysteresis (%): Type the value, expressed as a percentage of the alarm threshold, that defines how much the voltage must fall below the Over voltage threshold or rise above the Under voltage threshold to determine the alarm's "OFF" state.

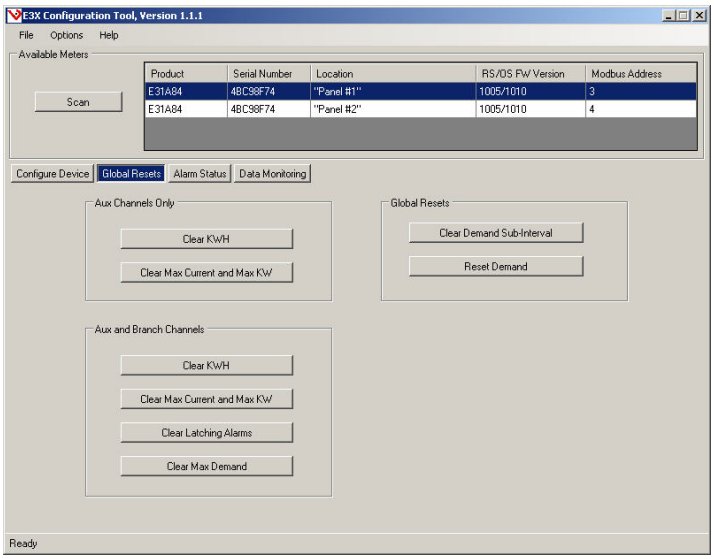
9. **Branch CT Phase.**

Use this tab to set the phase per channel. The standard product default setting is an "A, B, C" phase rotation. The default setting for the Y60 single-phase/split-phase version of the product is "A, B, A, B."



Global Resets Button

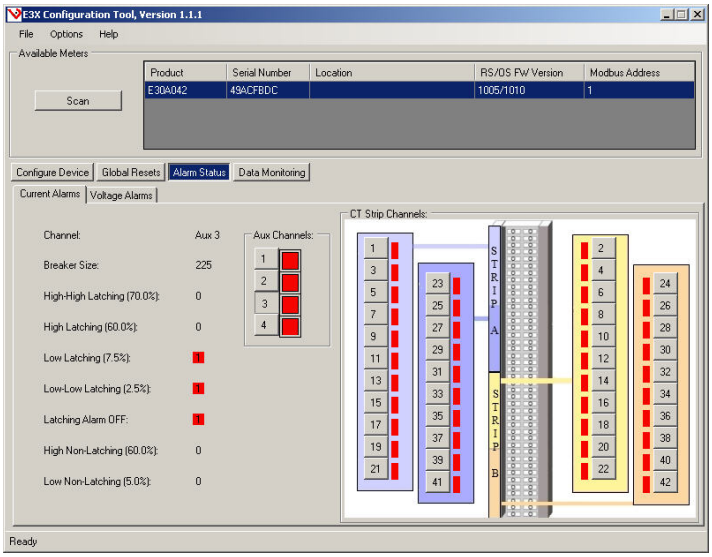
This section is used to reset data values. Resets are for each individual panel. ***WARNING: Data will be deleted and counters will return to a value of zero.***



Alarm Status Button

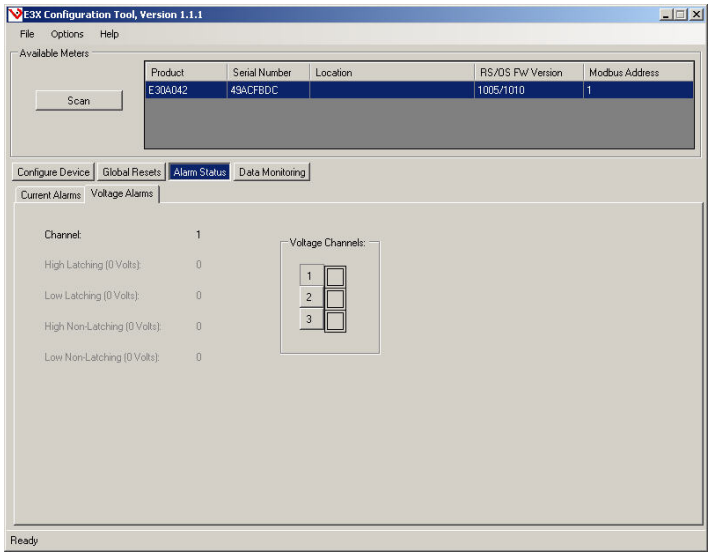
1. **Current Alarms Tab.**

   Choose a channel from the numbered buttons in the center of the window. The data values at the left will update to show current alarm status. A red box next to the channel number indicates an alarm condition.



2. **Voltage Alarms Tab.**

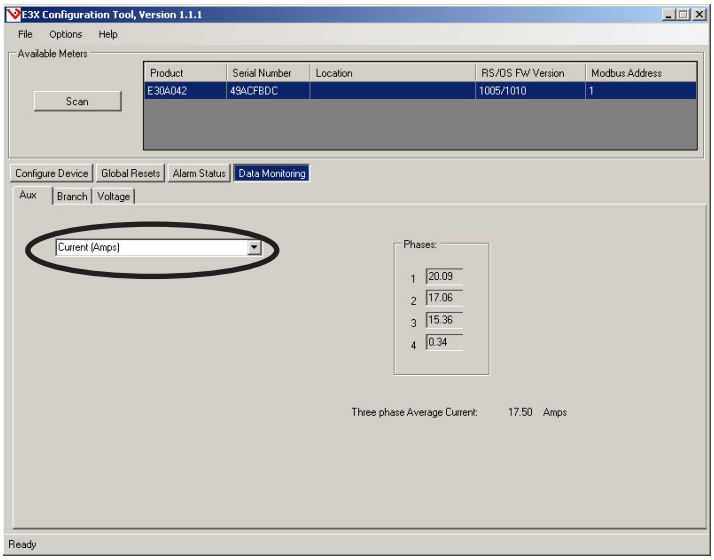
   Choose a channel from the numbered buttons in the center of the window. The data values at the left will update to show current alarm status. A red box next to the channel number indicates an alarm condition.



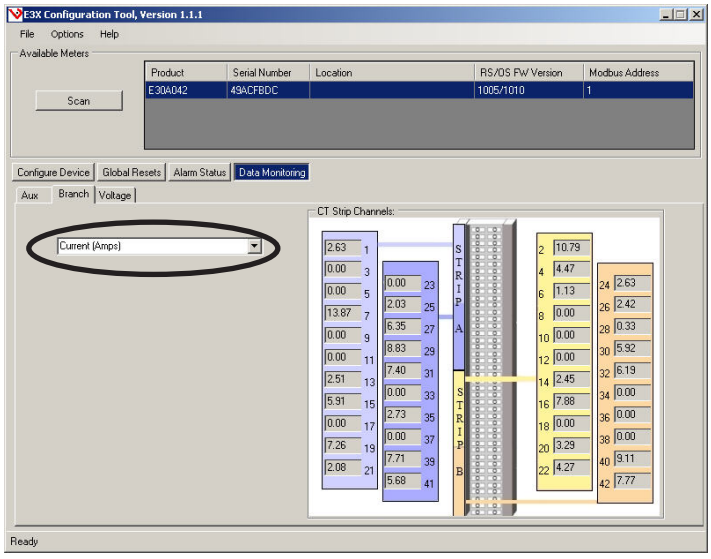
Data Monitoring Button

These tabs allow real-time viewing of data values.

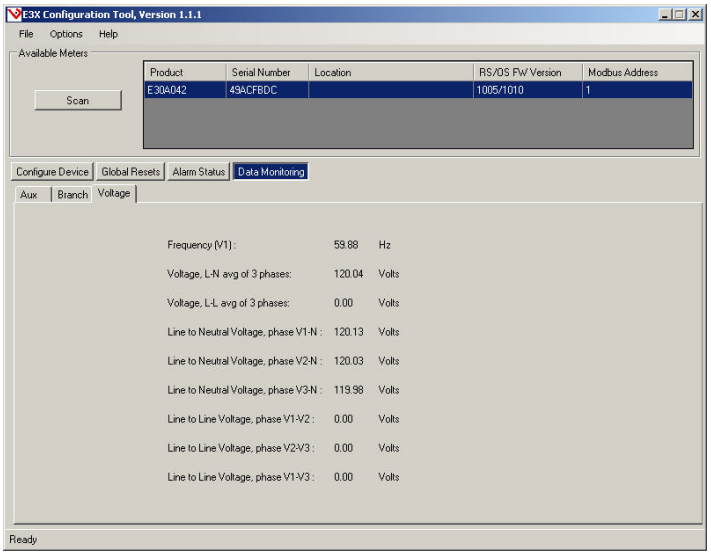
1. **Aux Tab.** Use the drop-down button to choose a data value. The selected data type appears to the right.



2. **Branch Tab.** Use the drop-down button to choose a data value. The selected data type appears to the right.



3. **Voltage Tab.** This tab has no drop-down list, as all data values appear on a single screen.



CONFIGURING ALARM REGISTERS

Latching alarms

Once the alarm threshold is crossed into an alarm state and after the associated Alarm Timer expires, the corresponding latching status bit is set and is not reset until the status bit is manually cleared by writing the alarm status register or resetting Latching alarms even if the signal is no longer in an alarm state. The alarm is also cleared if the threshold is changed.

Non-Latching alarms

Once the alarm threshold is crossed into an alarm state the corresponding Non-Latching status bit is set. The Non-Latching status bit is cleared once the signal crosses the threshold (plus hysteresis) out of an alarm state.

Alarm Timers

These timers control entry into an alarm state. All channels use the same global per-panel timers; per-panel timers only apply to latching alarms.

Registers 165-170:

- High-High Latching Alarm Time Delay
- High Latching Alarm Time Delay
- Low Latching Alarm Time Delay
- Low-Low Latching Alarm Time Delay
- Latching Alarm ON Time (when current is above Low-Low alarm then ON state is declared)
- Latching Alarm OFF State (current is below Low-Low alarm and ON state was declared)

Alarm Thresholds

All values are expressed as a percentage of breaker size. All channels use the same global per-panel values. An entry of 0% will disable the alarm for that channel. Hysteresis only applies to Non-Latching alarms.

Registers 171-177:

- High-High Latching Alarm Threshold
- High Alarm Latching Alarm Threshold
- Low Alarm Latching Alarm Threshold
- Low Low Latching Alarm Threshold
- Non-Latching High Threshold
- Non-Latching Low Threshold
- Hysteresis (0-100% percent of setpoint; non-latching alarms only)

Branch Current Alarms

Registers 178-219:

Latching Alarms are cleared by writing a 0 to its alarm bit. A write to a Non-Latching alarm is ignored.

- Bit 0: High High Latching Alarm
- Bit 1: High Latching Alarm
- Bit 2: Low Latching Alarm
- Bit 3: Low Low Latching Alarm
- Bit 4: Latching Alarm off state declared
- Bit 5-7: Reserved for future use (reads 0)
- Bit 8: High Non-Latching Alarm
- Bit 9: Low Non-Latching Alarm
- Bit 10-15: Reserved for future use (reads 0)

AUX Current Alarms

Registers 220-223:

Latching Alarms are cleared by writing a 0 to its alarm bit.

- Bit 0: High High Latching Alarm
- Bit 1: High Latching Alarm
- Bit 2: Low Latching Alarm
- Bit 3: Low Low Latching Alarm
- Bit 4: Latching Alarm Off
- Bit 5-7: Reserved for future use (reads 0)
- Bit 8: High Non-Latching Alarm
- Bit 9: Low Non-Latching Alarm
- Bit 10-15: Reserved for future use (reads 0)

Line-to-Line Voltage Alarm Timers

These timers control entry into an alarm state. All channels use the same global per-panel channels. **Voltage alarms are global; settings and alarms are shared between both panels for main boards with four ribbon cable connections.**

Registers 236-237:

- Overvoltage Alarm Timer
- Undervoltage Alarm Timer

Line-to-Line Voltage Alarm Thresholds

Thresholds are expressed as Volts. An entry of 0 disables that alarm for all channels.

Registers 238-240:

- Overvoltage Alarm Threshold
- Undervoltage Alarm Threshold
- Voltage Alarm Hysteresis (percentage of setpoint)

Line-to-Line Voltage Alarms

Registers 241-243:

- Latching Alarms are cleared by writing a 0 to its alarm bit.
- Bit 0: High Latching Alarm
- Bit 1: Low Latching Alarm
- Bit 2-7: Reserved for future use (reads 0)
- Bit 8: High Non-Latching Alarm
- Bit 9: Low Non-Latching Alarm
- Bit 10-15: Reserved for future use (reads 0)

Global Alarm Registers (Per Panel)

Registers 224-227:

These registers provide a means of identifying alarm conditions without polling every alarm and inspecting all the bits. A Global alarm register bit is set when a Branch or Auxiliary alarm channel activates. For example, if Bit 2 in Branch alarm status 38 is set, then Bit 2 in the Global latching alarm status will also be set. This allows the user to read the Global alarms only in the event of an alarm condition, minimizing network traffic. Global Most-Recent latching alarm channel tells the user the number of the channel that has had the most recent alarm event. Note: Bits 0 to 4 in Branch alarm status correspond to Bits 0 to 4 in Global alarm status; higher Bits do not match directly. An excerpt from the Modbus Point Map appears below; see the full Point Map for more information.

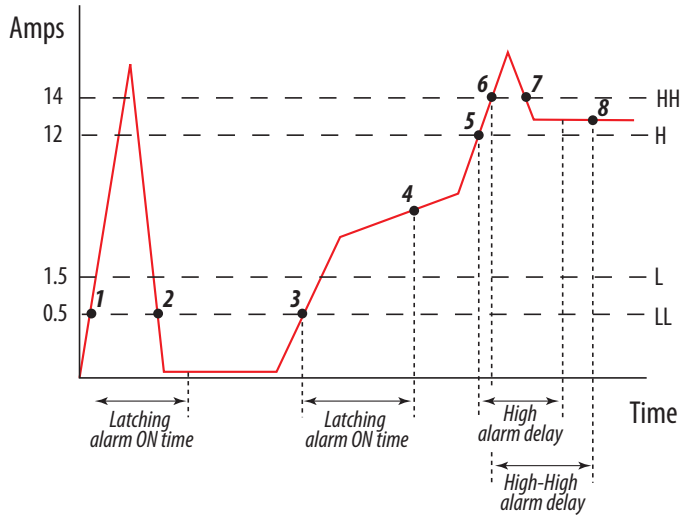
Register	Description
224	Global Latching Alarm Status; Bit 0: High High Latching Alarm; Bit 1: High Latching Alarm; Bit 2: Low Latching Alarm; Bit 3: Low Low Latching Alarm; Bit 4: Latching Alarm OFF state declared (1=OFF; ON state must have been achieved prior); Bit 5-7: Reserved for future use (reads 0); Bit 8: High Voltage Latching Alarm; Bit 9: Low Voltage Latching Alarm; Bit 10-15: Reserved for future use (reads 0)
225	Global Non-Latching Alarm Status; Bit 0: High Non-Latching Alarm; Bit 1: Low Non-Latching Alarm; Bit 2-7: Reserved for future use (reads 0); Bit 8: High Voltage Non-Latching Alarm; Bit 9: Low Voltage Non-Latching Alarm; Bit 10-15: Reserved for future use (reads 0)

Alarm Counters

The alarm counters measure the number of times an alarm has been set. On a multi-master system, these counters indicate whether an alarm went off and whether it was cleared afterward. It also allows one master to retain these records even if another master has cleared the alarm. When any of the 46 corresponding counters increment, the global variants of the latching alarm counters increment correspondingly.

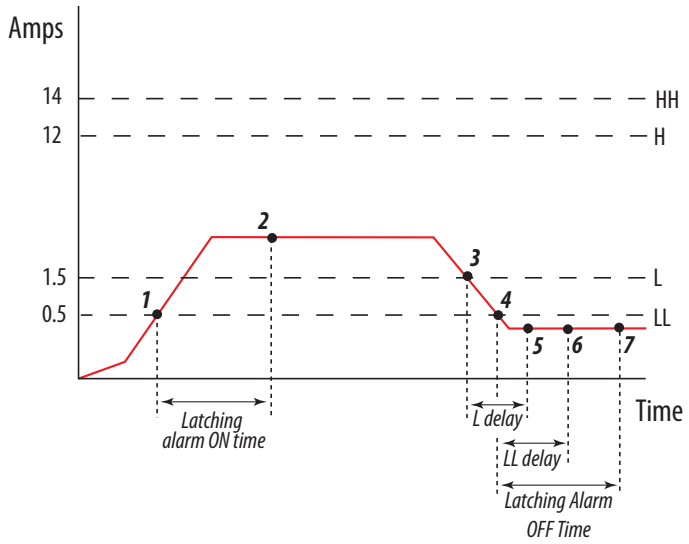
LATCHING ALARM EXAMPLES

Example 1



1. Current rises above LL (low-low alarm threshold) — this starts the Latching Alarm ON timer.
2. Current drops below LL before the Latching Alarm ON time period ends, so alarming is not enabled. The Latching Alarm ON timer is reset.
3. Current rises above LL — this starts the Latching Alarm ON timer.
4. Current remains above the low-low alarm threshold, beyond the time period specified by the Latching Alarm ON time setting — this enables the Latching Alarm (all Latching Alarms for the specific channel are armed).
5. Current rises above H (high alarm threshold) — this starts the high alarm delay timer.
6. Current rises above HH (high-high alarm threshold) — this starts the high-high alarm delay timer.
7. Current drops below HH before the high-high alarm delay period ends, so the high-high alarm delay timer is reset.
8. High alarm is latched at the end of the high alarm delay time period.

Example 2



1. Current rises above LL (low-low alarm threshold) — this starts the Latching Alarm ON timer.
2. Current remains above the low-low alarm threshold, beyond the time period specified by the Latching Alarm ON time setting — this enables the Latching Alarms (all Latching Alarms are armed).
3. Current drops below L (low alarm threshold) — this starts the low alarm delay timer.
4. Current drops below LL (low-low alarm threshold) — this starts the low-low alarm delay timer and the Latching Alarm Delay timer.

   Note: When the circuit current is continuously below the Low-Low Alarm Threshold (%) setting for the duration of the Latching Alarm OFF time period (and longer), the latching alarms for that channel are disarmed. At this point, the latched alarming feature is disabled (i.e. alarms disarmed), even though the Low, Low-Low and Latching Alarms are latched.

5. Low alarm is latched at the end of the L delay (low alarm delay) time period.
6. Low-low alarm is latched at the end of the L-L delay (low-low alarm delay) time period.
7. Current remains below the low-low alarm threshold, beyond the time period specified in the Latching Alarm OFF time setting, thus setting the Latching Alarm Off register for that channel

ASCII TABLE

Char	Dec	Oct	Hex	Char	Dec	Oct	Hex	Char	Dec	Oct	Hex	Char	Dec	Oct	Hex
(nul)	0	0000	0x00	(sp)	32	0040	0x20	@	64	0100	0x40	`	96	0140	0x60
(soh)	1	0001	0x01	!	33	0041	0x21	A	65	0101	0x41	a	97	0141	0x61
(stx)	2	0002	0x02	"	34	0042	0x22	B	66	0102	0x42	b	98	0142	0x62
(etx)	3	0003	0x03	#	35	0043	0x23	C	67	0103	0x43	c	99	0143	0x63
(eot)	4	0004	0x04	$	36	0044	0x24	D	68	0104	0x44	d	100	0144	0x64
(enq)	5	0005	0x05	%	37	0045	0x25	E	69	0105	0x45	e	101	0145	0x65
(ack)	6	0006	0x06	&	38	0046	0x26	F	70	0106	0x46	f	102	0146	0x66
(bel)	7	0007	0x07	'	39	0047	0x27	G	71	0107	0x47	g	103	0147	0x67
(bs)	8	0010	0x08	(	40	0050	0x28	H	72	0110	0x48	h	104	0150	0x68
(ht)	9	0011	0x09	)	41	0051	0x29	I	73	0111	0x49	i	105	0151	0x69
(nl)	10	0012	0x0a	*	42	0052	0x2a	J	74	0112	0x4a	j	106	0152	0x6a
(vt)	11	0013	0x0b	+	43	0053	0x2b	K	75	0113	0x4b	k	107	0153	0x6b
(np)	12	0014	0x0c	,	44	0054	0x2c	L	76	0114	0x4c	l	108	0154	0x6c
(cr)	13	0015	0x0d	-	45	0055	0x2d	M	77	0115	0x4d	m	109	0155	0x6d
(so)	14	0016	0x0e	.	46	0056	0x2e	N	78	0116	0x4e	n	110	0156	0x6e
(si)	15	0017	0x0f	/	47	0057	0x2f	O	79	0117	0x4f	o	111	0157	0x6f
(dle)	16	0020	0x10	0	48	0060	0x30	P	80	0120	0x50	p	112	0160	0x70
(dc1)	17	0021	0x11	1	49	0061	0x31	Q	81	0121	0x51	q	113	0161	0x71
(dc2)	18	0022	0x12	2	50	0062	0x32	R	82	0122	0x52	r	114	0162	0x72
(dc3)	19	0023	0x13	3	51	0063	0x33	S	83	0123	0x53	s	115	0163	0x73
(dc4)	20	0024	0x14	4	52	0064	0x34	T	84	0124	0x54	t	116	0164	0x74
(nak)	21	0025	0x15	5	53	0065	0x35	U	85	0125	0x55	u	117	0165	0x75
(syn)	22	0026	0x16	6	54	0066	0x36	V	86	0126	0x56	v	118	0166	0x76
(etb)	23	0027	0x17	7	55	0067	0x37	W	87	0127	0x57	w	119	0167	0x77
(can)	24	0030	0x18	8	56	0070	0x38	X	88	0130	0x58	x	120	0170	0x78
(em)	25	0031	0x19	9	57	0071	0x39	Y	89	0131	0x59	y	121	0171	0x79
(sub)	26	0032	0x1a	:	58	0072	0x3a	Z	90	0132	0x5a	z	122	0172	0x7a
(esc)	27	0033	0x1b	;	59	0073	0x3b	[	91	0133	0x5b	{	123	0173	0x7b
(fs)	28	0034	0x1c	<	60	0074	0x3c	\	92	0134	0x5c	|	124	0174	0x7c
(gs)	29	0035	0x1d	=	61	0075	0x3d	]	93	0135	0x5d	}	125	0175	0x7d
(rs)	30	0036	0x1e	>	62	0076	0x3e	^	94	0136	0x5e	~	126	0176	0x7e
(us)	31	0037	0x1f	?	63	0077	0x3f	_	95	0137	0x5f	(del)	127	0177	0x7f