



HINDLEPOWER

ATevo SERIES BATTERY CHARGER



ATevo



HINDLE HEALTH SYSTEM
PRODUCT

OPERATING & SERVICE INSTRUCTIONS

Microprocessor-Controlled Float Battery Charger
SINGLE PHASE INPUT
GROUP II - 16-100 Adc OUTPUT

ATevo O&SI - 1PH Input Group II (16-100 Adc)

1.1 — Last update: 27 September 2023

HindlePower Inc

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1. Receiving & Mounting



p/n JA5011-52

* The page breaks & formatting, as well as start & end sections, of this online variant of the *ATevo Operating & Service Instructions* may differ slightly, compared to the paper hard copy included in your battery charger manual pocket. For an Adobe PDF digital copy of that manual, access the following link ([JA5011-52](#)).

BEFORE YOU START

- Review your [5-Year Standard Warranty](#).
- Familiarize yourself with ALL [Safety Instructions](#).
- Download our [Quick Setup Sheet](#) for a checklist containing graphical instructions on

placement, wiring, startup, & configuration.

- Watch the [ATEvo Quick Setup Instructions](#) online video.

SECTION TOPICS
Storing ATevo
Receiving ATevo
Unpacking & Inspecting ATevo
Reporting Damage or Shortage
Returning Damaged Equipment
Moving ATevo
Mounting ATevo

Last modified: 7 September 2023

1.1. Storing ATevo

Storing ATevo

If you store ATevo for more than a few days before installation, store it in its original shipping container, in a temperature-controlled, dry climate. Ambient temperatures of 0 to 122 °F / -18 to 50 °C are acceptable. Storage should not exceed two (2) years due to limited shelf life of dc filter capacitors when they are not in service.

Last modified: 3 August 2023

1.2. Receiving ATevo

Receiving ATevo

The manufacturer does not assume any liability for damage during transportation or handling. Therefore, upon receipt of ATevo (or related products) immediately unpack, inspect for damage or shortage ([Section 1.3](#)). Report issues found ([Section 1.4](#)).

Last modified: 3 August 2023

1.3. Unpacking & Inspecting ATevo

Carefully remove all shipping materials from ATevo, and save until you are sure ATevo is undamaged. Remove ATevo from shipping pallet. Inspect for possible damage, using checklist below. If damage found, follow the instructions for proper reporting in [Section 1.4](#).

1.3.1 Inspection Checklist

- Enclosure exterior and interior are not marred or dented.
- No visible damage to exterior or interior components.
- Internal components are secure.
- Printed circuit boards are firmly seated on their standoffs.
- Hardware is tight.
- Wire terminations are secure.
- User's Manual is included.
- Includes all items on packing list.

Last modified: 3 August 2023

1.4. Reporting Damage or Shortage

Reporting Damage or Shortage

If damage or shortage is found, notify the delivery person and make notation on all copies of carrier's receipt before signing. If such is discovered after delivery, notify carrier immediately and request an inspection. The manufacturer does not assume any liability for damage during transportation or handling. Should the products require an inspection by (or return to) the manufacturer, please contact your sales representative for further instructions.

Last modified: 3 August 2023

1.5. Returning Damaged Equipment

Returning Damaged Equipment

Returned material must be packed in compliance with shipping regulations. It is preferable to use all original shipping materials if possible. Mark the outside of the shipping container with manufacturer's Return Material Authorization (RMA) number.

Last modified: 3 August 2023

1.6. Moving ATevo

Identifying Unit Weight

Once you have established that ATevo is undamaged, identify the weight of your unit using the table in Section 1.6.1 below.

For Style-5054 enclosure	x y	Refer to outline drawing (JE5251-00)
For Style-5070 enclosure	x y z	Refer to outline drawing (JE5309-00)

1.6.1 ATevo Weight Table (see also [JF5054-00](#) Product Literature)

ATevo Weight by Model					
Output Voltage	Ampere Rating				
	30 ADC	40 ADC	50 ADC	75 ADC	100 ADC
24 VDC	Style-5054	Style-5054	Style-5054	Style-5070	Style-5070
	147 lbs	149 lbs	177 lbs	282 lbs	317 lbs
	66 kg	67 kg	80 kg	128 kg	143 kg
48 VDC	Style-5054	Style-5054	Style-5054	Style-5070	Style-5070
	181 lbs	198 lbs	204 lbs	321 lbs	398 lbs
	82 kg	90 kg	92 kg	146 kg	178 kg
130 VDC	Style-5054	Style-5070	Style-5070	Style-5070	N/A
	241 lbs	341 lbs	384 lbs	422 lbs	
	109 kg	155 kg	174 kg	192 kg	
	16 ADC	25 ADC	30 ADC	50 ADC	100 ADC
260 VDC	Style-5070	Style-5070	N/A	N/A	N/A
	380 lbs	312 lbs			
	172 kg	142 kg			

The ATevo Style-5054 and Style-5070 enclosures do not feature top-lifting eyes for moving. Move ATevo with a forklift using the supplied shipping pallet.

- To lift the Style-5054 enclosure ([JE5251-00](#)) into a wall-mount installation, use a heavy-duty sling or a scissor lift.
- To place the Style-5070 enclosure ([JE5309-00](#)) into a floor-mount installation, use a forklift. Raise the enclosure between the bottom mounting legs.

Last modified: 18 September 2023

1.7. Mounting ATevo

Mount ATevo so you can easily access the front panel AC Input (CB1) and DC Output (CB2) Circuit Breakers. Choose from the following mounting methods:

- [Wall-Mounting](#)
- [Floor-Mounting](#)
- [Rack-Mounting](#)
- [Floor-Mounting](#)
- [Wall-Mounting](#)
- [Rack-Mounting](#)

Last modified: 7 September 2023

1.7.1. Wall-Mounting (Style-5054)

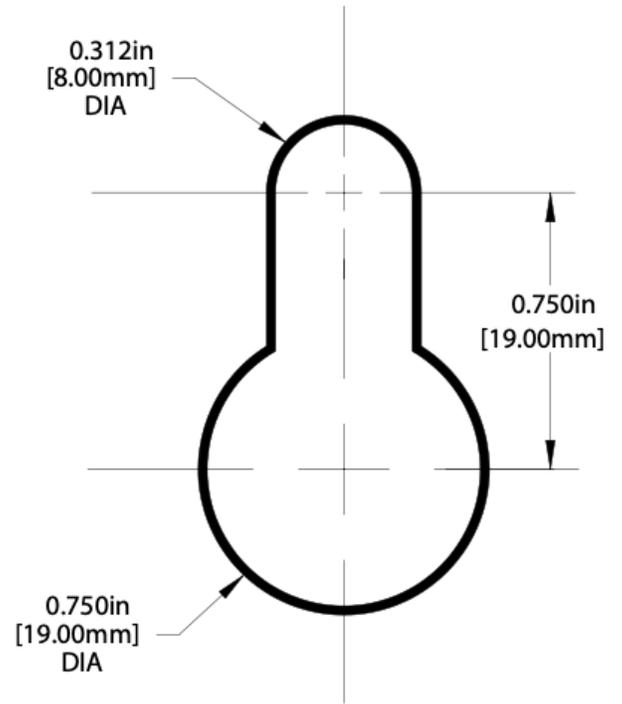
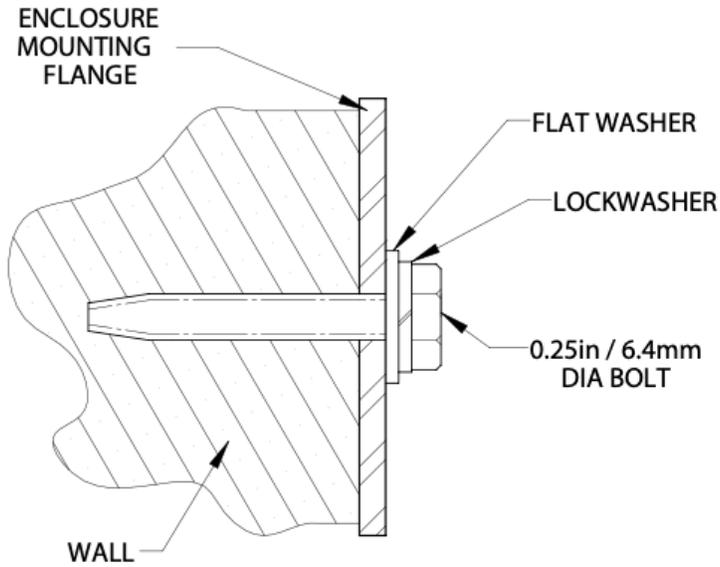
Wall-mounting is the standard method. Refer to Style-5054 enclosure outline drawing ([JE5251-00](#)). When wall-mounting ATevo, consider the following:

1. Wall must be strong enough to properly support ATevo's weight, plus a safety factor. Refer to Weight Table in [Section 1.6, Moving ATevo](#). The weight of your ATevo may be different, depending on the features, options, and accessories ordered with the unit.
2. Select conduit entrances with planned AC input and DC output wiring in mind. By using pre-fab knockouts on enclosure sides or bottom, the enclosure shroud can be removed for internal servicing without removing ATevo from the wall.
3. Location requirements:
 - a. Free of drips and splatter. If falling particles and liquids are a problem, install a NEMA Type-2 drip shield accessory.
 - b. Between 0 and 122 °F / -18 and 50 °C, with relative humidity between 0% and 95% non-condensing.
 - c. Must be free of flammable or explosive materials.
4. Maintain at least 6in / 152mm of free air on all vented surfaces for cooling.
5. Allow at least 36in / 914mm front clearance for operation and maintenance.

PROCEDURE

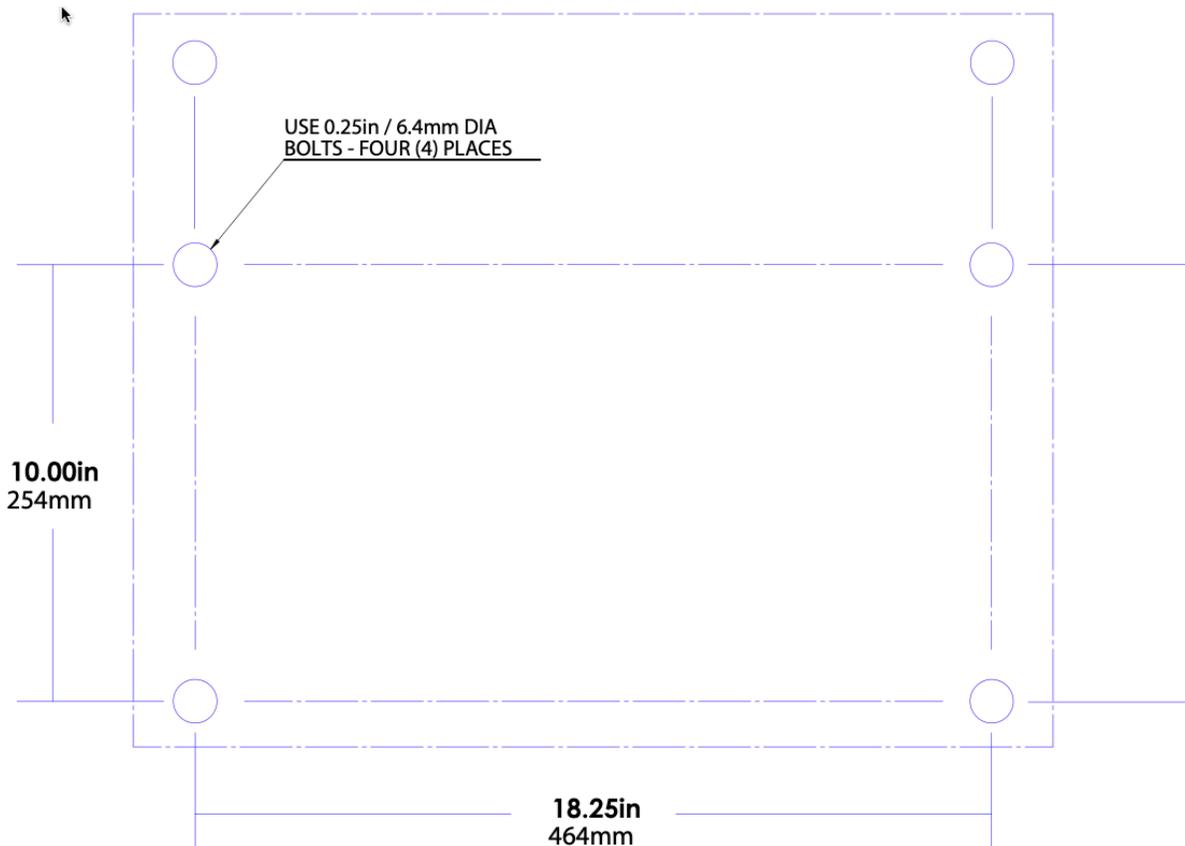
Install four (4) 0.25in / 6.4mm anchor bolts (not supplied) rated to support ATevo's weight plus a minimum safety factor of two (2) times, into the wall. Place ATevo onto anchor bolts, add appropriate mounting hardware, and tighten securely. Refer to the following graphics for ATevo's wall-mounting pattern and specification.

Wall-Mounting: Style-5054 Enclosure



**RECOMMENDED MOUNTING
HARDWARE LOADING**

**KEYHOLE SLOT USED ON ATEVO
MOUNTING FLANGE**



Last modified: 3 August 2023

1.7.2. Floor-Mounting (Style-5054)

To install ATevo onto a horizontal surface, the standard enclosure does not need to be modified, but a special floor mounting accessory is required. The kit includes a set of mounting brackets that elevate the top of ATevo approximately 47in /1194mm above floor level, with provisions for floor anchoring. The kit also includes appropriate hardware and installation instructions ([JA0083-50](#)) for the floor-mounting procedure.

When floor-mounting ATevo, consider the following:

1. Locate anchor bolt holes at least 4.25in /108mm from any wall, to allow clearance behind the mounting brackets.
2. Select conduit entrances with planned ac input and dc output wiring in mind. By using pre-fab knockouts on enclosure sides or bottom, the enclosure shroud can be removed for internal servicing without removing ATevo from the floor stand.
3. Location requirements:
 - a. Free of drips and splatter. If falling particles and liquids are a problem, install a NEMA Type-2 drip shield accessory.
 - b. Between 0 and 122 °F / -18 and 50 °C, with relative humidity between 0% and 95% non-condensing.
 - c. Must be free of flammable or explosive materials.
4. Maintain at least 6in /152mm of free air on all vented surfaces for cooling.
5. Allow 36in /914mm front clearance for operation and maintenance.

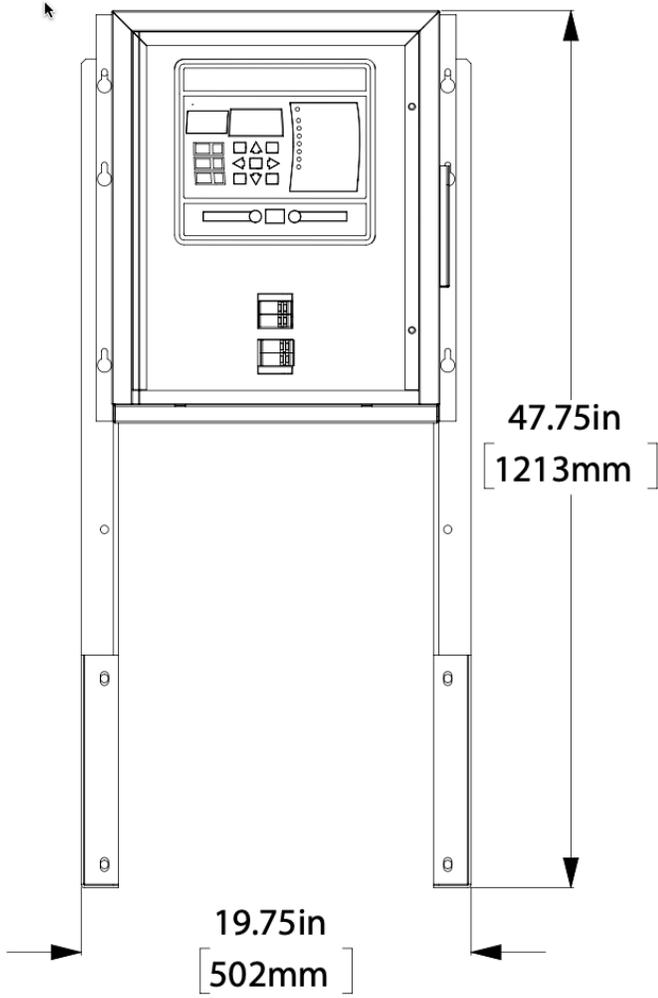
PROCEDURE

Install four (4) 0.25in / 6.4mm anchor bolts (not supplied) rated to support the unit weight plus a minimum safety factor of two (2) times, into floor.

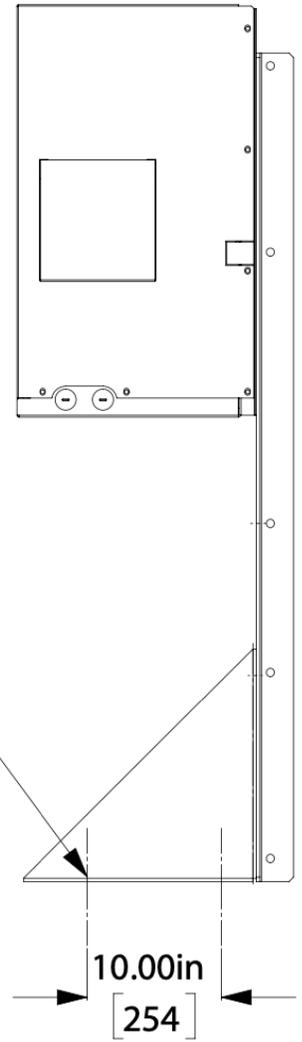
Assemble the floor-mounting accessory on to the anchor bolts as shown. Place ATevo onto vertical posts, add appropriate mounting hardware, and tighten.

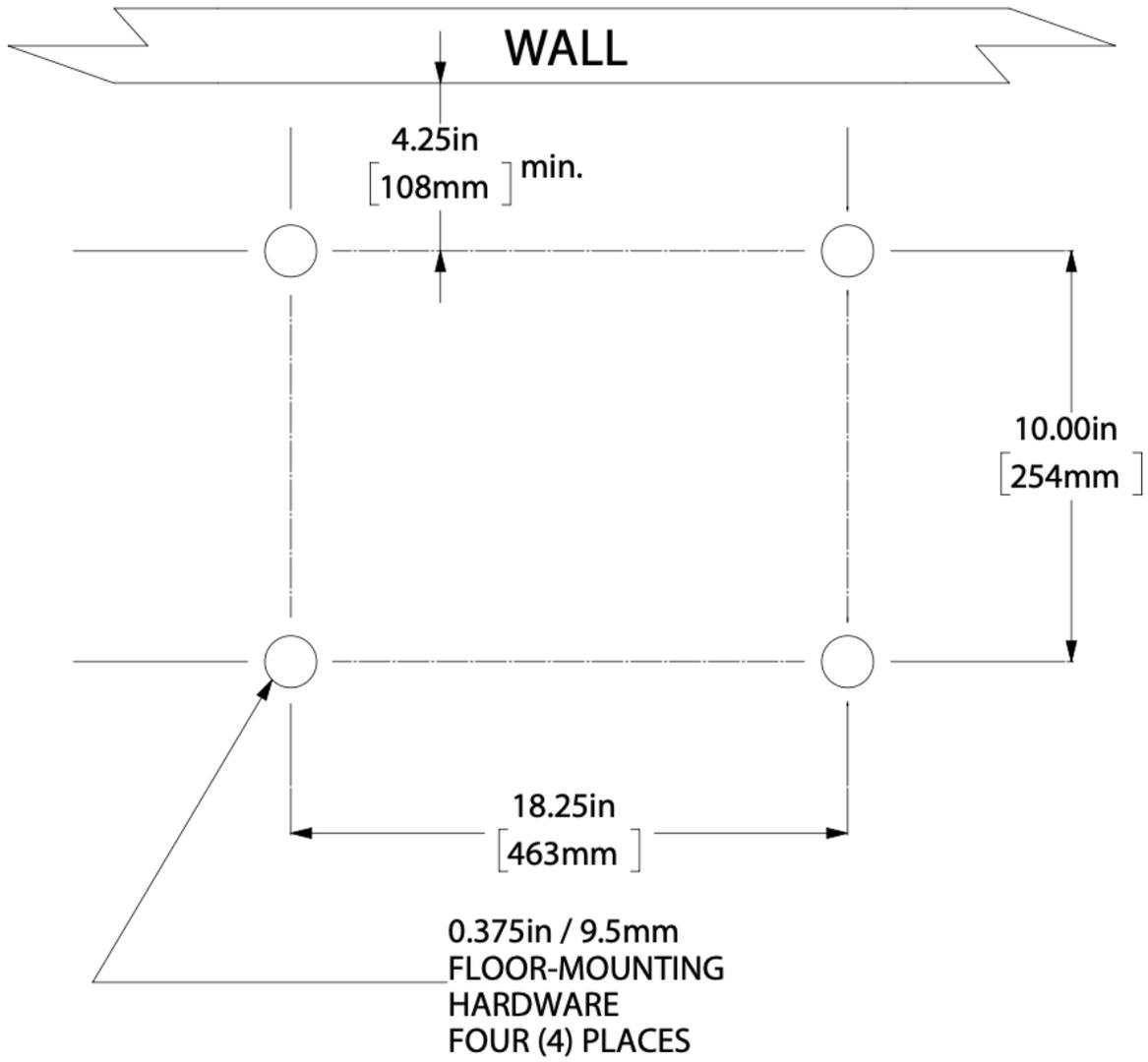
Refer to the following graphics for floor mounting patterns and enclosure footprints.

Floor-Mounting: Style-5054 Enclosure



0.437in / 11mm
FLOOR MTG HOLE
FOUR (4) PLACES





Last modified: 3 August 2023

1.7.3. Rack-Mounting (Style-5054)

ATevo can be installed into most 23in/584mm and 24in/610mm relay racks with standard EIA hole spacing. ATevo's enclosure does not need to be modified for rack mounting, but a special kit is required. The kit includes two (2) mounting brackets, appropriate hardware, and Installation Instructions ([JA0091-50](#)) for the rack-mounting procedure.

When rack-mounting ATevo, consider the following:

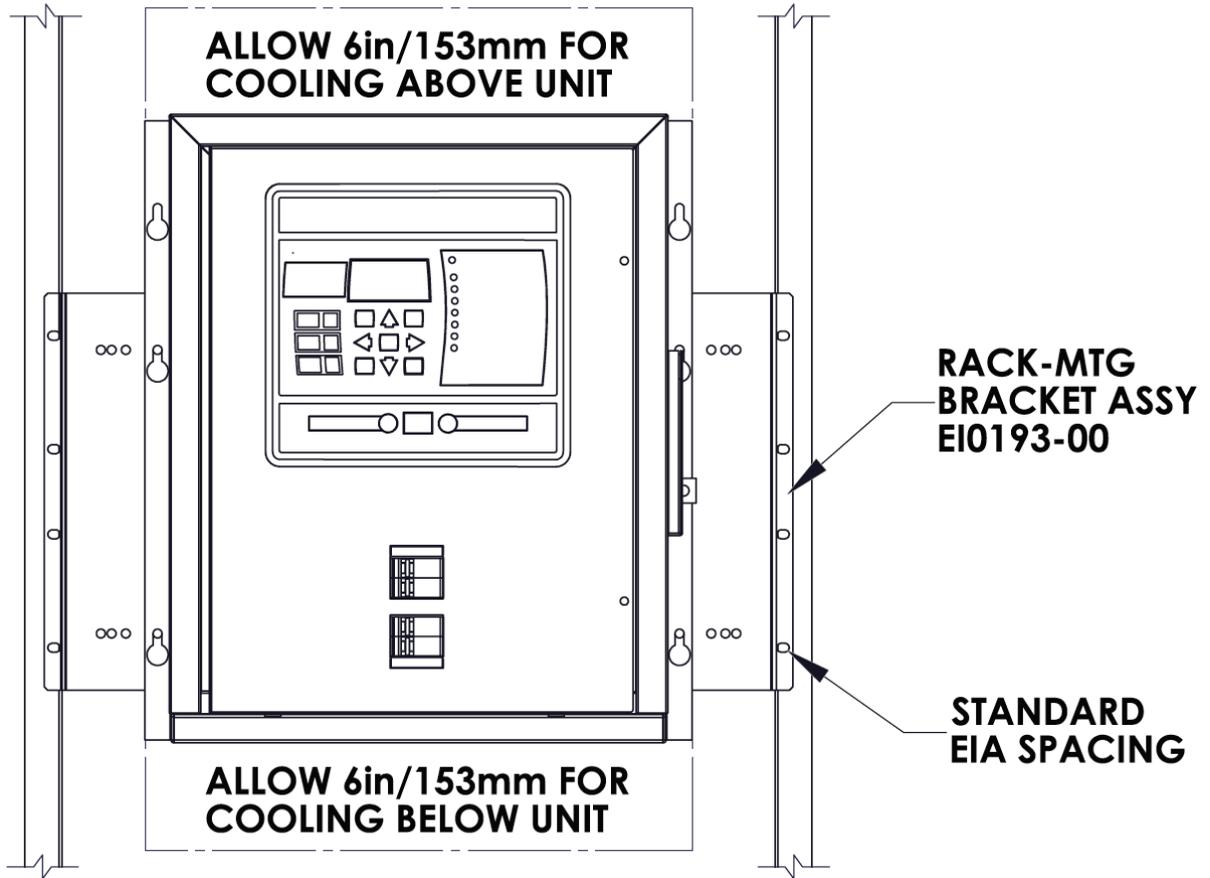
1. Rack must be strong enough to properly support the unit's weight. Refer to the Weight Table in [Section 1.6, Moving ATevo](#).
2. Select conduit entrances such that planned ac input and dc output conduit is accessible after rack-mounting. Note the standard pre-fab conduit knockouts located on the sides, top, and bottom of the enclosures.
3. Location requirements:
 - a. Free of drips and splatter. If falling particles and liquids are a problem, install a NEMA Type-2 drip shield accessory.
 - b. Between 0 and 122 °F / -18 and 50 °C, with relative humidity between 0% and 95% non-condensing.
 - c. Must be free of flammable or explosive materials.
4. Maintain at least 6in /152mm of free air on all vented surfaces for cooling.
5. Allow 36in /914mm front clearance for operation and maintenance.

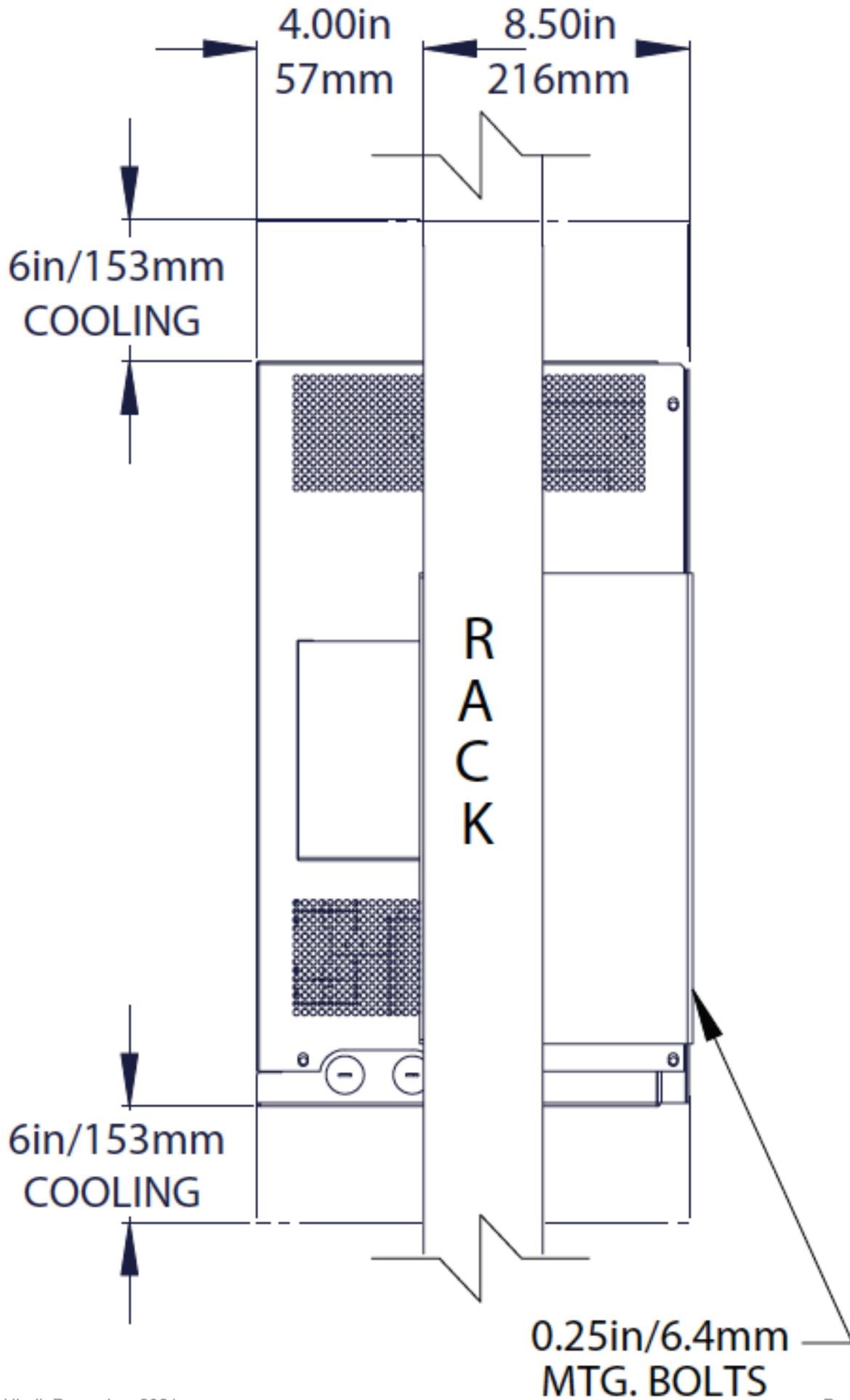
PROCEDURE

To rack mount ATevo, first install mounting brackets into rack using proper hardware (not supplied). Second, mount ATevo onto installed brackets, using supplied kit hardware. Provide at least 6in /152mm of free air above and below ATevo for cooling. Refer to the following graphics for rack-mounting configurations.

Rack Mounting: Style-5054 Enclosure

RACK-MOUNTING: STYLE-5054 ENCLOSURE





1.7.4. Floor-Mounting (Style-5070)

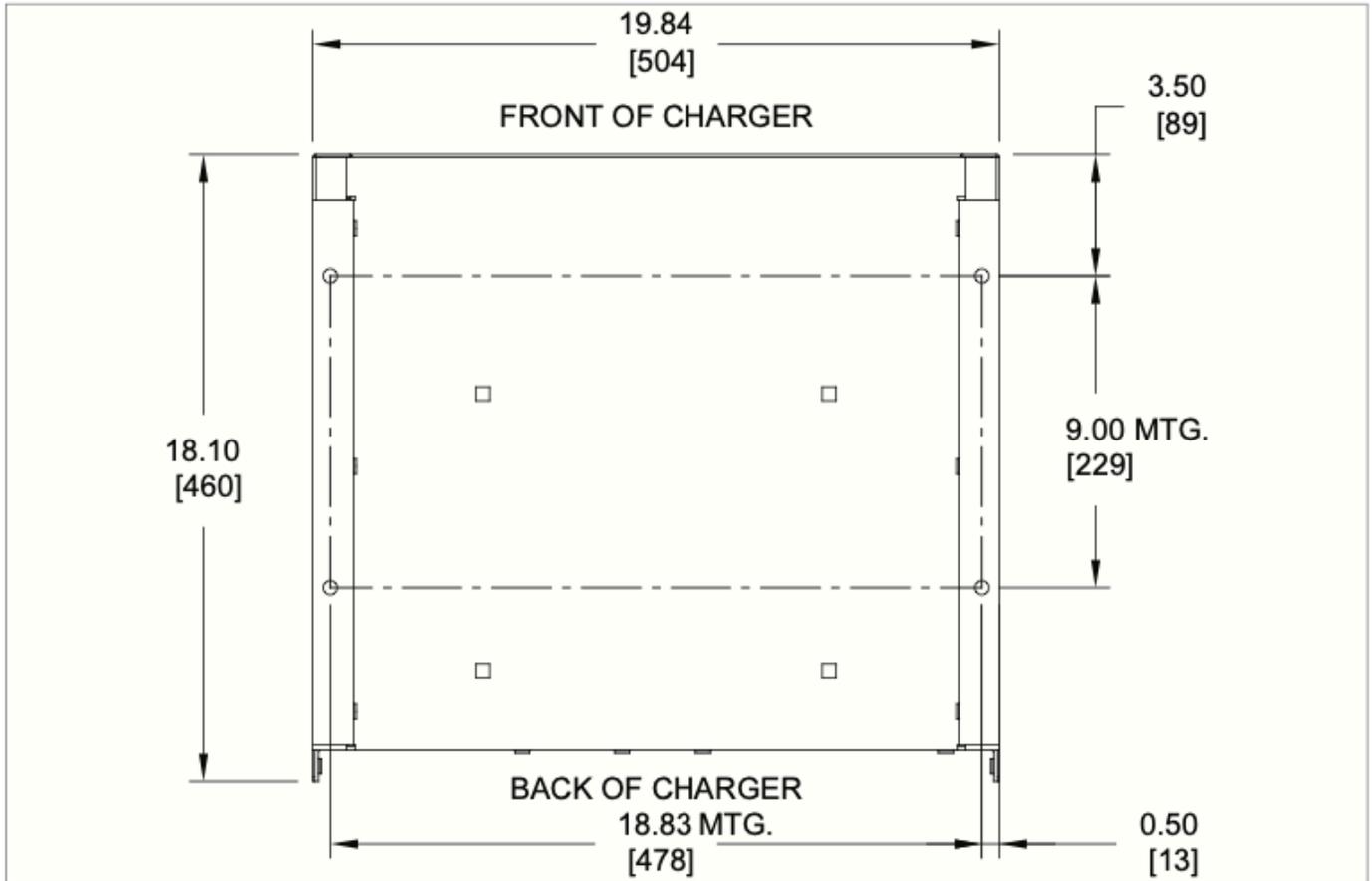
Floor-mounting is the standard method of installing the Style-5070 enclosure. Refer to the Style-5070 enclosure outline drawing ([JE5309-00](#)). Be sure to consider the following:

1. Be conscious of planned ac input and dc output wiring to the ATevo selecting conduit entrances carefully.
2. Location requirements:
 - a. Free of drips and splatter. If falling particles and liquids are a problem, install a NEMA Type-2 drip shield accessory.
 - b. Between 0 and 122 °F / -18 and 50 °C, with relative humidity between 0% and 95% non-condensing.
 - c. Must be free of flammable or explosive materials.
3. Maintain at least 6in /152mm of free air on all vented surfaces for cooling.
4. Allow 36in /914mm front clearance for operation and maintenance.

PROCEDURE

1. To floor-mount the ATevo, install four (4) 0.25in / 6.4mm anchor bolts into the floor.
2. Refer to the following graphic for the Style-5070 floor-mounting pattern and enclosure footprint. Dimensions are in/mm.
3. Carefully lift the ATevo above the anchor bolts, guide the enclosure onto the floor bolt pattern and lower it into place.
4. Add appropriate mounting hardware to the anchor bolts and tighten securely.

FLOOR-MOUNTING: STYLE-5070 ENCLOSURE



Last modified: 7 September 2023

1.7.5. Wall-Mounting (Style-5070)

To wall-mount the ATevo Style-5070 enclosure, a special mounting accessory (p/n [EI5008-50](#)) is required. The kit includes two (2) mounting brackets, appropriate hardware, and Installation Instructions ([JE5122-50](#)) for the wall-mounting procedure.

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1.7.6. Rack-Mounting (Style-5070)

To rack-mount the ATevo Style-5070 enclosure, a special mounting accessory (p/n EI0193-51) is required. The kit includes two (2) mounting brackets, appropriate hardware, and Installation Instructions ([JA0091-53](#)) for the rack-mounting procedure.

Last modified: 7 September 2023

2. Wiring



<https://www.youtube.com/embed/VjuwjKU7Kt4?rel=0&start=39&end=82>

SECTION TOPICS

[Mechanical Diagram and Component Location](#)

[Removing Protective Safety Shield](#)

[Retapping Power Isolation Transformer](#)

[Making AC Input Connections](#)

[Making DC Output Connections](#)

[Remote Voltage Sense](#)

[Wiring ATevo Common Alarm](#)

[Wiring Relays on Auxiliary I/O Board](#)

[Wiring Temperature Compensation Probe](#)

[Wiring Serial Communications Adapters](#)

[Wiring Ethernet Adapter](#)



Download our [Quick Setup Sheet](#) for a checklist containing graphical instructions on placement, wiring, startup, & configuration.

Last modified: 8 September 2023

2.1. Mechanical Diagram and Component Location

ATevo features a mechanical layout and connection diagram screen-printed onto its internal acrylic safety shield.

ATevo consists of the following components and subsections:

- Rectifier Assembly (A6)
 - Heatsink, SCR module, Free-Wheeling Diode (CR4), Polarity Diode (CR1) & DC Shunt (R1)
- [A1 - Main Control Board](#)
- [A2 - Power Board](#) with 9V Power Supply (P/S-A2)
- [A4 - Auxiliary I/O Board](#) - optional
- [A7 - Filter Capacitor \(C1x/R9x\) Board](#)
or
- C1x - Discrete Filter Capacitor Bank with Bleeder Resistor (R9)
- [A9 - AC MOV \(surge suppressor\) Board](#)
- A10 - Remote Temperature Probe - optional
- [A12 - Serial Communications Adapter](#) - optional
- [A13 - Forced Load Sharing Communications Adapter](#) - optional
- [A22 - Ethernet Communications Adapter](#) - optional
- [C2 - Eliminator Filter Capacitor](#) - optional
- [CB1 - AC Input Circuit Breaker](#) (and input terminals)
- [CB2 - DC Output Circuit Breaker](#) (and output terminals)
- [L1 - Main Filter Inductor](#)
- [L2 - Secondary Filter Inductor](#)
- [T1 - Power Isolation Transformer](#)

For detailed component location and orientation, refer to the Style-5054 ([JE5252-20](#)) or Style-5070 ([JE5310-10](#), [JE5310-20](#)) Internal Component Layout Drawings in Appendix B.

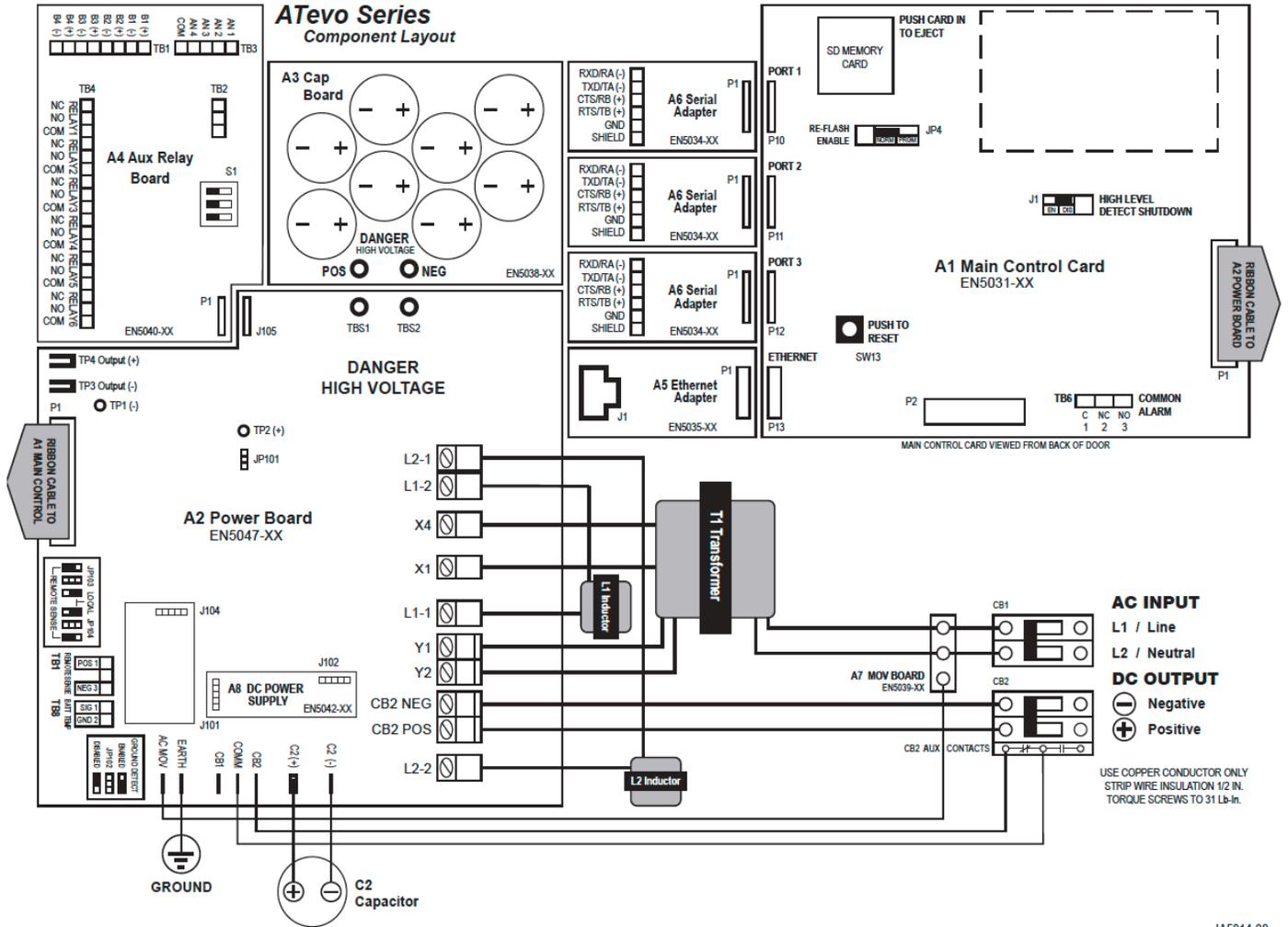
Rectifier Assembly (A6)

This is a grouping of an aluminum heatsink and a Silicon-Controlled Rectifier (SCR) module. It is mounted on the left side of ATevo in Style-5054 enclosures. The Rectifier (A6) converts single-phase alternating current (ac) power to direct current (dc) for the battery.

Remote Temperature Probe (A10) – optional

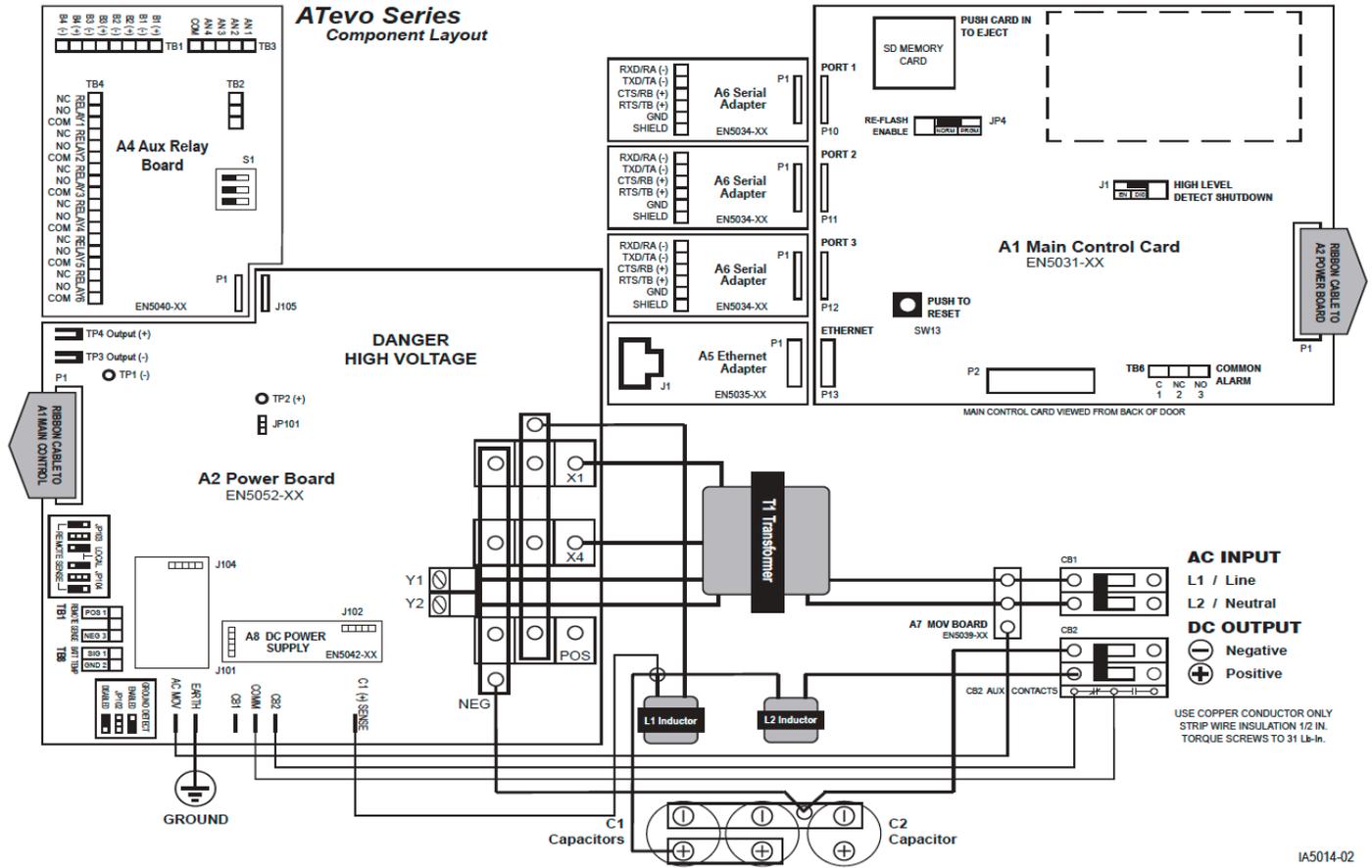
The battery temperature compensation, or 'TempCo', probe (A10) contains a temperature-dependent resistor in an epoxy module. When used, this probe is installed on the battery and is connected to the Power Board (A2) at TB8.

ATEvo Silkscreen (1PH 30-50 Adc)



IA5014-00

ATEvo Silkscreen (1PH 75-100 Adc)



Last modified: 7 September 2023

2.1.1. Main Control Board (A1)

Mounted on the inside of the ATevo front panel door. It contains the front display, push buttons, and alarm LEDs. It is responsible for battery charger controls.

Last modified: 7 September 2023

2.1.2. Power Board (A2)

Mounted to the rectifier heat sink, along the left side of ATevo. It contains most power electronic connections, and terminal blocks for remote sense / optional TempCo wiring.

Last modified: 7 September 2023

2.1.3. Auxiliary I/O Board (A4) – optional

Plugged directly into, and mounted with, the Power Board (A2).

- Six (6) relays, four (4) Binary Inputs, and four (4) Analog Inputs
- Relays can be configured to indicate status of six (6) different alarms or status points
- Independently-isolated Binary Inputs can be configured to report ON/OFF status of four (4) controls
- Analog Inputs include input scaling and can report the status of four (4) analog controls referenced to the dc bus

Last modified: 7 September 2023

2.1.4. Filter Capacitor Board (A7) or Capacitors (C1x)

The electrolytic capacitors (C1x) filter 'ripple' from the dc output.

- ATevo units rated 30-50Adc utilize a Capacitor Board (A7) bolted to the top of the Power Board (A2).
- ATevo units rated 75-100Adc utilize a bank of discrete capacitors (C1x). The light blue can-shaped components are hardwired to the Power Board (A2) with bolted connections. In these units, a Bleeder Resistor (R9) is supplied across the filter caps.

Last modified: 13 September 2023

2.1.5. AC MOV Board (A9)

Mounted near the AC Input Breaker (CB1) in Style-5054 enclosures, and on the I/O panel in Style-5070 enclosures. It contains ac input surge suppression and filtering. The MOV Board (A9) is located for easy access, examination, and replacement in case an input transient event should occur.

Last modified: 7 September 2023

2.1.6. Serial Communications Adapter (A12) – optional

Located above Ethernet Adapter (A22). Up to three (3) Serial Communications Adapter pc boards can be plugged into the Main Control Board (A1) at locations, P10, P11, and P12.

- Supports DNP3 and Modbus protocols (A12), and can be configured to support 2-wire or 4-wire RS-232 connections, or 2-wire or 4-wire RS-485 connections.

Last modified: 7 September 2023

2.1.7. Forced Load Sharing Comm Adapter (A13) – optional

Mounted similarly to Serial Communications Adapter (A12).

Last modified: 7 September 2023

2.1.8. Ethernet Communications Adapter (A22) – optional

Plugged into the bottom left-side edge of the Main Control Board (A1) at P13. It supports DNP3 and Modbus protocols via 10/100 copper Ethernet connection.

Last modified: 7 September 2023

2.1.9. Eliminator Capacitor (C2) – optional

Mounted to the rear base. These light blue, can-shaped components provide additional ripple filtering required for the 'eliminator' option.

Last modified: 7 September 2023

2.1.10. AC Input Circuit Breaker (CB1)

Located in center, accessible through door window. It protects ATevo ac wiring, and can be used to disconnect ATevo from its ac source.

Last modified: 7 September 2023

2.1.11. DC Output Circuit Breaker (CB2)

Located next to ac breaker, accessible through door window. It protects ATevo dc wiring, and can be used to disconnect ATevo from the battery and system load.

Last modified: 7 September 2023

2.1.12. Main Filter Inductor (L1)

Mounted to rear base. It is part of the dc filter, lowering ripple.

Last modified: 7 September 2023

2.1.13. Secondary Filter Inductor (L2)

Mounted to rear base. It is the second stage of the dc filter.

Last modified: 7 September 2023

2.1.14. Power Isolation Transformer (T1)

The largest and heaviest component in ATevo, bottom-mounted to the base. It provides isolation, and converts ac voltage to appropriate levels prior to rectification.

Last modified: 7 September 2023

2.2. Removing Protective Safety Shield



To prevent injuries, the ATevo safety shield must always be installed when charger is in operation and/or energized.

2.2.1 Style-5054 Enclosure Instructions

- A standard flat blade screwdriver is required.
- Open the ATevo front panel door to access safety shield.
- Remove the two (2) screws that attach the safety shield to the ATevo, one above AC Input Breaker (CB1), the other below the DC Output Breaker (CB2).
- Grab the safety shield on both left and right sides.
- Gently lift up and off of AC Input and DC Output Circuit Breakers.
- Reverse procedure for reinstalling the safety shield.

2.2.2 Style-5070 Enclosure Instructions

- Standard Phillips head screwdriver is required.
- Open ATevo front panel door to access safety shield.
- Remove four (4) screws from corners of top shield and (4) screws from corners of bottom shield.
- Grab the safety shield while removing the last screw, and gently remove.
- Reverse procedure for reinstalling the safety shield.

Last modified: 8 September 2023

2.3. Retapping Power Isolation Transformer

ATevo 1PH Group II (16-100 Adc) models are not equipped with a multi-tap ac input terminal block for the Power Isolation Transformer (T1). However, transformers for certain models can be re-tapped in the field, to switch between connected input voltages. See special Service Instruction ([JD5026-52](#)).

Last modified: 8 September 2023

2.4. Making AC Input Connections

ATevo is a commercial/industrial product. It is not intended for use at any time in a residential environment or to be powered by low-voltage public mains.

It is the responsibility of the installer to provide ac supply wiring approved for use in the country where installed. When selecting wire sizes, consult the data nameplate decal affixed to ATevo for voltage and current requirements.

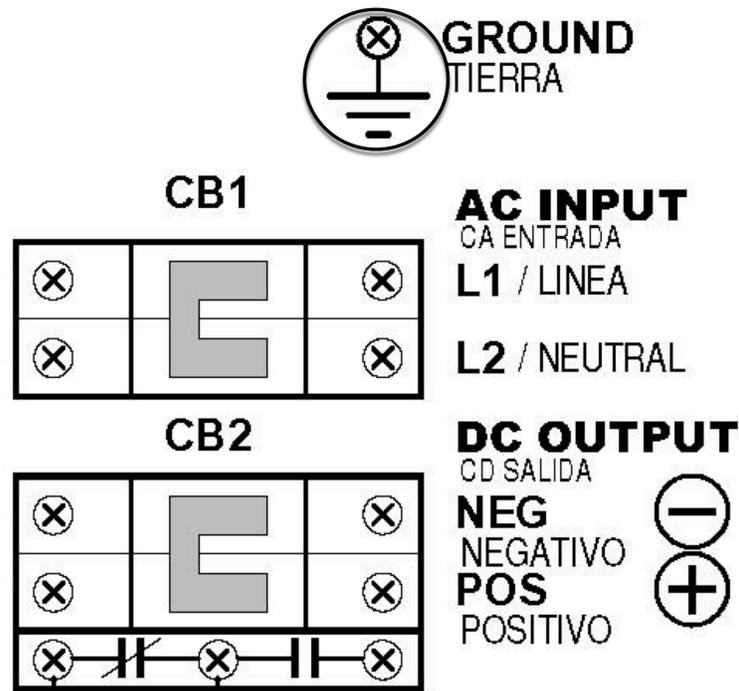
Guidelines for Supplying AC Power to ATevo

Follow these steps to supply proper ac power to ATevo:

1. Confirm that the ATevo nameplate voltage rating is correct for the ac input supply voltage.
2. Use a branch circuit breaker or fused disconnect switch upstream from ATevo. This device should have lockout capabilities so that the ac input supply to ATevo can be deenergized for unit maintenance. A time-delay circuit breaker or slow-blow fuse is recommended.
3. Size the branch circuit breaker or fused disconnect switch for ATevo's maximum ac input current as listed on the data nameplate decal. For a table of ratings, refer to standard ([JF5072-01](#)).
4. Size the ac input wiring per the National Electric Code (NEC), Canadian Electrical Code, local and site codes for the trip rating of the branch circuit breaker or fused disconnect switch.
5. Conduit must be properly grounded, and in compliance with the national wiring rules of the country where installed.
6. Do not run external ac input power wiring through the same conduit as external dc wiring.
7. Use copper or aluminum conductors only.
8. For 120 Vac, connect the neutral leg to input terminal (CB1-L2).
9. All site requirements of the facility take precedence over these instructions.

Refer to the section below that has the AC Input connections required for your ATevo's enclosure style:

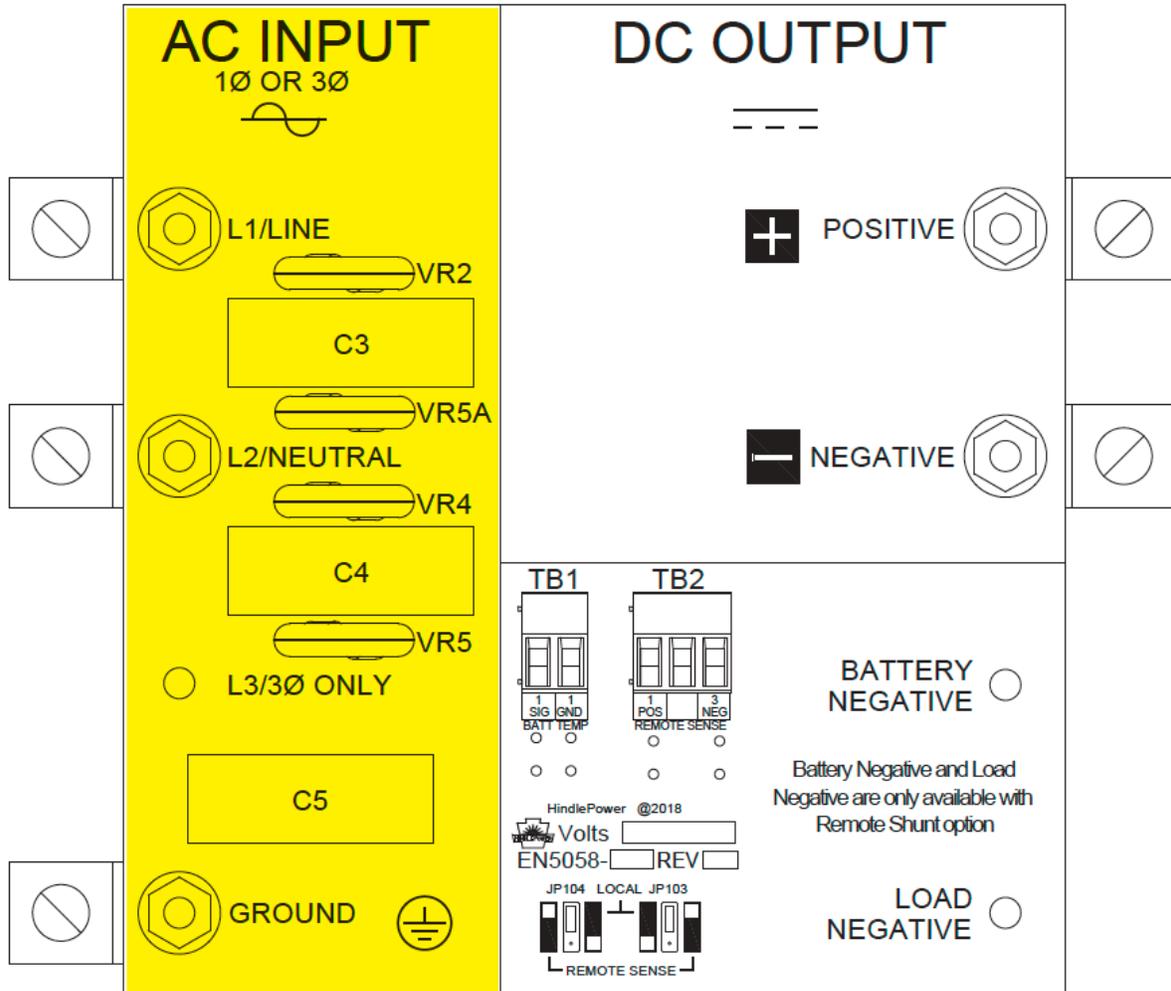
2.4.1 I/O Connections (Style-5054)



PROCEDURE

1. Remove safety shield per [Section 2.2](#).
2. Run ac input supply wiring into ATevo, ending at the AC Input Circuit Breaker (CB1) and ground stud.
3. Connect wires to appropriate locations on AC Input Circuit Breaker (CB1-L1/L2) and system ground stud, as indicated on drawing above.
4. Using a flat-blade screwdriver, securely tighten the compression screws on AC Breaker (CB1-L1/L2).
5. Securely tighten ground wire on system ground stud.
6. Check all connections and reinstall safety shield.

2.4.2 I/O Connections (Style-5070)



PROCEDURE

1. Remove top safety shield per [Section 2.2](#).
2. Run ac input supply wiring into ATevo, ending at left side of I/O panel.
3. Connect wires to appropriate ac input CU-AL compression lugs on left side of I/O panel.
4. Using a flat-blade screwdriver, securely tighten lugs for L1, L2, and GROUND connections.
5. Check all ac input connections and reinstall safety shield.

Last modified: 8 September 2023

2.5. Making DC Output Connections

Installer is responsible to provide suitable dc output, battery, and dc load wiring.

Guidelines for DC Connections

Follow these steps to connect the battery to ATevo:

1. Size the dc wiring to minimize voltage drop. Acceptable wire size depends on the installation. As a guideline, voltage drop should not exceed 1% of nominal output voltage at full current. Refer to the following table to determine the voltage drops for various wire sizes, currents and distances.

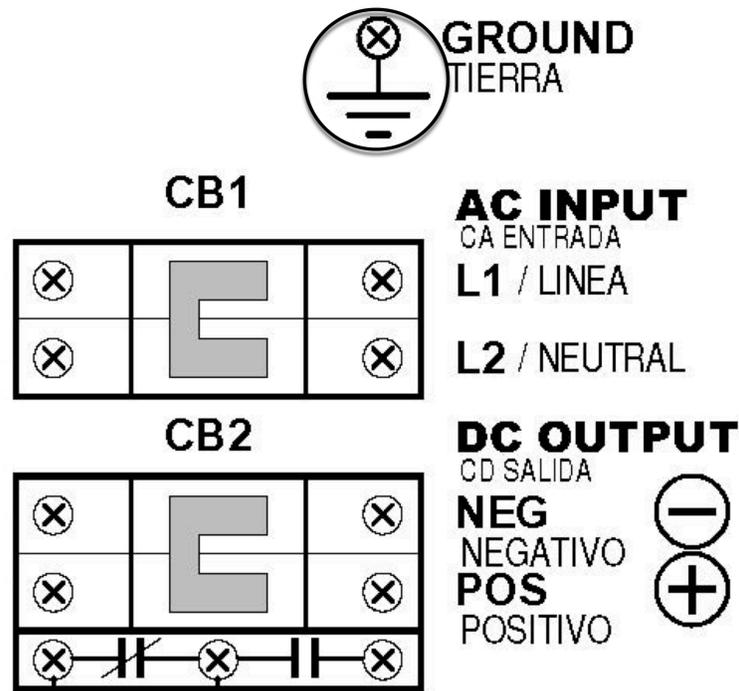
Wire Sizing Chart					
Voltage Drop per 100ft / 30.5m of Wire (for copper at 68 F / 20 C)					
Wire Size (AWG)	DC Current (Amperes)				
	30	40	50	75	100
10	3.0V	4.0V	5.0V	<i>not recommended</i>	<i>not recommended</i>
8	1.9V	2.5V	3.1V	<i>not recommended</i>	<i>not recommended</i>
6	1.2V	1.6V	2.0V	3.0V	<i>not recommended</i>
4	0.7V	1.0V	1.2V	1.9V	2.5V
2	0.5V	0.6V	0.8V	1.2V	1.6V
0	0.3V	0.4V	0.5V	0.7V	1.0V

Example: 100ft / 30.5m of #8 AWG wire at 50A has a 3.1V drop.

2. ATevo is factory wired to regulate output voltage at the output terminals. If total voltage drop is greater than 1% (e.g. 1.3V for a 130 Vdc system), remote sense wiring is recommended (refer to [Section 11](#)).
3. Do not run external ac and dc power wiring through the same conduit.
4. Facility-specific installation requirements take precedence.

Click the toggle below to see the DC Output connections required for your ATevo's enclosure style:

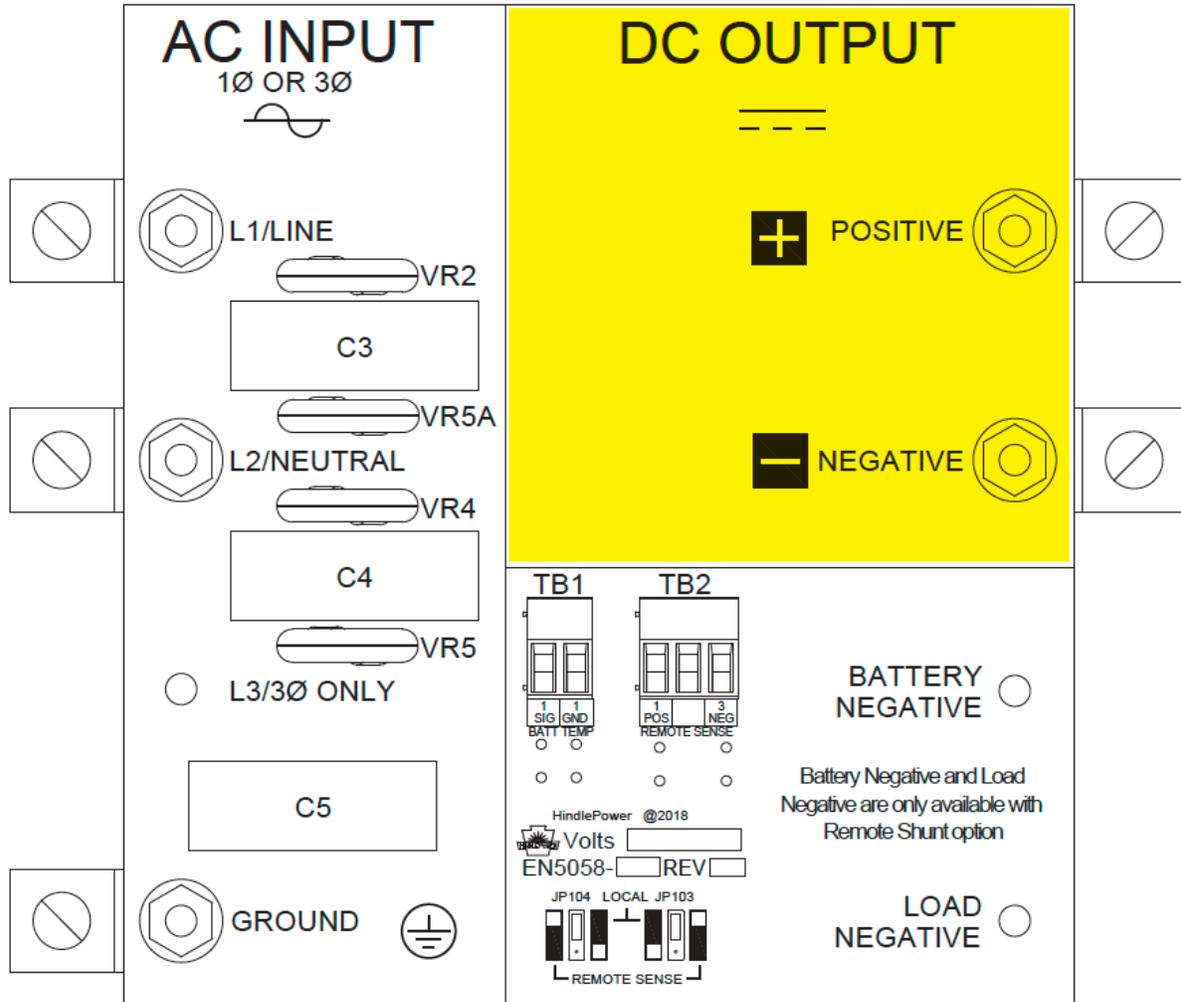
2.5.1 I/O Connections (Style-5054)



PROCEDURE

1. Use a dc disconnect switch or circuit breaker between ATevo and the dc bus. This device should have lockout capability to allow ATevo to be disconnected from the dc bus for maintenance.
2. Remove safety shield per [Section 2.2](#).
3. Run dc wiring to Output Circuit Breaker (CB2).
4. Connect wires to appropriate locations on the DC Output Breaker (CB2+/-) as indicated on drawing above.
5. Using a flat-blade screwdriver, securely tighten compression screws on DC Output Breaker Terminals (CB2+/-).
6. Reinstall safety shield after you have made and checked all connections.

2.5.2 I/O Connections (Style-5070)



PROCEDURE

1. Use a dc disconnect switch or circuit breaker between ATevo and the dc bus. This device should have lockout capability to allow ATevo to be disconnected from the dc bus for maintenance.
2. Remove safety shield per [Section 2.2](#).
3. Run dc wiring into ATevo, ending at right side of I/O panel.
4. Connect wires to appropriate dc output CU-AL compression lugs on right side of I/O panel.

! To prevent equipment damage, confirm polarity of pos(+) and neg(-) wiring.

5. Using a flat-blade screwdriver, securely tighten lugs for pos(+) and neg(-) connections.
6. Check all dc output connections, and reinstall safety shield.

Last modified: 8 September 2023

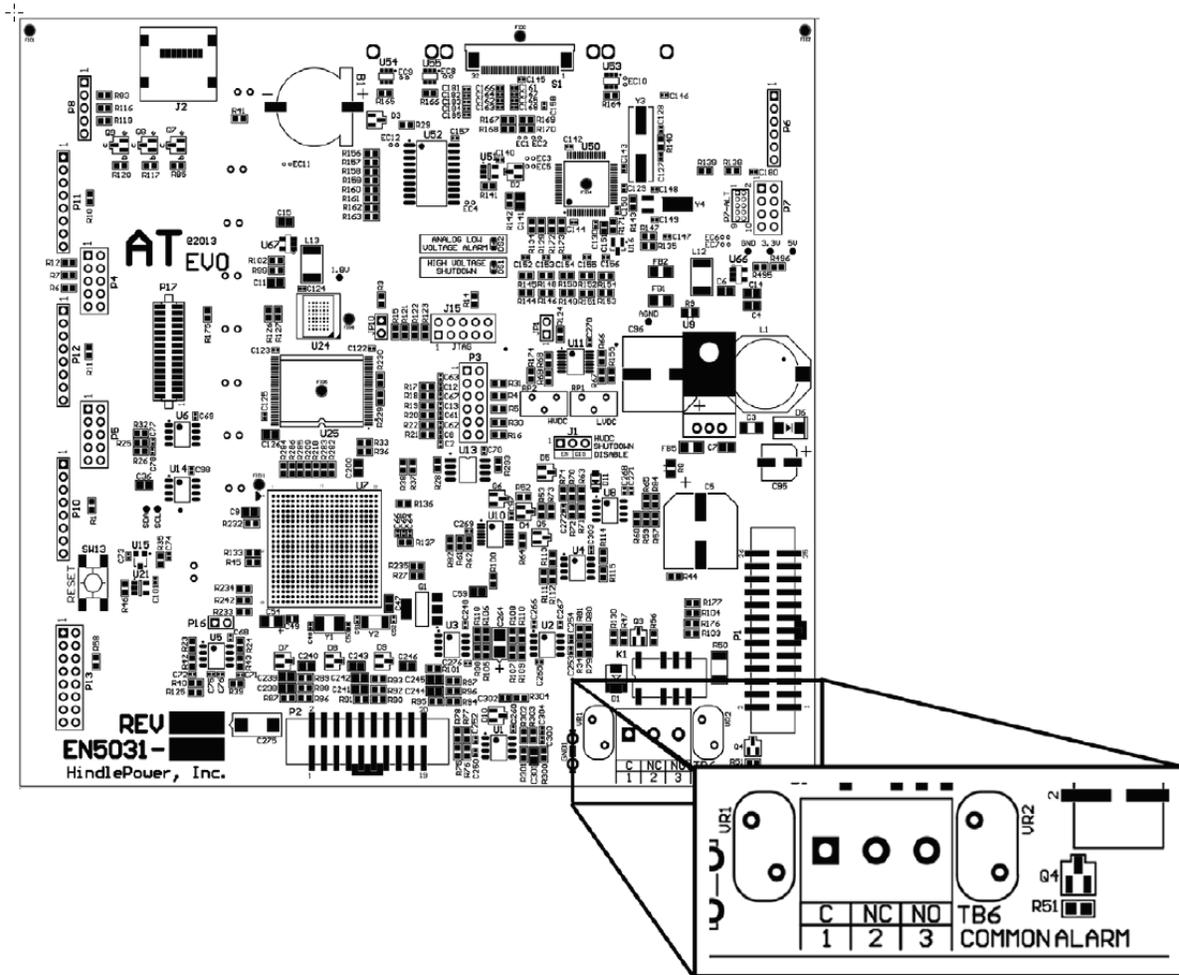
2.6. Remote Voltage Sense

You can wire ATevo to regulate output voltage at the battery terminals instead of at the battery charger dc output terminals (CB2+/-). See [Section 13, Remote Sense](#) for information and wiring instructions.

Last modified: 3 August 2023

2.7. Wiring ATevo Common Alarm

ATEvo Main Control Board (A1) is equipped with a 'summary' Common Alarm relay. This relay contact transfers when any one (1) or more of the standard ATevo alarm(s) become active. One (1) set of form-C alarm contacts is provided, and are accessible via terminal block (A1-TB6) on the Main Control Board. Refer to figure below.



PROCEDURE

1. Allow 30in / 762mm of wire inside enclosure, and trim excess.
2. Route annunciator wires to ATevo front panel door by following existing harness past door hinge.
3. Use two (2) wire ties and allow a 4-6in / 102-153mm loop for the hinge.
4. Trim wires to length to connect to alarm terminal block (A1-TB6), and strip 0.25in / 6.4mm of insulation.
5. Make connections at A1-TB6 and tighten compression screws.

NOTES

1. Alarm contacts are rated at 0.5A / 125 Vac or Vdc.
2. Common Alarm relay terminal block (A1-TB6) is compression type, accepting wire sizes #22-14 AWG.
3. Terminals are labeled in the *non-alarm* condition, with ATevo operating 'normally' and relays energized.

 Not 'shelf state'

4. If user alarm contacts (A1-TB6) are to drive inductive dc loads (e.g. a larger dc relay) an external protective diode must be installed at the dc relay to avoid equipment damage. Refer to *Application Note* ([JD5011-00](#)).

Last modified: 3 August 2023

2.8. Wiring Relays on Auxiliary I/O Board

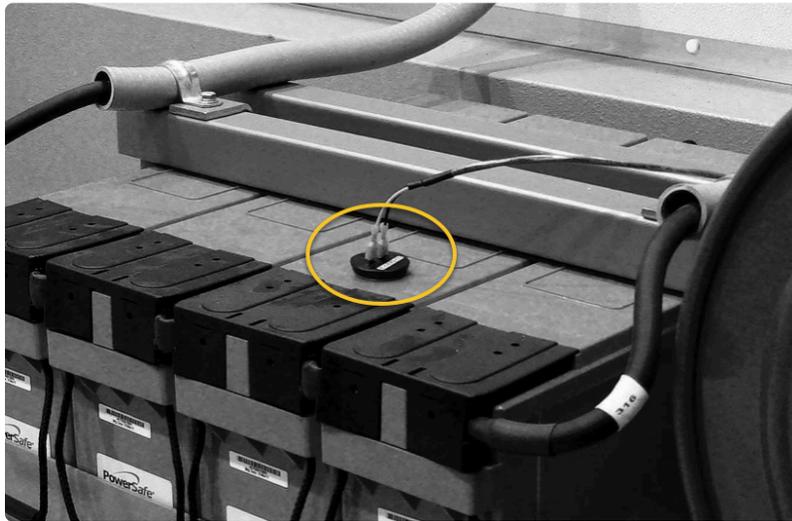
When provided, the optional Auxiliary Alarm I/O Board (A4) is mounted to the heat sink, above the Power Board (A2) on the left side of the ATevo.

See [Section 12, Auxiliary Inputs/Outputs](#) for more information and wiring instructions.

Last modified: 3 August 2023

2.9. Wiring Temperature Compensation Probe

The battery temperature compensation, or 'TempCo', probe (A10) contains a temperature-dependent resistor in an epoxy module. When used, this probe is installed on the battery.



See [Section 12, Battery Temperature Compensation](#) for more information and wiring instructions.

Last modified: 27 September 2023

2.10. Wiring Serial Communications Adapters

ATevo will support up to three (3) optional Serial Communications Adapter pc boards. They mount on the ATevo's front panel door, by plugging directly into the Main Control Board (A1) via connection points P10, P11, and P12.

- * For wiring instructions of the ATevo Communications Adapters (A12, A13 & A22), refer to the supplementary Communications Manual ([JA0102-54](#)). This document also details communication hardware, defines communication capabilities, and lists ATevo front panel configuration. Finally, it catalogs DNP3 and Modbus communication registers.

Last modified: 6 September 2023

2.11. Wiring Ethernet Adapter

ATEvo will support an optional Ethernet Adapter Board (A22). It mounts on the ATEvo's front panel door, by plugging directly into the Main Control Board (A1) via connection point P13.

- * For wiring instructions of the ATEvo Communications Adapters (A12, A13 & A22), refer to the supplementary Communications Manual ([JA0102-54](#)). This document also details communication hardware, defines communication capabilities, and lists ATEvo front panel configuration. Finally, it catalogs DNP3 and Modbus communication registers.

Last modified: 6 September 2023

3. Controls & Navigation

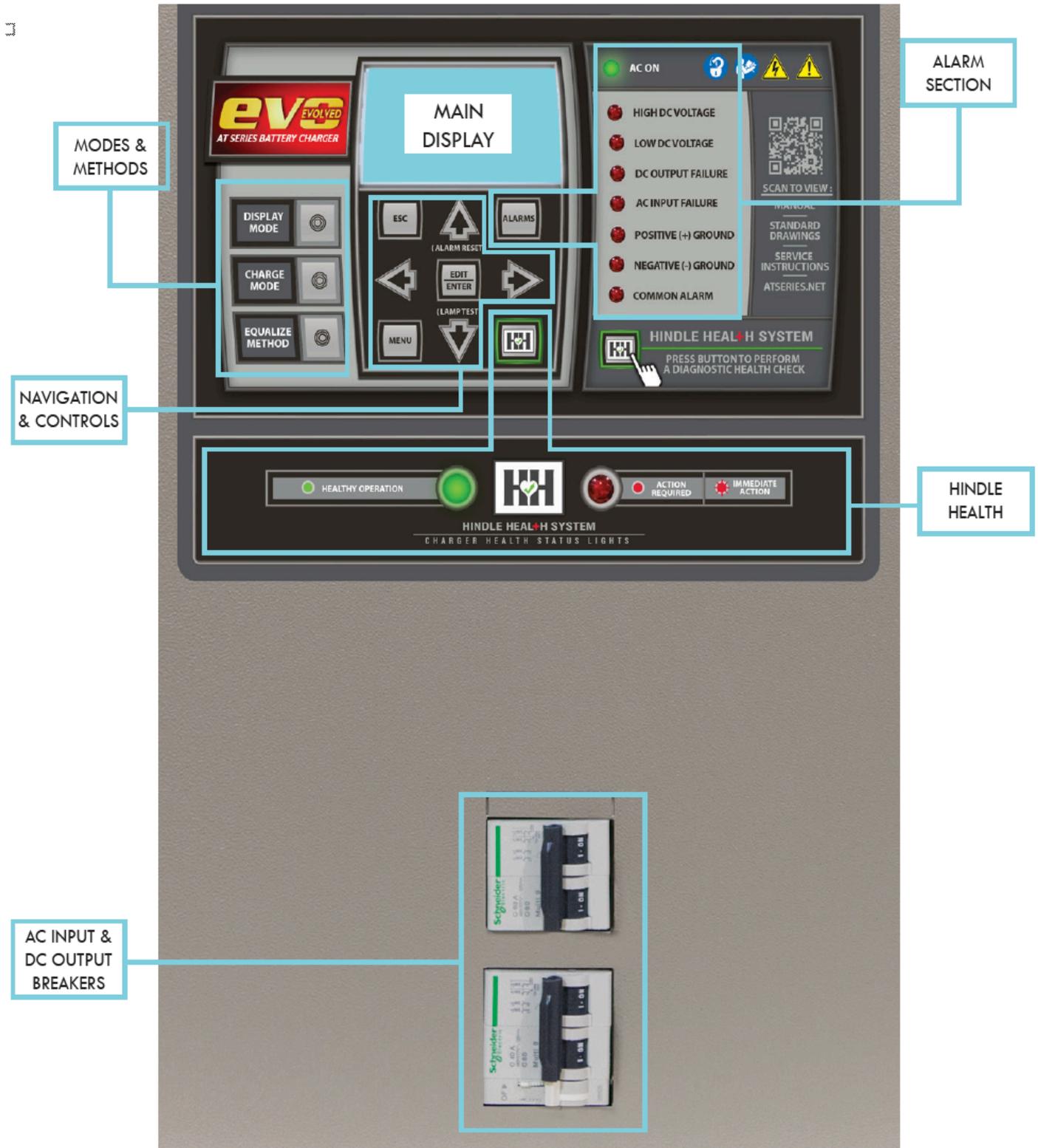


SECTION TOPICS
Front Panel Controls and Indicators
Display
Main Menu and Navigation

Last modified: 8 September 2023

3.1. Front Panel Controls & Indicators

ATevo front panel controls and indicators are organized into six (6) major groups or sections.



AC INPUT & DC OUTPUT CIRCUIT BREAKERS

Actuator controls for ac input (CB1) and dc output (CB2) circuit breakers are accessible via front panel door cut-outs. See Enclosure Outline Drawings for location and arrangement of internally- mounted circuit breaker protection devices.

- [JE5251-00](#) Style-5054 Enclosure (CB1 top / CB2 bottom)
- [JE5309-00](#) Style-5070 Enclosure (CB1 left / CB2 right)

3.1.1 ATevo Main Display

A back-lit Liquid Crystal Display (LCD) shows all charger status and configuration information. The display is discussed in [Section 3.2](#).

3.1.2 Navigation and Control Button Group

This group of buttons (MENU, ESC, EDIT/ENTER, LEFT, RIGHT, UP, and DOWN) is used to navigate ATevo screens and menus. Use of these controls is covered in [Section 3.3](#).

3.1.3 Operation Modes and Methods Button Group

This group of buttons (DISPLAY MODE, CHARGE MODE, and EQUALIZE METHOD) selects the ATevo mode of operation. Use of these controls is covered in [Section 5.1](#).

3.1.4 Alarm Section

The alarm section consists of the discrete alarm indication LEDs, the AC ON indicator (LED), and the ALARMS button. An alarm indicator will light when its associated alarm is activated. The AC ON indicator is lit when ac power is detected by the Main Control Board (A1). The ALARMS button is used to enter screens which display alarm statuses. Alarms and indicators are discussed in [Section 7](#).

3.1.5 Hindle Health System (HHS) Section

The Hindle Health System section consists of the HEALTH BUTTON (HH) and the **RED** and **GREEN** health indication LEDs at the bottom of the panel. The Hindle Health System is discussed in [Section 8](#).

3.1.6 AC Input and DC Output Breakers

Molded case circuit breaker protection devices are accessible via actuator cut-outs on the front panel door.

The AC Input Circuit Breaker (CB1) is directly below the front control panel. When opened, this device disconnects ATevo internal components from the ac voltage source, except for the

breaker terminals (CB1-L1/L2), where the ac input feed is connected.

The DC Output Circuit Breaker (CB2) is below or right. When opened, this device disconnects ATevo output from the dc bus (battery) voltage.



There still may be live dc power connected to some of ATevo's internal boards (this will include any relays wetted by the battery voltage).

Last modified: 8 September 2023

3.2. Display

The ATevo front panel features a back-lit Liquid Crystal Display (LCD) that is capable of displaying various fonts, text sizes, and graphical objects. The graphical display, in combination with the front panel control buttons, provides an easy-to-use, powerful interface. The various ATevo screens include user prompts and navigation icons to provide an intuitive and hedonic experience.

ATevo screens can be grouped, by function, into five (5) basic types.

- [Home Screen](#)
- [Configuration Screens](#)
- [Status Screens](#)
- [Hindle Health System Screens](#)
- [Other Screens](#)

Last modified: 27 September 2023

3.2.1. Home Screen

The HOME screen is the primary ATevo display, and is active most of the time ATevo is energized. Other screens are displayed during configuration changes, during testing, when the user requests more detailed status than what is provided on the HOME screen, or when the user wishes to utilize one of the advanced ATevo features.



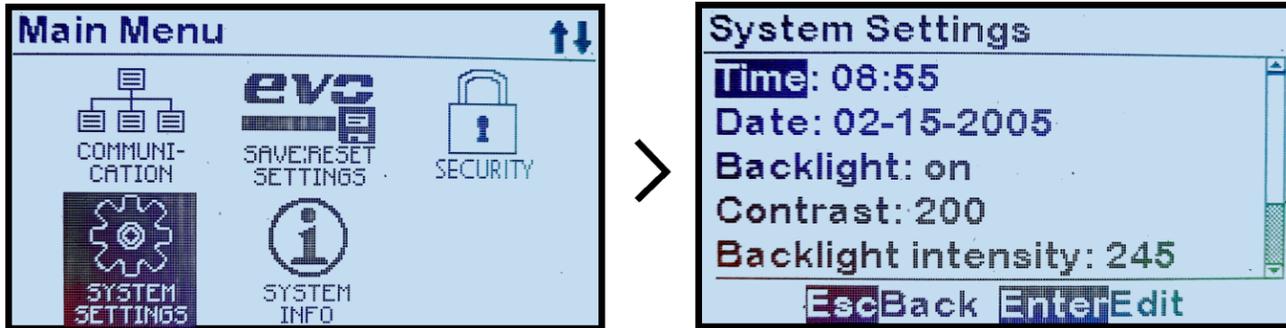
- The Factory Default HOME Screen displays the output voltage (Vdc) and output current (Adc) in a large font for easy reading.
- 'Float' or 'Equalize' will appear on the left side of the top of the display to indicate that the charger is actively in either FLOAT or EQUALIZE CHARGE MODE.
- 'Eqlz Mthd: Man' or 'Eqlz Mthd: Auto' will appear on the right side of the top of the display to indicate that the EQUALIZE METHOD is presently configured for MANUAL TIMER or AUTOMATIC TIMER mode.
- If a Temperature Compensation (TempCo) Probe option is installed and enabled, the present battery temperature and normalized voltage set point will also appear on the display (see [Section 10](#) for more details on the TempCo option and display).

Last modified: 19 July 2023

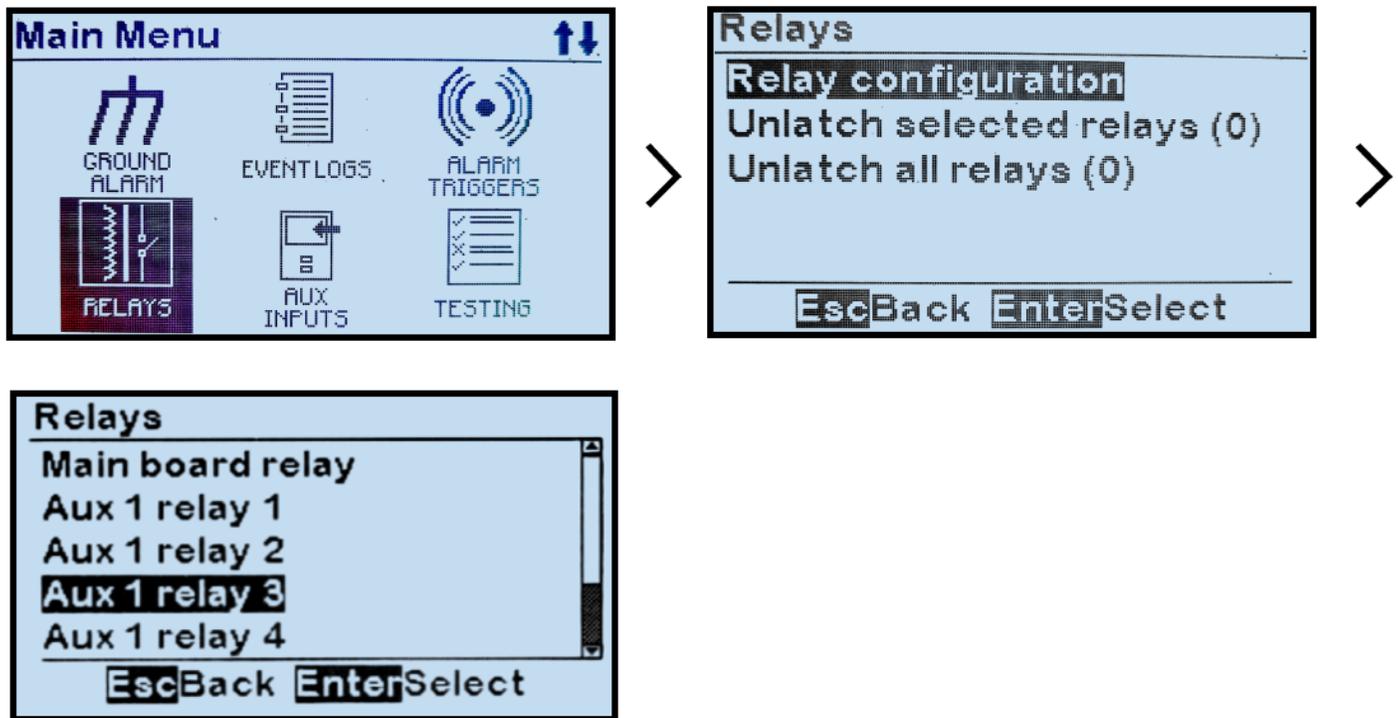
3.2.2. Configuration Screens

These screens are used for changing ATevo set points and configuration.

Many of these screens will be described in [Section 4, Startup and Configuration](#).



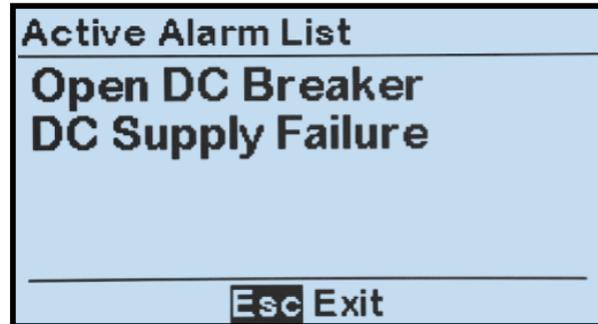
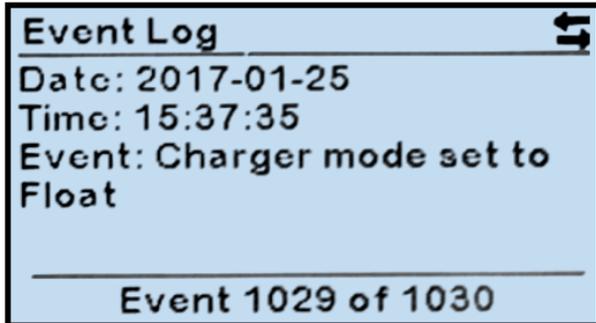
Other configuration screens for installed options will be described later in their respective installed option sections.



Last modified: 26 September 2023

3.2.3. Status Screens

ATevo Status screens do not permit any system changes, and are used only for viewing information. Most of the status screens (e.g. Event Log and Active Alarm List) are covered in [Section 6, Advanced Operation](#).

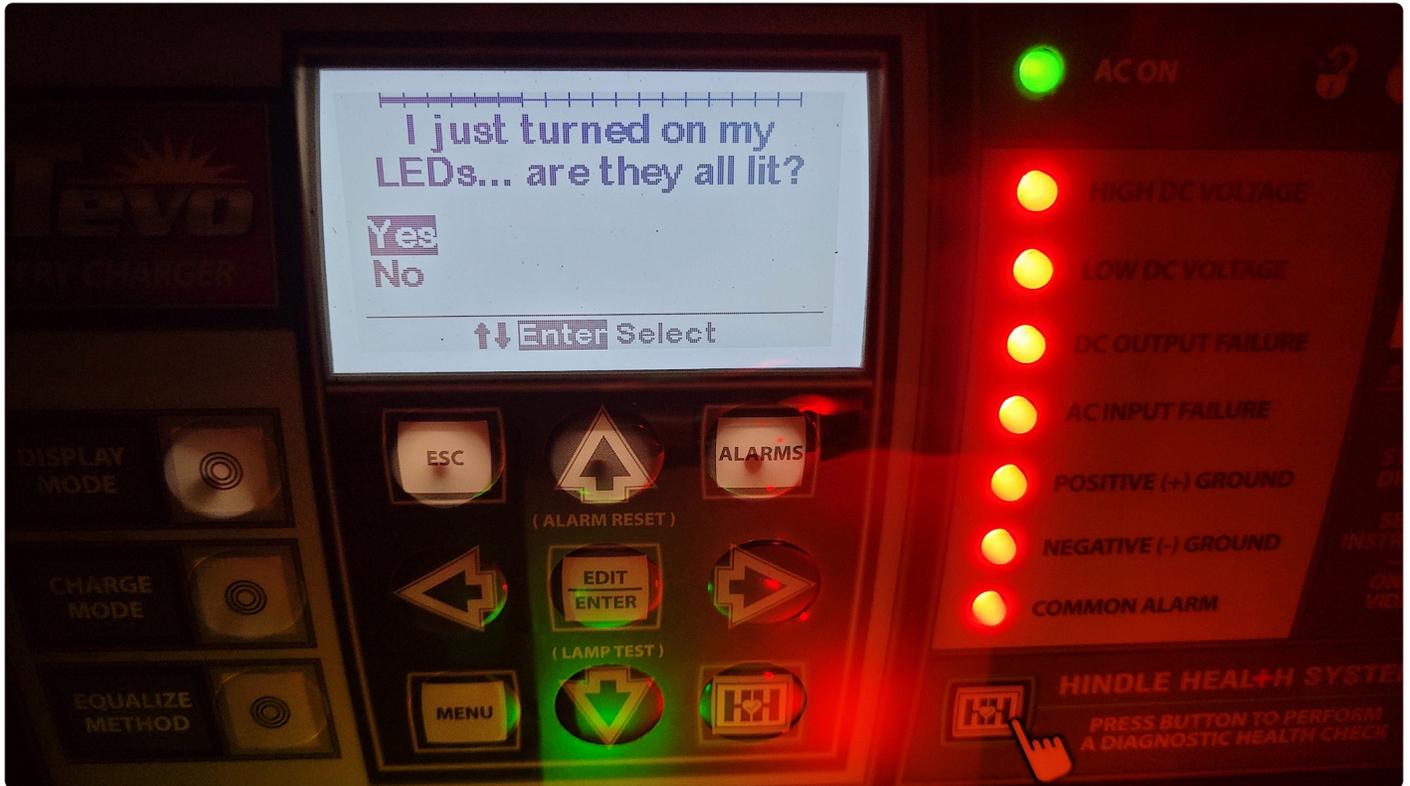


The HOME screen can be thought of as a 'special' Status Screen in that it can indicate dc output voltage (Vdc), dc output current (Adc), and status of Equalize/Float mode and method.

Last modified: 26 September 2023

3.2.4. Hindle Health System Screens

Hindle Health System screens are associated with the Hindle Health button (HH). When (HH) is pressed, ATevo enters a user-assisted self-diagnostic mode. Screens prompt the user to participate in a series of tests that confirm that ATevo is operating correctly. For more information on the Hindle Health System, see [Section 8](#).

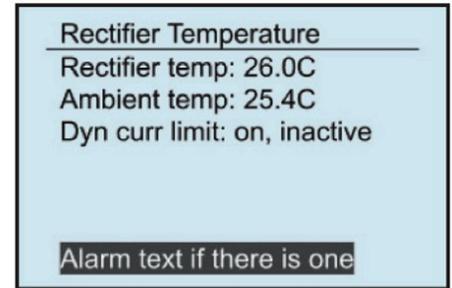
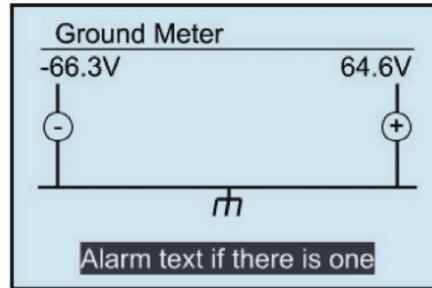


Last modified: 26 September 2023

3.2.5. Other Screens

Accessible from the DISPLAY MODE button, and read-only alternates to HOME, three (3) other screens are available in ATevo:

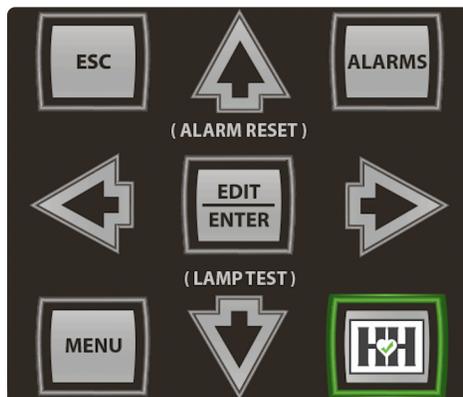
- Date and Time
- Ground Meter (see also [JA5124-09](#))
- Rectifier Temperature



Last modified: 19 July 2023

3.3. Main Menu & Navigation

The navigation control buttons (MENU, ESC, EDIT/ENTER, LEFT, RIGHT, UP and DOWN) are used to navigate through ATevo screens and menus. This system is intuitive to most people as it is similar to universally-adopted television remote control navigation buttons.

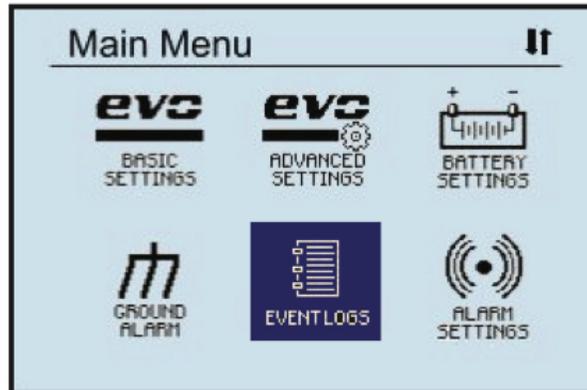


- [Menu and Arrow Buttons](#)
- [EDIT/ENTER Button](#)
- [Navigation Conventions in this Manual](#)
- [Escape \(ESC\) Button](#)

Last modified: 3 August 2023

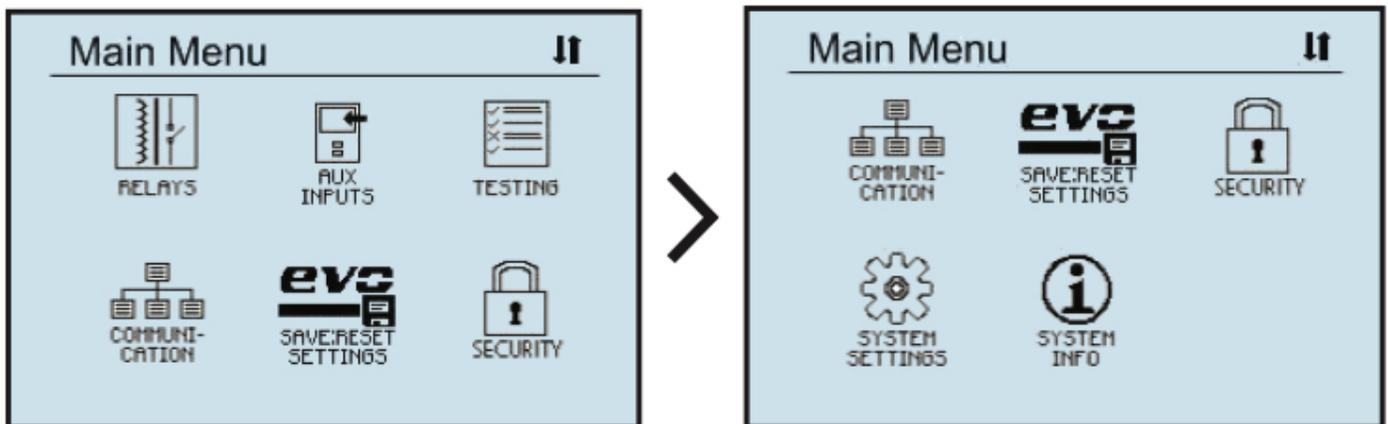
3.3.1. Menu and Arrow Buttons

Press the MENU button to access the Main Menu. The first six (6) menu selection icons appear. Use the UP, DOWN, LEFT, or RIGHT arrow buttons to navigate. Icons appear in inverse video when selected. In the screenshot below, the user has already pressed the DOWN arrow to select “Event Logs”.



The top-left of the screen indicates the Main Menu is being displayed. The top-right displays an up and/or down arrow icon that indicates that more menu selection icons are available if you continue to navigate in the direction of the arrow(s). In the screenshot above, both up and down arrow icons appear in the top right corner. This indicates that menu icons can be accessed by navigating either up or down from the presently selected icon.

Further Displayed Main Menu Icons

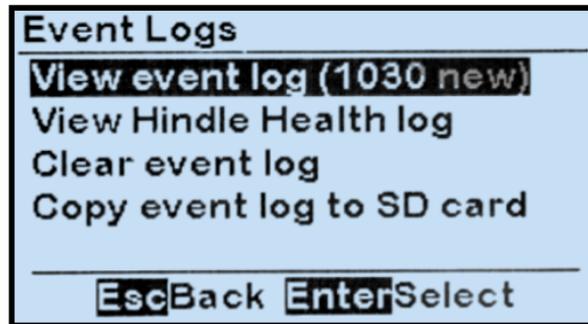


Refer to [Section 6.1](#) for descriptions of each.

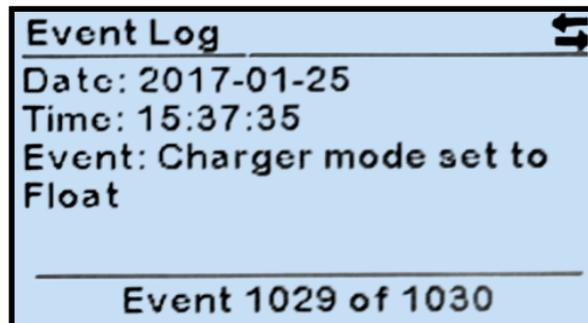
Last modified: 3 August 2023

3.3.2. EDIT/ENTER Button

Pressing the EDIT/ENTER button will activate the feature or function selected onscreen. As an example, in the prior screenshot, 'Event Logs' was selected. Pressing EDIT/ENTER with this selection causes the following screen to open.



Pressing EDIT/ENTER with 'View event log' selected, as shown above, takes the user to an event log entry as seen below.



The screenshot above is an example where a left and right arrow icon appear in the top right of the display. This indicates that pressing either LEFT or RIGHT arrow buttons will show additional screens. LEFT and RIGHT arrow buttons are also used when moving between numbers when setting parameters or between characters when setting passwords.

Last modified: 26 September 2023

3.3.3. Navigation Conventions in this Manual

In the previous two (2) pages, we showed a sequence of commands and the sequence of screens caused by those commands. That example was provided to illustrate the use of the UP, DOWN, LEFT, RIGHT arrow buttons, and the EDIT/ENTER button for navigation.

The full command sequence shown was:

1. Press MENU to open the Main Menu screen.
2. Press DOWN to select EVENT LOGS.
3. Press EDIT/ENTER to open 'Event Logs' screen.
4. Press UP OR DOWN arrows to navigate to 'View event log'.
5. Press EDIT/ENTER to open an event log screen.

Using a full command sequence with every command in this manual would lead to needless repetition and tedious document length. As the above example illustrates, most of the repetition comes from listing every navigation button push. ATevo uses a simple, nearly universal navigation system that is used by most tv remote controls. It is not necessary to list the following navigation button pushes: UP, DOWN, RIGHT, LEFT or EDIT/ENTER. This convention results in a streamlined sequence of ATevo-specific commands.

For our example, this is:

1. Press MENU to open the Main Menu screen.
2. Execute the EVENT LOGS command on the Main Menu.
3. Execute the 'View event log' command on the Events Logs screen.

To simplify further, we use a shorthand convention that makes use of the '>' character between commands.

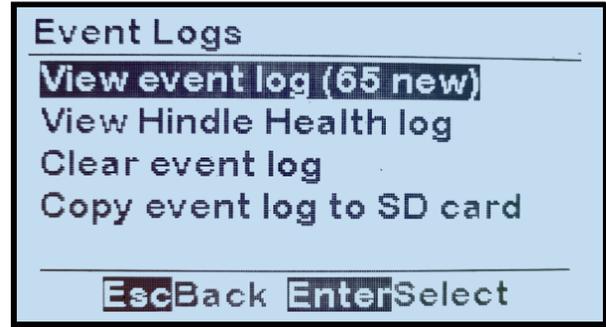
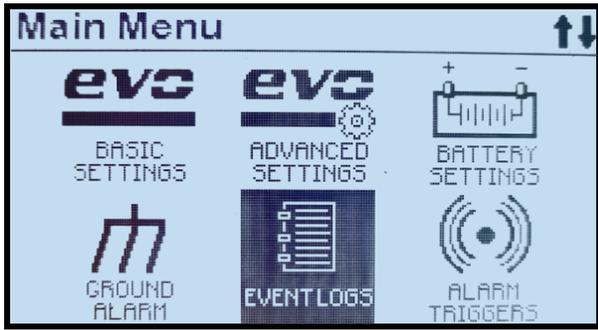
Navigation Convention: Command > Command > Command

With this convention, the previous example's command sequence is:

MENU > EVENT LOGS > 'View event log'.

Screen Convention:

In the same way that the character '>' is used between commands in a sequence, the same character appears between a sequence of screens.



Last modified: 21 September 2023

3.3.4. Escape (ESC) Button



In general, pressing ESC returns back one menu level. The examples below illustrate its use:

- If Main Menu displayed: ESC will return to HOME screen.
- If in SYSTEM SETTINGS screen, pressing ESC will return to Main Menu. Pressing ESC again will return to the HOME screen.

Last modified: 27 September 2023

4. Startup & Configuration



SECTION TOPICS

[Startup](#)

[Configuring Basic Set Points & Alarms](#)

[Configuring Advanced Set Points & Alarms](#)

[Configuring System Settings](#)

[Configuring Relays](#)

[Disabling Alarms in Common Alarm List](#)

[Configuring Serial Communications Adapter](#)

[Configuring Ethernet Adapter](#)

[Enabling/Disabling High Level Detect](#)

[Configuring Ground Alarms](#)

[Configuring Battery Settings](#)

* Download our [Quick Setup Sheet](#) for a checklist containing graphical instructions on placement, wiring, startup, & configuration.

Last modified: 8 September 2023

4.1. Startup

The startup procedure is shown below by means of (1) a video and (2) a graphic.

Startup: Video Instruction



<https://www.youtube.com/embed/VjuwjKU7Kt4?rel=0&start=39&end=82>

<https://www.youtube.com/embed/VjuwjKU7Kt4?rel=0&start=39&end=82>

Startup: Graphic Instruction



! Startup procedure for the ATevo is the reverse of the legacy ATevo series chargers.

Last modified: 3 August 2023

4.1.1. Understanding the Startup Sequence

ATevo is pre-configured to work with most common batteries and loads without further adjustment.

When you start ATevo for the first time, the charger will:

- Use the [FACTORY SETTINGS](#) (float voltage, equalize voltage, etc) tables listed in [4.1.2](#). These settings may be changed after startup if necessary.
- Take about fifteen (15) seconds to start. Control circuitry will “soft start” ATevo, such that DC output voltage and current increase gradually to rated values.

Last modified: 27 September 2023

4.1.2. Factory Settings Tables

Factory settings for each ATevo are summarized below.

* These values may be revised following a firmware update. For a printable worksheet, or to access the *latest* revision of these settings, see online resource ([JA5124-02](#)).

24 Volt ATevo Set Points & Defaults

Parameter	Low Range Set Point	High Range Set Point	Nominal (default)	Units
Float Voltage	22.00	29.50	26.00	Volts
Equalize Voltage	23.40	32.00 *	28.00	Volts
Current Limit	50% rating	110% rating	110% rating	Amperes
Equalize Time	0 (disabled)	255	24	hours
High VDC Alarm	24.00	38.00	28.80	Volts
Low VDC Alarm	14.00	29.50	24.00	Volts
HVDC Shutdown	24.00	38.00	28.80	Volts
High Level Detect	24.00	35.00	29.40	Volts
Low Level Detect	15.00	24.00	20.40	Volts
End of Discharge	15.00	24.00	21.00	Volts
AC Ripple Alarm	50	500	500	milli-Volts
Ground Fault POS[+]	1	50	10	kOhms
Ground Fault NEG[-]	1	50	10	kOhms

* 32.00 Vdc High Range Set Point considered “extended equalize”. Unit may not meet +/-0.25% regulation, beyond 31.00 Vdc.

48 Volt ATevo Set Points & Defaults

Parameter	Low Range Set Point	High Range Set Point	Nominal (default)	Units
Float Voltage	44.00	58.00	52.00	Volts
Equalize Voltage	46.80	61.00 *	56.00	Volts
Current Limit	50% rating	110% rating	110% rating	Amperes

Equalize Time	0 (disabled)	255	24	hours
High VDC Alarm	48.00	76.00	57.60	Volts
Low VDC Alarm	28.00	58.00	48.00	Volts
HVDC Shutdown	48.00	76.00	57.60	Volts
High Level Detect	48.00	72.00	58.80	Volts
Low Level Detect	33.00	48.00	40.80	Volts
End of Discharge	33.00	48.00	42.00	Volts
AC Ripple Alarm	50	500	500	milli-Volts
Ground Fault POS[+]	1	50	10	kOhms
Ground Fault NEG[-]	1	50	10	kOhms

* 61.00 Vdc High Range Set Point considered “extended equalize”. Unit may not meet +/-0.25% regulation, beyond 59.00 Vdc.

130 Volt ATevo Set Points & Defaults

Parameter	Low Range Set Point	High Range Set Point	Nominal (default)	Units
Float Voltage	110.0	140.0	131.0	Volts
Equalize Voltage	117.0	149.0 *	139.0	Volts
Current Limit	50% rating	110% rating	110% rating	Amperes
Equalize Time	0 (disabled)	255	24	hours
High VDC Alarm	120.0	175.0	144.0	Volts
Low VDC Alarm	70.00	141.0	120.0	Volts
HVDC Shutdown	120.0	175.0	144.0	Volts
High Level Detect	120.0	175.0	147.0	Volts
Low Level Detect	87.00	120.0	102.0	Volts
End of Discharge	87.00	120.0	105.0	Volts
AC Ripple Alarm	50	500	500	milli-Volts
Ground Fault POS[+]	1	50	10	kOhms
Ground Fault NEG[-]	1	50	10	kOhms

* 149.0 Vdc High Range Set Point considered “extended equalize”. Unit may not meet +/-0.25%

regulation, beyond 145.0 Vdc.

260 Volt ATevo Set Points & Defaults

Parameter	Low Range Set Point	High Range Set Point	Nominal (default)	Units
Float Voltage	220.0	282.0	262.0	Volts
Equalize Voltage	234	298.0 *	278.0	Volts
Current Limit	50% rating	110% rating	110% rating	Amperes
Equalize Time	0 (disabled)	255	24	hours
High VDC Alarm	240.0	350.0	288.0	Volts
Low VDC Alarm	140.0	282.0	240.0	Volts
HVDC Shutdown	240.0	350.0	288.0	Volts
High Level Detect	240.0	350.0	294.0	Volts
Low Level Detect	177.0	244.0	204.0	Volts
End of Discharge	177.0	244.0	210.0	Volts
AC Ripple Alarm	50	500	500	milli-Volts
Ground Fault POS[+]	1	50	10	kOhms
Ground Fault NEG[-]	1	50	10	kOhms

* 298.0 Vdc High Range Set Point considered “extended equalize”. Unit may not meet +/-0.25% regulation, beyond 290.0 Vdc.

Last modified: 1 August 2023

4.1.3. Checking Installation

Prior to powering up ATevo for the first time, it is recommended that:

- You have followed installation instructions carefully.
- You check that ac input supply voltage and battery voltage match information on ATevo nameplate.
- Open the front panel
- Check battery polarity at DC Output Circuit Breaker (CB2 +/-).

Last modified: 8 September 2023

4.1.4. Starting Up

After confirming that all connections to ATevo are properly made, start up as follows:

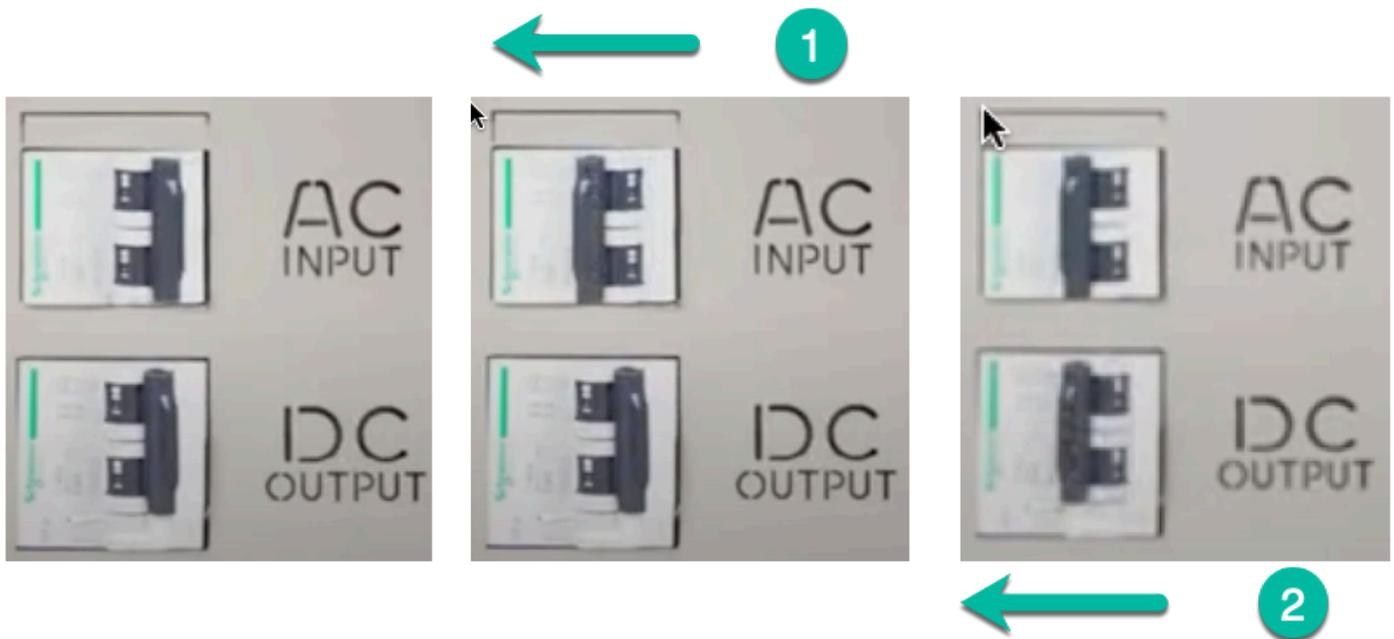
1. Turn ON (close) AC Input Circuit Breaker (CB1) first.

You should hear a soft hum from ATevo as output increases. ATevo LCD should start up and indicate dc output voltage. If the display does not light, do not proceed. Turn OFF (open) the AC Breaker (CB1) and recheck connections.

! If you attempt to turn ON the DC Output Circuit Breaker (CB2) first, it may trip due to the filter capacitor in-rush.

2. Turn ON (close) the DC Output Circuit Breaker (CB2).

If any error codes or alarms appear on the Main ATevo Display and/or Alarm Indicator LEDs, refer to [Section 8, Alarms & Indicators](#) to interpret the origin and resolution of the indication before proceeding.



Last modified: 3 August 2023

4.1.5. HOME Screen

The default HOME screen appears after power up showing the dc bus voltage and dc charger current, along with the status for CHARGER MODE and EQUALIZE METHOD on the top line. CHARGE MODES and EQUALIZE METHODS are described in [Section 5.1, ATevo Operating Modes](#). ATevo will automatically switch back to the HOME screen if no buttons are pushed for ten (10) minutes, or by pressing ESC one or more times. Each press of ESC returns one level until HOME is reached.



Last modified: 3 August 2023

4.2. Configuring Basic Set Points & Alarms

The ATevo is the second generation of the AT Series microprocessor-controlled float battery chargers. Because its configuration button sequence is identical, users of legacy AT10.1 chargers will easily adapt to ATevo. This section details how to configure basic ATevo set points and alarms found also on legacy AT10.1 chargers. The process is shown by both (1) video and (2) instructions with screenshots.

Instructions by Video



<https://www.youtube.com/embed/VjuwjKU7Kt4?rel=0&start=39&end=82>

<https://www.youtube.com/embed/VjuwjKU7Kt4?rel=0&start=39&end=82>

<https://www.youtube.com/embed/VjuwjKU7Kt4?rel=0&start=107&end=185>

Instructions with Screenshots (see subsections below)

- [How to Configure General Parameter Settings](#)
- [Setting Float Voltage](#)
- [Setting Equalize Voltage](#)
- [Setting Equalize Timer](#)
- [Setting High DC Alarm Voltage](#)
- [Setting Low DC Alarm Voltage](#)
- [Setting Current Limit Level](#)

Last modified: 8 September 2023

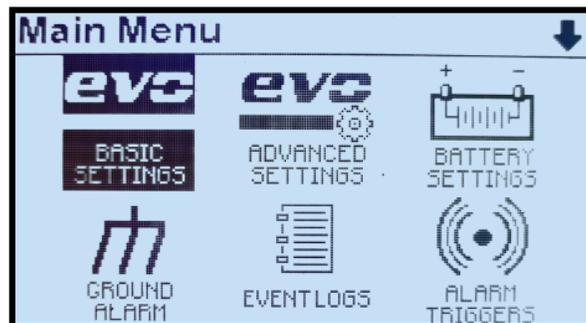
4.2.1. How to Configure General Parameter Settings

You can adjust ATevo settings during operation using the front panel controls. When you first press EDIT/ENTER on the front panel, ATevo prompts you to set the first of six (6) basic charger parameters (Float Voltage).

To set parameters, do the following:

- Press UP or DOWN (or hold down to scroll) until desired value displays. Each parameter has a minimum and maximum limit as listed in [Section 4.1.2, Factory Settings Tables](#).
- Press EDIT/ENTER to save setting. ATevo prompts you to set the next parameter.
- Continue in the same manner to set all six (6) parameters in the list. If you want to skip setting any parameter, press EDIT/ENTER (or RIGHT arrow) to bypass it.
- When finished setting the sixth parameter (Current Limit), press EDIT/ENTER to save setting and return to normal operation.
- Any changes made take effect immediately; ATevo uses its last saved values if it is powered down and returned to service.

* The Basic ATevo Set Point mode can also be entered from the Main Menu by selecting the BASIC SETTINGS icon.

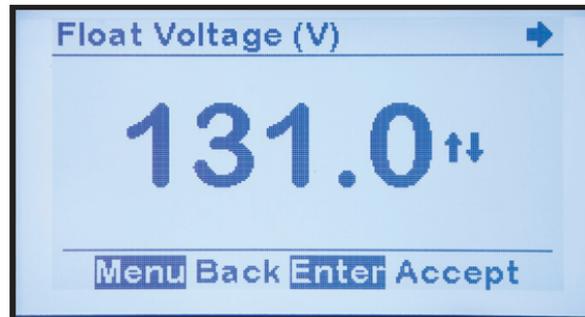


! If you are interrupted while adjusting settings and do not press a front panel key for 10 minutes, Edit Mode ends automatically without saving adjustments to any setting not previously saved with the EDIT/ENTER key.

Last modified: 22 September 2023

4.2.2. Setting Float Voltage

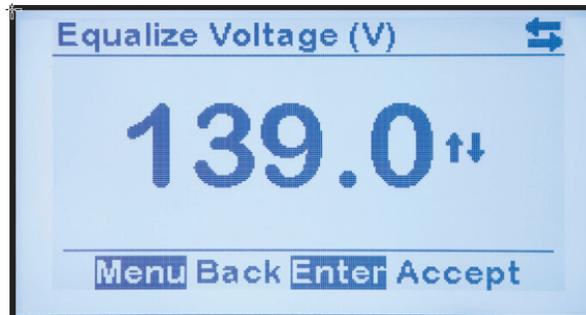
From the HOME Screen, press EDIT/ENTER. The Edit Float Voltage Screen appears, as evident by text 'Float Voltage (V)' at the top of the display. The present set point is displayed. To set this parameter, follow the steps in [Section 4.2.1](#).



Last modified: 19 July 2023

4.2.3. Setting Equalize Voltage

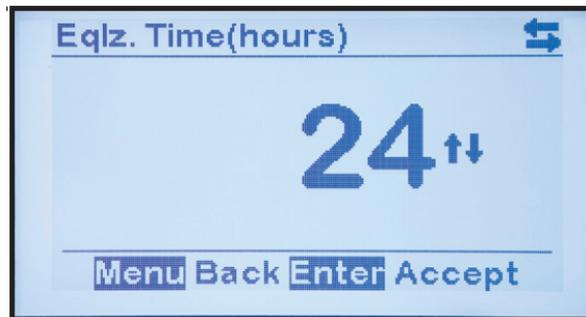
From the HOME screen, press EDIT/ENTER twice, until the Edit Equalize Voltage Screen is visible 'Equalize Voltage (V)' on top of display. To set this parameter follow the steps in [Section 4.2.1](#).



Last modified: 19 July 2023

4.2.4. Setting Equalize Timer

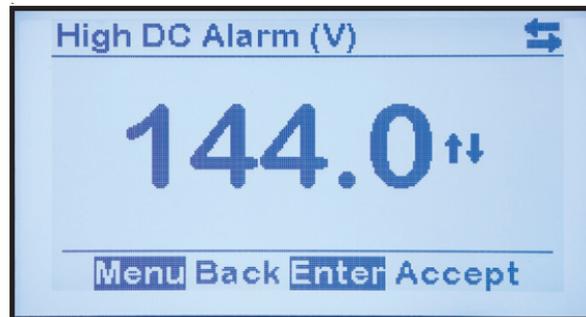
From the HOME screen, press EDIT/ENTER three (3) times, until the Edit Equalize Timer Screen is visible, 'Eqlz. Time(hours)', on top of display. To set this parameter follow the steps in [Section 4.2.1.](#)



Last modified: 19 July 2023

4.2.5. Setting High DC Alarm Voltage

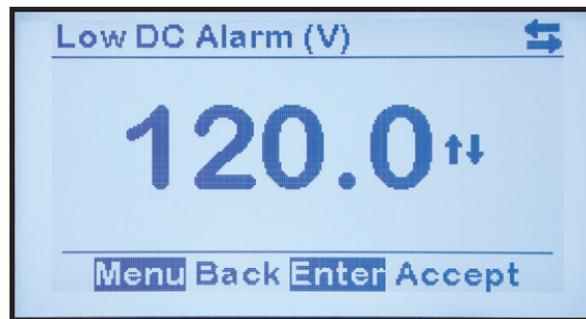
From the HOME screen, press EDIT/ENTER four (4) times, until the Edit High DC Alarm Voltage Screen is visible, 'High DC Alarm (V)', on top of display. To set this parameter follow the steps in [Section 4.2.1](#).



Last modified: 19 July 2023

4.2.6. Setting Low DC Alarm Voltage

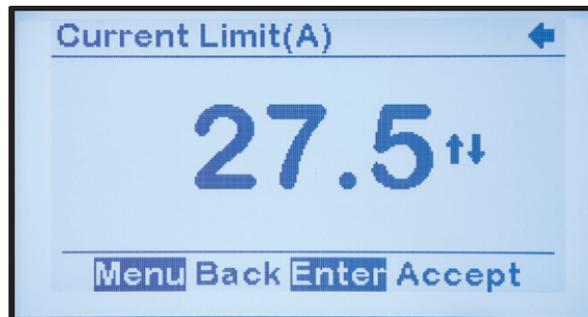
From the HOME screen, press EDIT/ENTER five (5) times, until the Edit Low DC Alarm Voltage Screen is visible, 'Low DC Alarm (V)', on top of display. To set this parameter follow the steps in [Section 4.2.1](#).



Last modified: 19 July 2023

4.2.7. Setting Current Limit Level

From the HOME screen, press EDIT/ENTER six (6) times, until the Edit Current Limit Level Screen is visible, 'Current Limit A', on top of display. To set this parameter follow the steps in [Section 4.2.1](#).

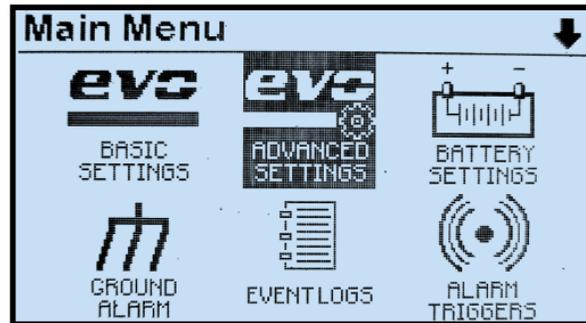


After setting the Current Limit level to the desired value and pressing EDIT/ENTER to save the set point, configuration of Basic ATevo Set Points and Alarms is complete and the display returns to the HOME screen.

Last modified: 19 July 2023

4.3. Configuring Advanced Set Points & Alarms

This section details the configuration of ATevo's new, more advanced features. It also details features that may have been present in legacy AT10.1 Series battery chargers, where the configuration process has been changed or simplified.

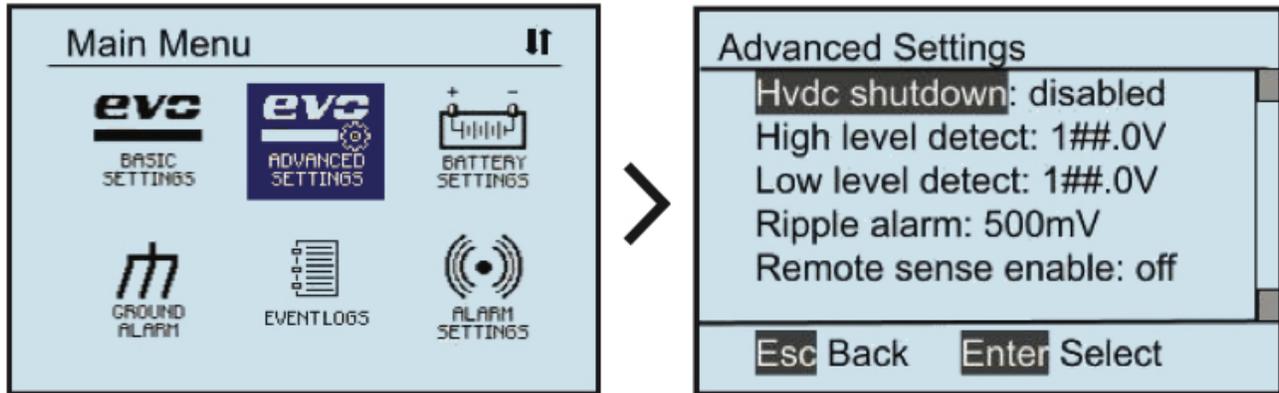


- [How to Configure Advanced Settings](#)
- [Setting High Voltage Shutdown](#)
- [Setting High Level Detect](#)
- [Setting Low Voltage Level Detect](#)
- [Setting Ripple Alarm](#)

Last modified: 26 September 2023

4.3.1. How to Configure Advanced Settings

To enter Advanced Settings mode, select MENU > ADVANCED SETTINGS. ATEvo will display a scrollable page of parameters.



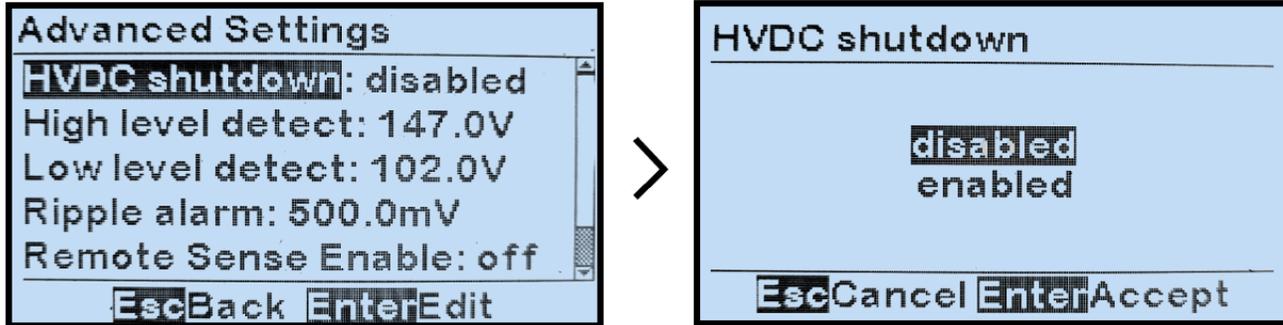
To change a parameter, do the following:

- Navigate using UP and DOWN, and select it with EDIT/ENTER.
- Press LEFT and RIGHT to navigate to any digit to be modified.
- Press UP and DOWN to change setting value.
- Once desired setting is displayed, press EDIT/ENTER to store it.

Last modified: 19 July 2023

4.3.2. Setting High Voltage Shutdown

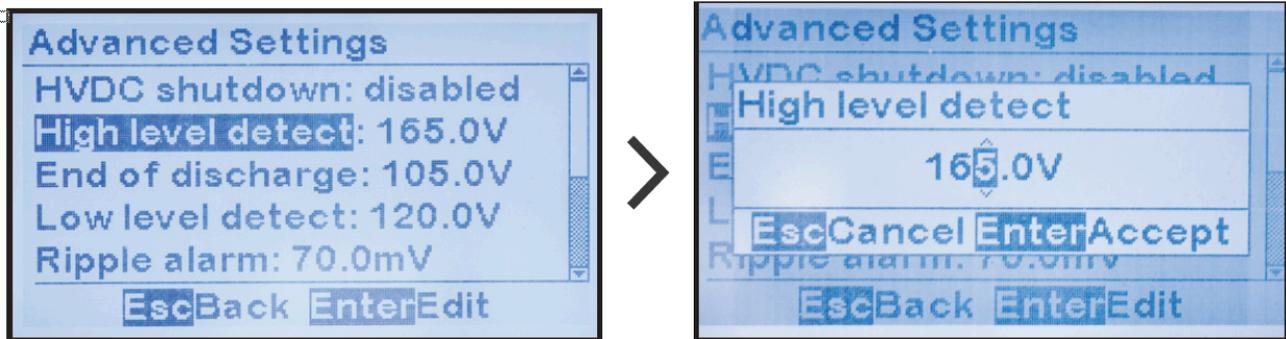
To access and change the High Voltage Shutdown status for the High Voltage Shutdown feature (covered in [Section 5.2](#)), follow the steps in [Section 4.3.1](#).



Last modified: 27 September 2023

4.3.3. Setting High Level Detect

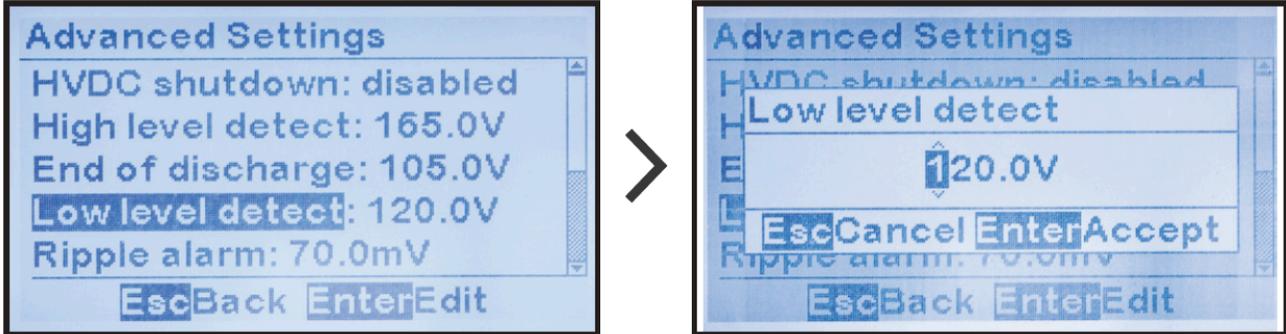
To access and change the High Level Detect set point for the High Level Detect feature (covered in [Section 5.4](#)), follow the steps in [Section 4.3.1](#).



Last modified: 27 July 2023

4.3.4. Setting Low Voltage Level Detect

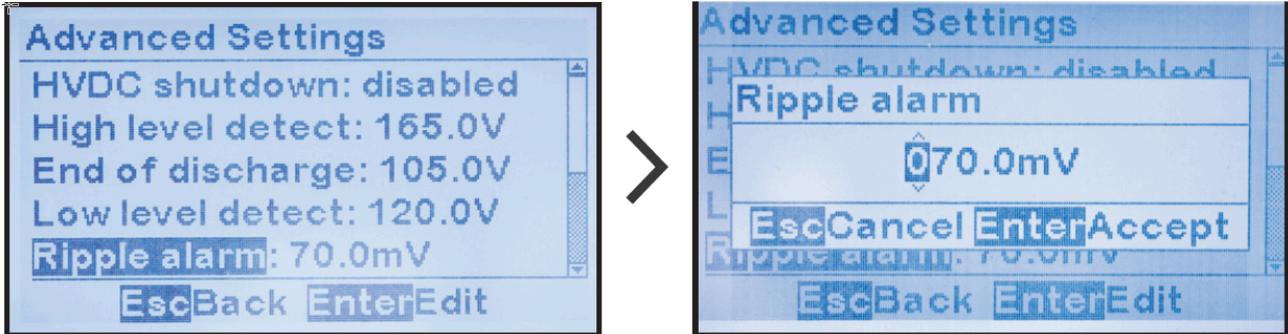
To access and change the Low Level Detect set point for the Low Level Detect feature (covered in [Section 5.3](#)), follow the steps in [Section 4.3.1](#).



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4.3.5. Setting Ripple Alarm

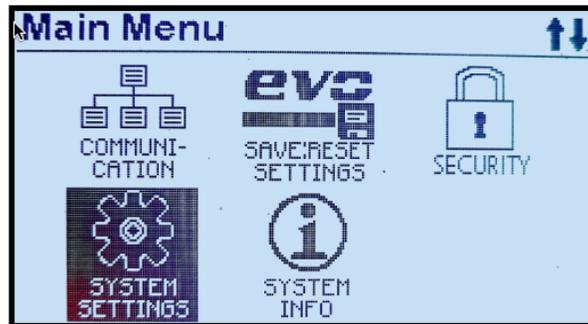
To access and change the set point for the AC Ripple Alarm (covered in [Section 7.5.4](#)), follow the steps in [Section 4.3.1](#).



Last modified: 1 August 2023

4.4. Configuring System Settings

This section details configuration of the ATevo system parameters, including date, time, and LCD controls (brightness, contrast, etc.).

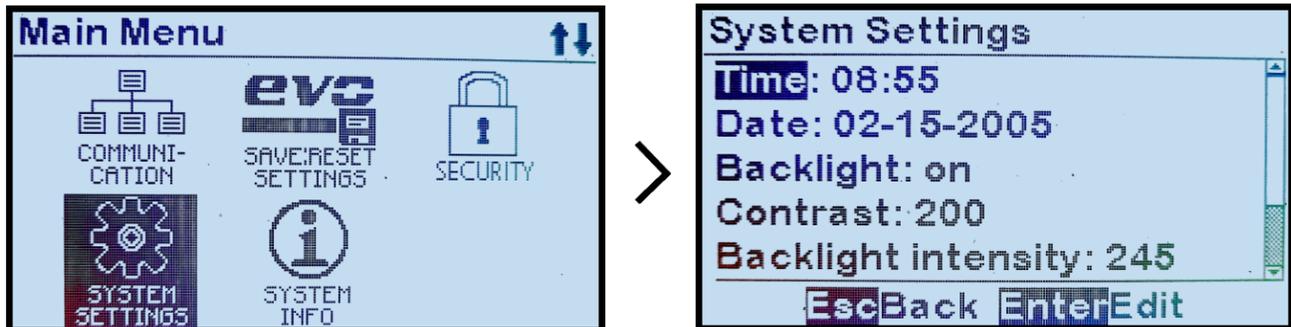


- [How to Configure System Settings](#)
- [Setting System Time](#)
- [Setting System Date](#)
- [Setting Display Backlight Control](#)
- [Setting Display Contrast](#)
- [Setting Display Backlight Intensity](#)
- [Setting Display Reverse Image Control](#)

Last modified: 26 September 2023

4.4.1. How to Configure System Settings

To enter System Settings mode, select MENU > SYSTEM SETTINGS. ATevo will display a scrollable page of parameters.



To change a parameter, do the following:

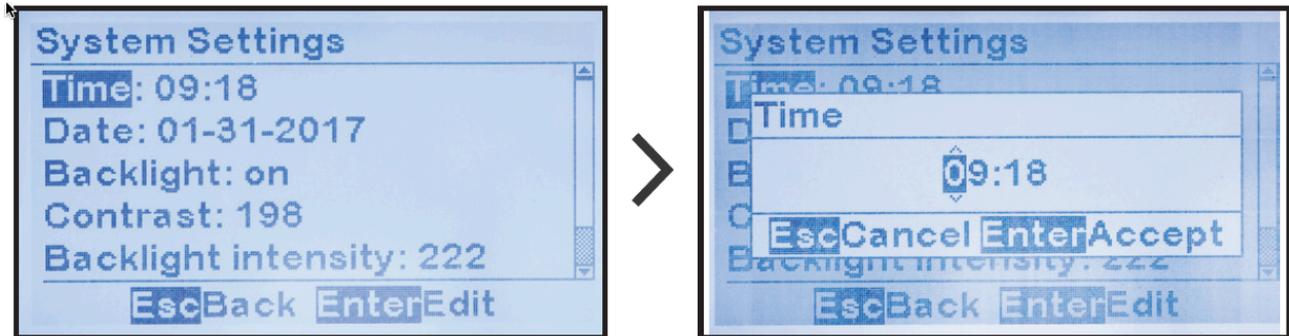
- Navigate using UP and DOWN, and select it with EDIT/ENTER.
- Press LEFT and RIGHT to navigate to the digit to be modified
- Press UP and DOWN to change setting value.
- Once desired setting is displayed, press EDIT/ENTER to store it.

Last modified: 21 September 2023

4.4.2. Setting System Time

To access and change the System Time, follow the steps in [Section 4.4.1](#).

MENU > SYSTEM SETTINGS > 'Time'



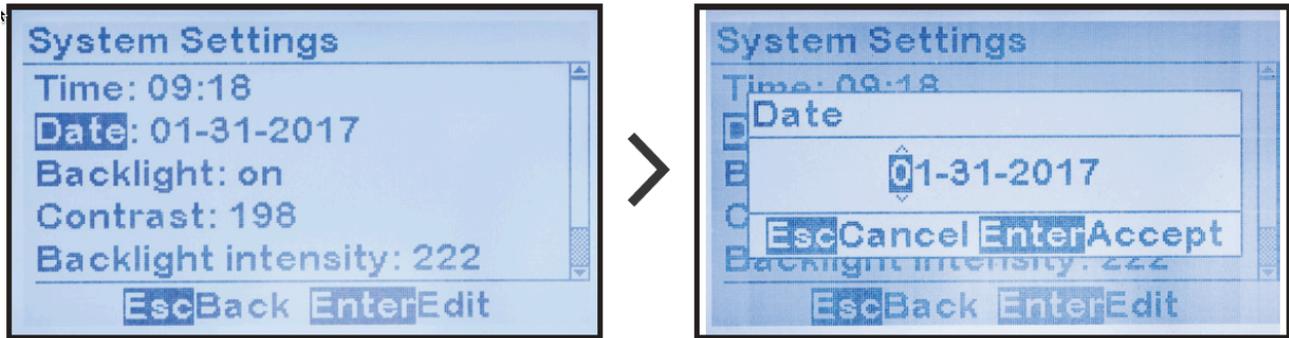
* ATevo uses a 24-hour clock (e.g. 2:30 PM is 14:30)

Last modified: 19 July 2023

4.4.3. Setting System Date

To access and change the System Date, follow the steps in [Section 4.4.1](#).

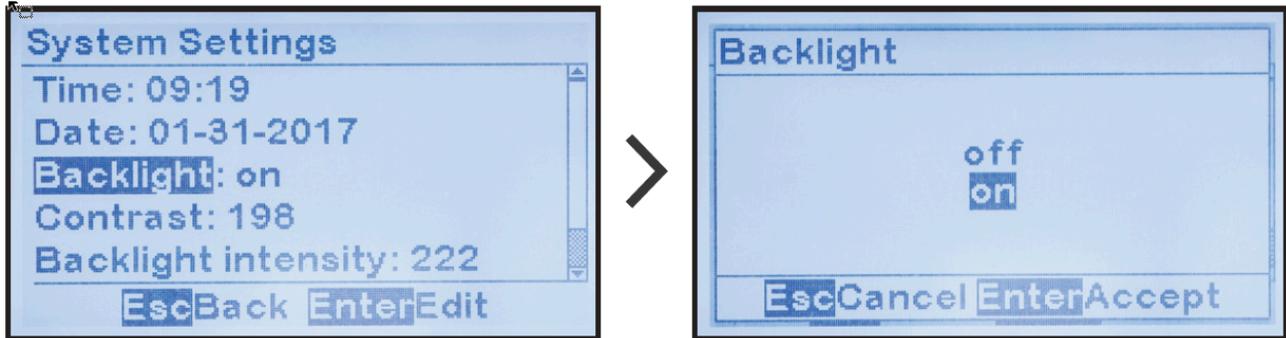
MENU > SYSTEM SETTINGS > 'Date'



Last modified: 19 July 2023

4.4.4. Setting Display Backlight Control

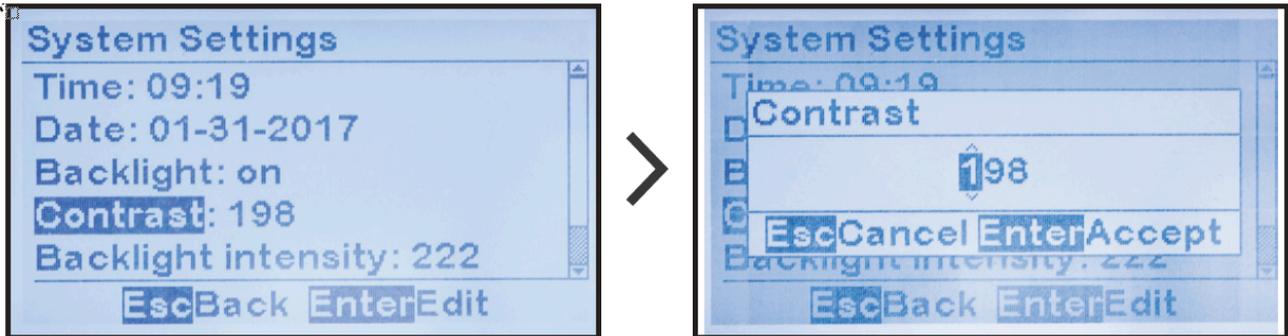
To change the LCD Backlight setting (ON/OFF), follow the steps in [Section 4.4.1](#).
MENU > SYSTEM SETTINGS > 'Backlight'



Last modified: 19 July 2023

4.4.5. Setting Display Contrast

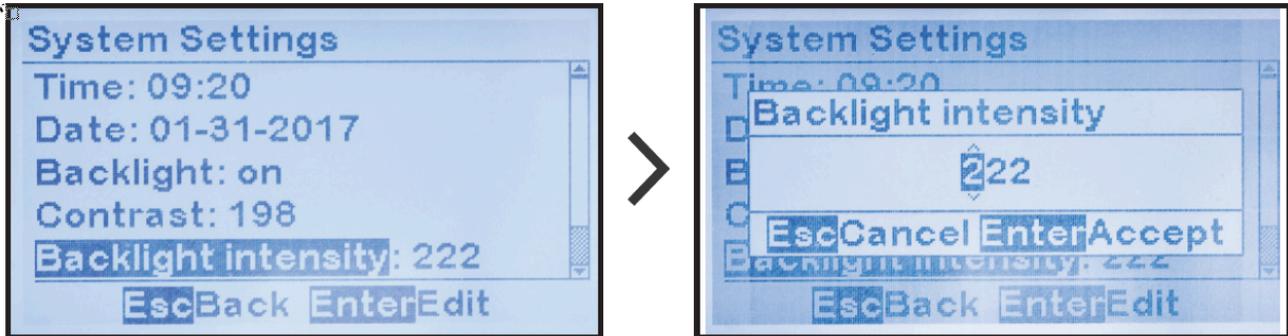
To change the LCD Display Contrast, follow the steps in [Section 4.4.1](#).
MENU > SYSTEM SETTINGS > 'Contrast'



Last modified: 19 July 2023

4.4.6. Setting Display Backlight Intensity

To change the LCD Display Backlight Intensity, follow the steps in [Section 4.4.1](#).
MENU > SYSTEM SETTINGS > 'Backlight Intensity'



Last modified: 19 July 2023

4.4.7. Setting Display Reverse Image Control

To change the LCD Display Image preference, follow the steps in [Section 4.4.1](#).

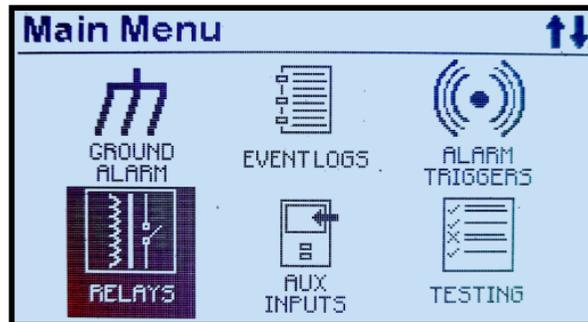
MENU > SYSTEM SETTINGS > 'LCD color'



Last modified: 19 July 2023

4.5. Configuring Relays

ATevo is equipped with a Common Alarm Relay on the Main Control Board (A1). Optional Auxiliary I/O boards are available, each supplying six (6) additional relays. ATevo will support up to four (4) optional Auxiliary I/O boards (24 relays total).



- [Configuring Common Alarm Relay](#)
- [Configuring Auxiliary I/O Board Relays](#)

Last modified: 26 September 2023

4.5.1. Configuring Common Alarm Relay

The Common Alarm Relay (or Main Board Relay) has three (3) configuration parameters that allow the relay:

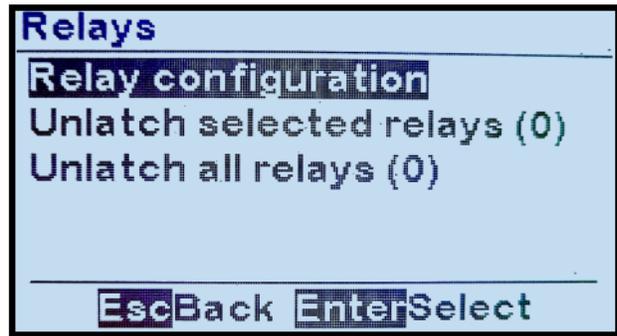
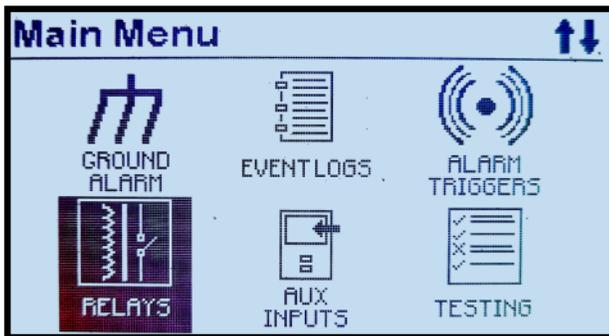
- to be assigned to a fault condition or status point
- to be assigned a delay period before activating the relay after the alarm or status condition changes states
- to operate in a latching or non-latching mode

By default, the Main Board Relay is configured to indicate the status of the Common Alarm, but this may be changed to indicate the status of any ATevo alarm or status state.

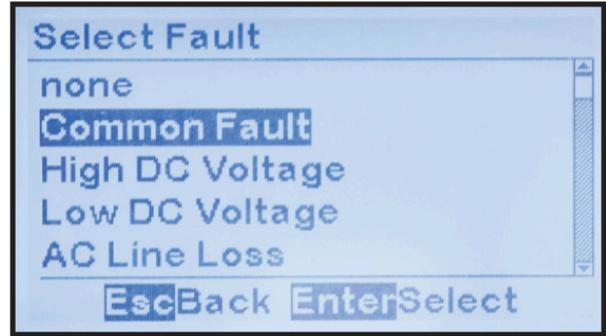
If this relay is configured to be 'latching', it will change to the active state after the configured time delay, and remain in the active state even if the alarming condition is no longer present. Latched relays must be cleared manually to ensure that they are acknowledged. See [Section 7.6](#) for instructions on how to clear (or reset) latched relays.

To change the Common Alarm Relay configuration:

MENU > RELAYS > 'Relay Configuration' > 'Main board relay'



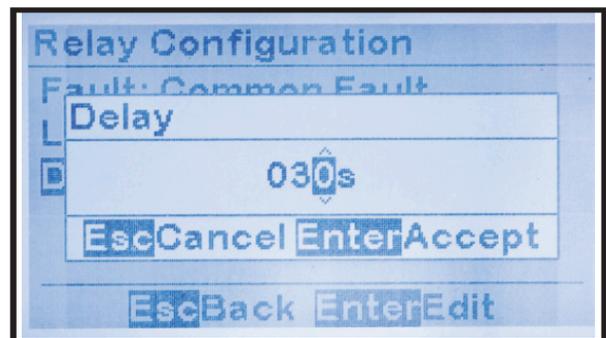
To change the relay's assigned fault condition:
'Fault' > select desired condition



To change the relay's latching status:
'Latching' > select desired status



To change the relay time delay:
'Delay' > increment/decrement to set point value



Last modified: 22 September 2023

4.5.2. Configuring Auxiliary I/O Board Relays

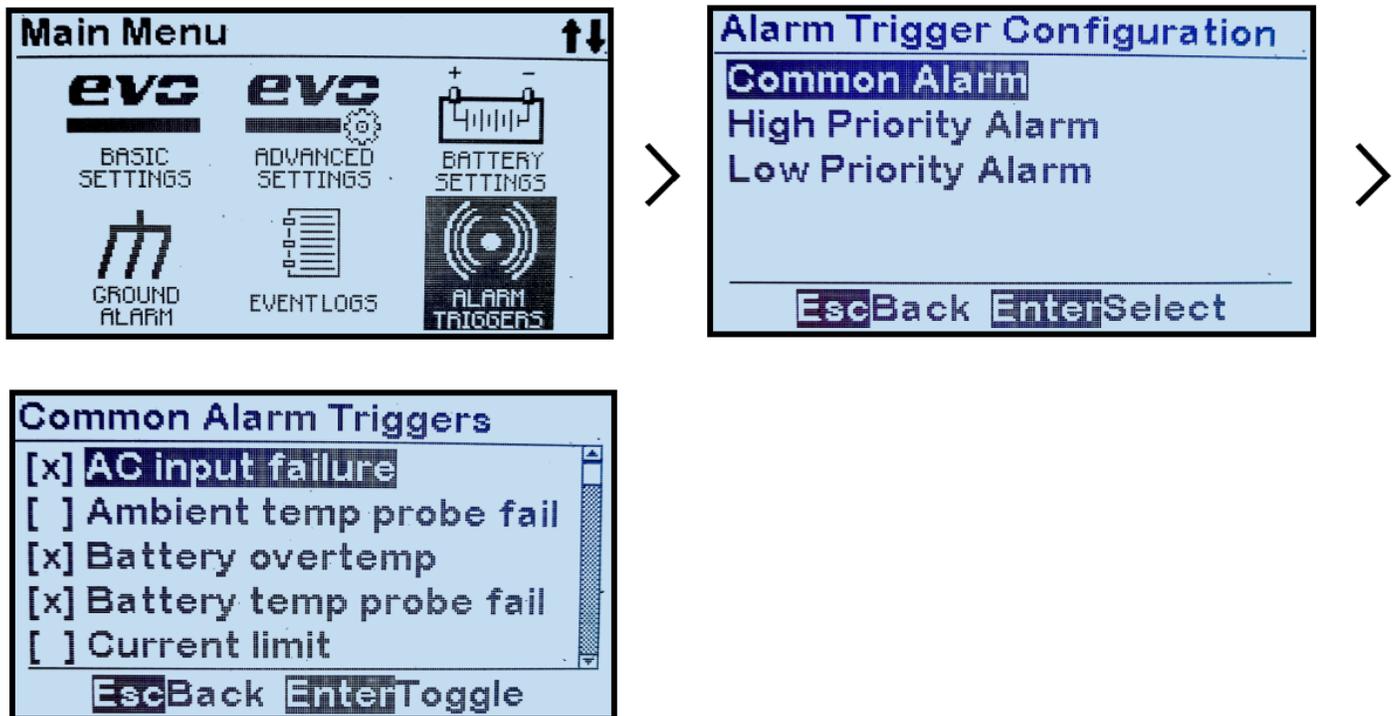
Configuration of the relays on the optional Auxiliary I/O Board (A4) is similar to the Common Alarm Relay configuration on the Main Control Board (A1). This is because the Auxiliary I/O Board Relays have the same three (3) configuration parameters. Refer to [Section 12.4](#) for configuration instructions.

Last modified: 1 August 2023

4.6. Disabling Alarms in Common Alarm List

By default, the COMMON ALARM will activate when any ATevo alarm is active. If you disable an alarm in the COMMON ALARM list the alarm will activate, but it will not cause the COMMON ALARM to activate.

To disable an alarm in the COMMON ALARM list: MENU > ALARM TRIGGERS > Common Alarm > select alarm to change status.



If an '[X]' appears to the left of the alarm, it will activate the COMMON ALARM. If '[]' appears, it will not activate the COMMON ALARM.

Last modified: 21 September 2023

4.7. Configuring Serial Communications Adapter

ATevo can support up to three (3) optional Serial Adapter modules.
Each Serial Adapter module can:

- support SCADA protocols (DNP3 or Modbus)
- be used as a standard communications interface to connect to external serial devices
- be used in various applications (such as Forced Load Sharing)

* Instructions on how to configure Serial Communications Adapters are found in [JA0102-54](#).

Last modified: 26 July 2023

4.8. Configuring Ethernet Adapter

ATevo can support an optional Ethernet Adapter (A22) module.

The Ethernet Adapter module:

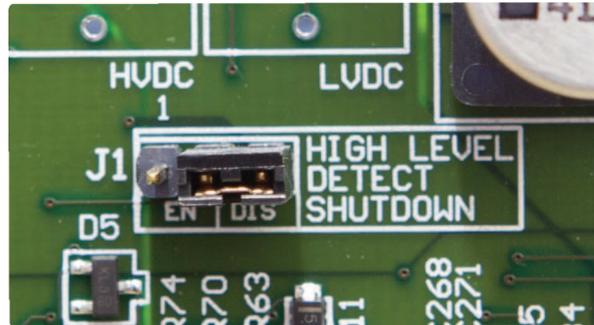
- can support SCADA protocols (DNP3 or Modbus)
- will support an ATevo web page interface (future)
- will permit a file transfer mechanism to upload/download files for firmware upgrade and log file transfer (future)

* For configuration details, refer to the supplementary ATevo Communications Manual ([JA0102-54](#)). This document details communication hardware / wiring, defines communication capabilities, and lists ATevo front panel configuration. Finally, it catalogs DNP3 and Modbus communication registers.

Last modified: 26 July 2023

4.9. Enabling/Disabling High Level Detect

ATevo has a dedicated hardware circuit that can shut down the charger should a catastrophic microprocessor failure occur and the rectifier control become locked to the full 'on' state. The setting for the Analog High Voltage Shutdown jumper determines whether the High Level Detect circuit is enabled or disabled.



The High Voltage Shutdown jumper (J1) is located center right on the Main Control Board (A1). To change the enable/disable status of the High Level Detect circuit:

1. Turn OFF (open) both AC Input (CB1) and DC Output (CB2) Circuit Breakers.
2. Open the ATevo front panel door.
3. Locate the Main Control Board (A1) on back of the door.
4. Locate jumper (J1) labeled 'High Level Detect Shutdown' on the center right of the Main Control Board (A1).
5. Move jumper shorting block as follows:
 - a. 'EN' to enable the High Level Detect Shutdown
 - b. 'DIS' to disable the High Level Detect Shutdown
6. Close the front panel door.
7. Turn ON (close) both Circuit Breakers (CB1/CB2).

See [Section 5.4](#) for more information on the High Level Detect feature.

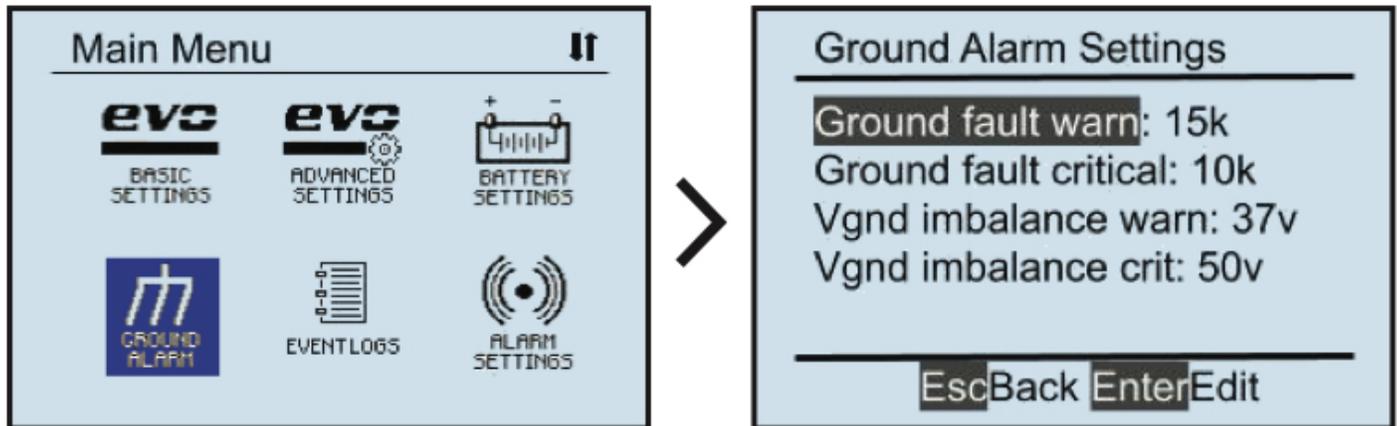
Last modified: 3 August 2023

4.10. Configuring Ground Alarms

The ATevo firmware provides two (2) types of ground alarms.

- ground fault alarm - triggered by current leakage to ground
- ground imbalance alarm - triggered by pos(+) / neg(-) difference

Likewise, each ground alarm type features two (2) levels of notification priority (alarm 'warning' & alarm 'critical').

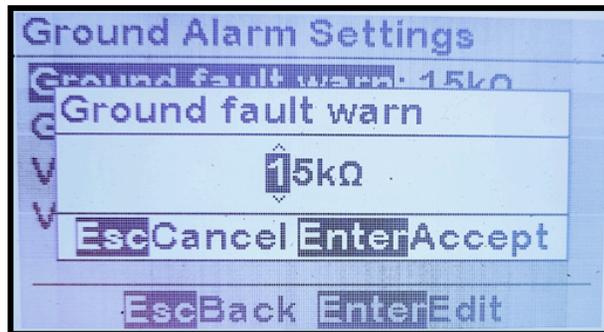
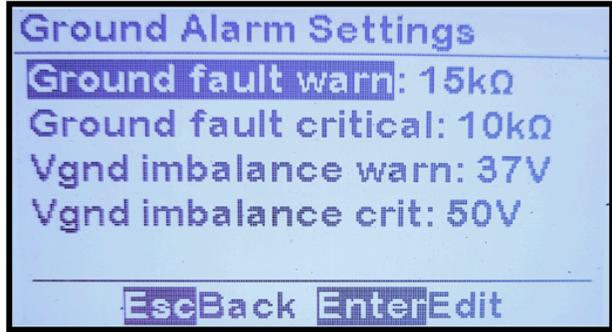
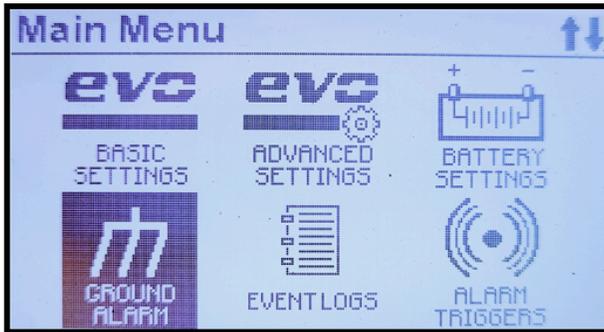


- [Setting Up Ground Fault Alarm Sensitivity](#)
- [Setting Up Ground Imbalance Alarm](#)

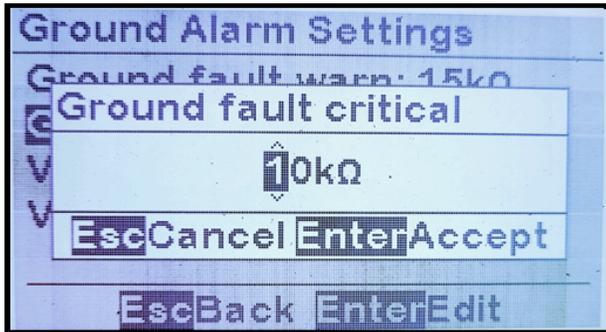
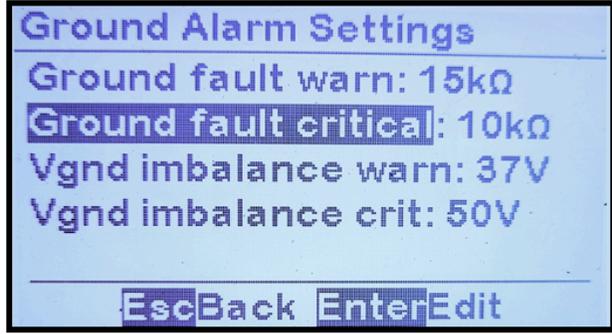
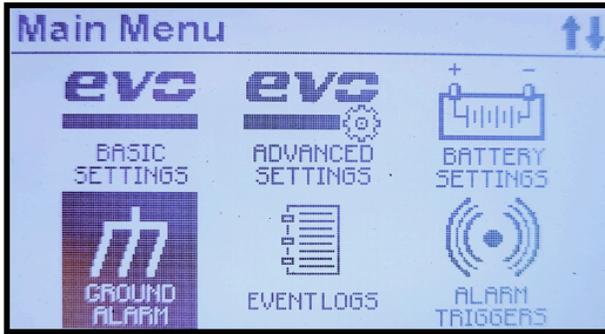
Last modified: 26 July 2023

4.10.1. Setting Up Ground Fault Alarm Sensitivity

To change the resistance values (measured in kOhm) of the ground fault alarm sensitivities, MENU > GROUND ALARM > 'Ground Fault Warning' > adjust value > EDIT/ENTER to accept value.



To change the resistance values (measured in kOhm) of the ground fault critical, MENU > GROUND ALARM > 'Ground Fault Critical' > adjust value > EDIT/ENTER to accept value.

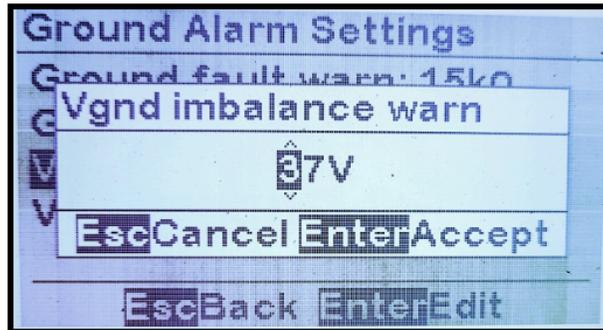
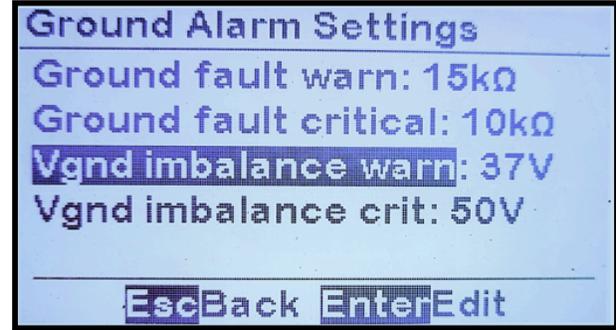
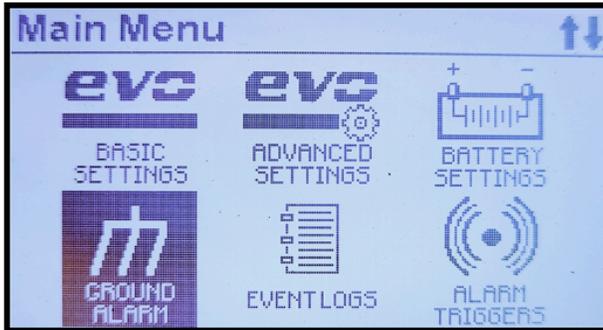


* To increase the ground alarm sensitivity, lower the kOhm value. To decrease the sensitivity, raise the kOhm value.

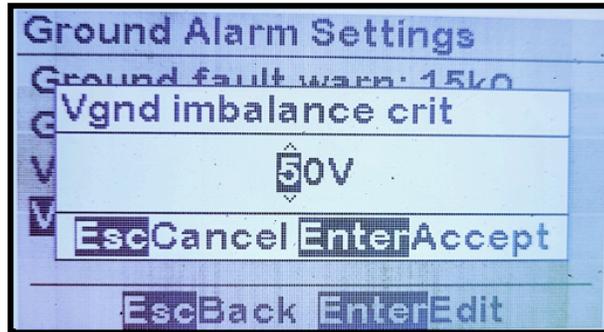
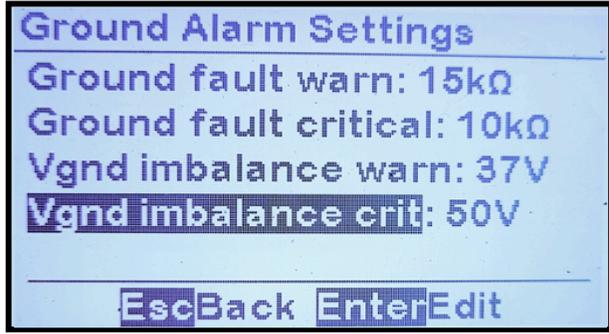
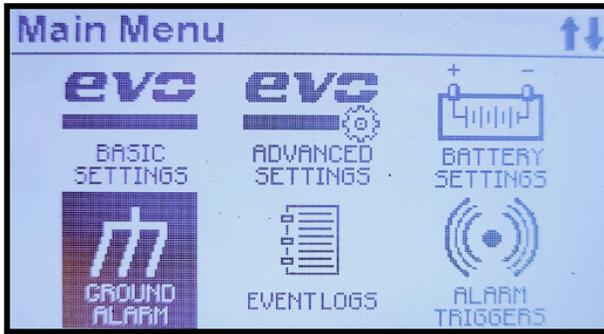
Last modified: 26 September 2023

4.10.2. Setting Up Ground Imbalance Alarm

To change the the Ground Imbalance Alarm (measured in Vdc),
 MENU > GROUND ALARM > 'Vgnd Imbalance Warning' > adjust value > EDIT/ENTER to accept.



To change the the Ground Imbalance Critical Alarm (measured in Vdc),
 MENU > GROUND ALARM > 'Vgnd Imbalance Critical' > adjust value > EDIT/ENTER to accept.

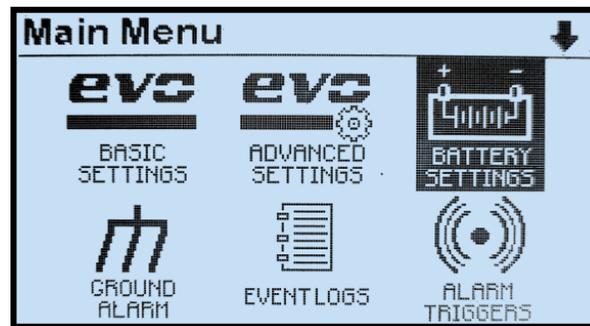


* For further information regarding ATevo ground alarms, including instructions for locating and identifying faults, refer to supplemental instructions ([JA5124-09](#) and/or [JD5032-00](#)).

Last modified: 26 September 2023

4.11. Configuring Battery Settings

This Section details the configuration of ATevo parameters, as it relates to the battery. These include battery type, End of Discharge alarm level (Vdc), and optional Battery Temperature Probe.



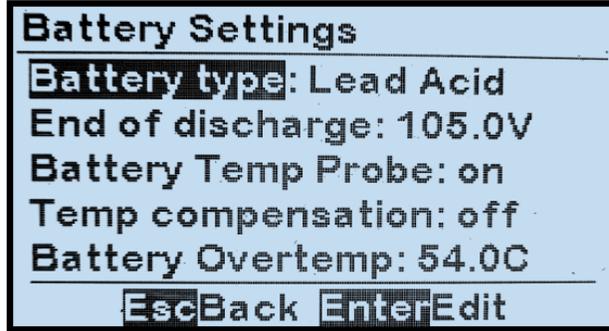
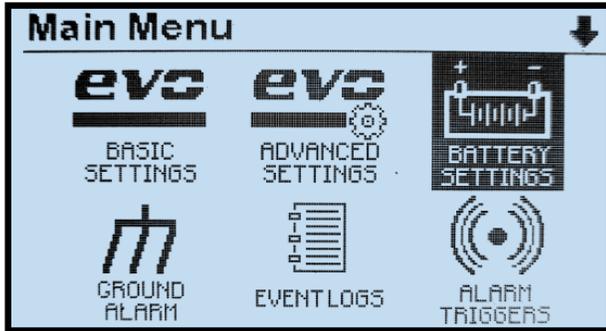
- [Selecting Battery Type](#)
- [Setting End of Discharge \(EOD\) Alarm](#)
- [Setting Up the Battery Temperature Probe](#)

Last modified: 27 September 2023

4.11.1. Selecting Battery Type

To select battery type,

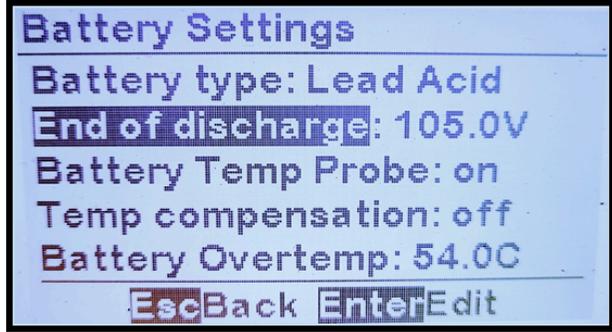
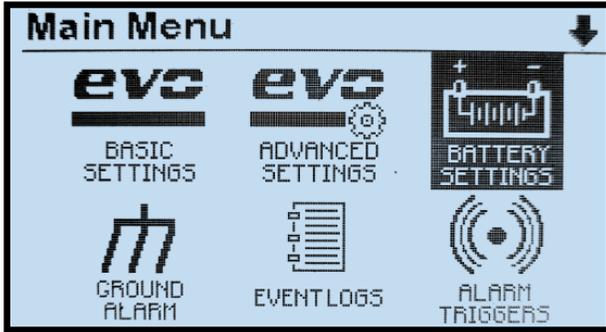
MENU > BATTERY SETTINGS > 'Battery type' > select type > EDIT/ENTER to save



Last modified: 27 September 2023

4.11.2. Setting End of Discharge (EOD) Alarm

To change the set point for the End of Discharge Alarm (covered in [Section 7.5.3](#)), MENU > BATTERY SETTINGS > 'End of discharge' > select & change digit values > EDIT/ENTER to save.

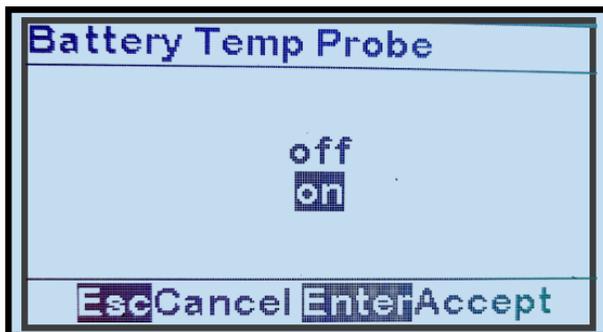
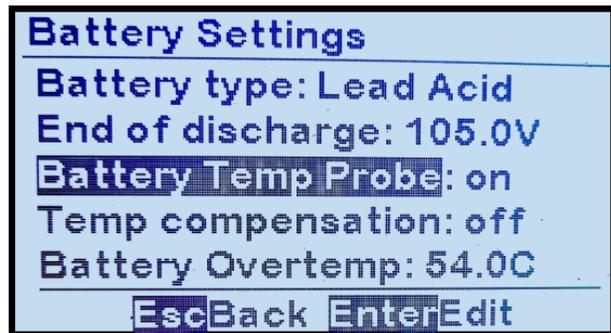
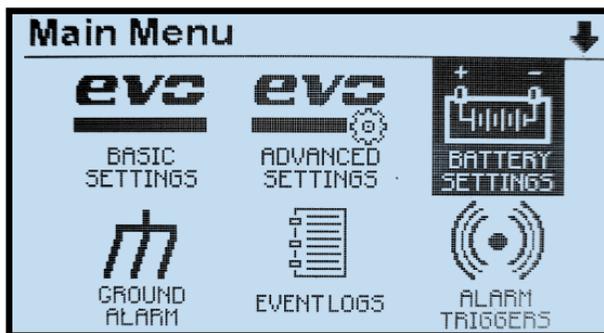


Last modified: 27 September 2023

4.11.3. Setting Up the Battery Temperature Probe

To enable the Battery Temperature Probe (covered in [Section 10](#)), press MENU, then select BATTERY SETTINGS:

- Navigate to Battery Temp Probe using UP and DOWN.
- Select it with EDIT/ENTER.
- Press UP and DOWN to change status (off / on).
- Once desired setting is displayed, press EDIT/ENTER to store it.



Last modified: 27 September 2023

5. Basic Operation



SECTION TOPICS

[ATevo Operating Modes](#)

[High Voltage Shutdown](#)

[Low Level Detect](#)

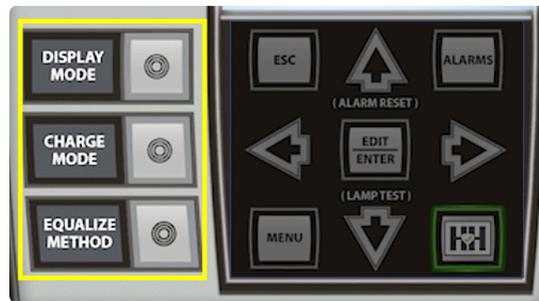
[High Level Detect](#)

[Disabling Ground Detection](#)

Last modified: 3 August 2023

5.1. ATevo Operating Modes

ATevo operating mode and method selections are primarily controlled by three buttons (DISPLAY MODE, CHARGE MODE, and EQUALIZE METHOD) at the far left of the control panel.



- [Changing Display Mode](#)
- [Changing Charge Mode](#)
- [Changing Equalize Method](#)
- [Lamp Test & Display of Firmware Versions](#)
- [Resetting Latched Relays](#)

Last modified: 3 August 2023

5.1.1. Changing Display Mode

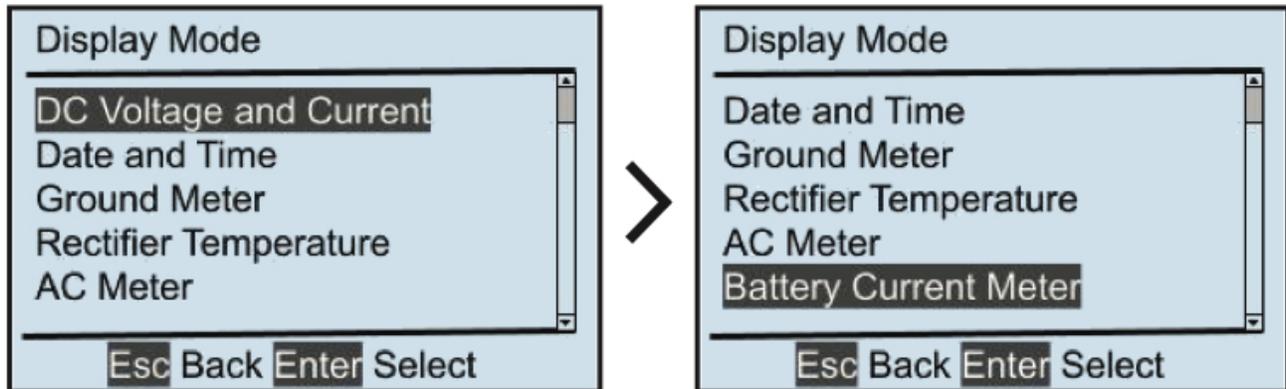
<https://www.youtube.com/embed//bEc7qvyGcBY?rel=0&start=8>

The DISPLAY MODE button selects the HOME Screen display choices:

- DC Voltage and Current (Vdc / Adc output)
- Date and Time (refer to [Section 3.2.5](#))
- Ground Meter (refer to [Section 3.2.5](#) and/or [JA5124-09](#))
- Rectifier Temperature (refer to [Section 3.2.5](#))
- AC Meter - optional (refer to [JA5124-03](#))
- Battery Current Meter - optional (refer to [JA5124-07](#))

To change Display Mode:

DISPLAY MODE > one of 6 displayed choices



- * The DISPLAY MODE button is in the same relative location as the METER MODE button on legacy AT10.1 chargers. Its functionality is equivalent in that it determines which measurements are to be shown on the HOME screen.

Last modified: 8 September 2023

5.1.2. Changing Charge Mode

https://www.youtube.com/embed//_6nyTznWz6k?rel=0&start=7

ATevo has two (2) output voltage modes that are set with the CHARGE MODE button:

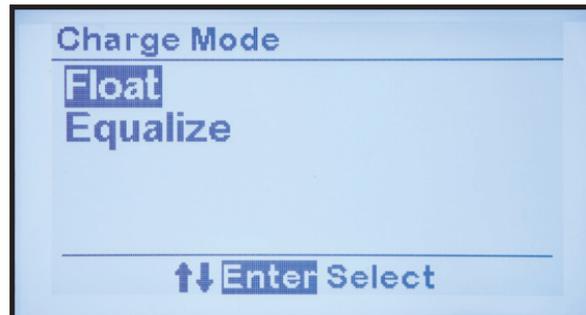
- FLOAT – for normal battery charging
- EQUALIZE – to balance voltage among battery cells. *Before using, consult your battery manufacturer's data sheets.*

Present charge mode is displayed at the top left of the HOME screen:

- 'Float' appears when charger is in FLOAT mode
- 'Equalize' appears when it is in EQUALIZE mode.

To change Charge Mode:

CHARGE MODE > other displayed choice



When ATevo is in EQUALIZE mode, the charger will:

- Ramp up to the EQUALIZE VOLTAGE set point.
- Start the EQUALIZE TIMER.
- Alternate display between showing the HOME screen and a screen that shows the EQUALIZE TIME REMAINING.



ATevo will remain in EQUALIZE mode until either the EQUALIZE TIMER expires or the charge mode is manually switched back to FLOAT.

- * The CHARGE MODE button is in the same relative location as the CHGR MODE button on legacy AT10.1 chargers. Its functionality is equivalent in that it changes charge mode between EQUALIZE and FLOAT.

Last modified: 8 September 2023

5.1.3. Changing Equalize Method

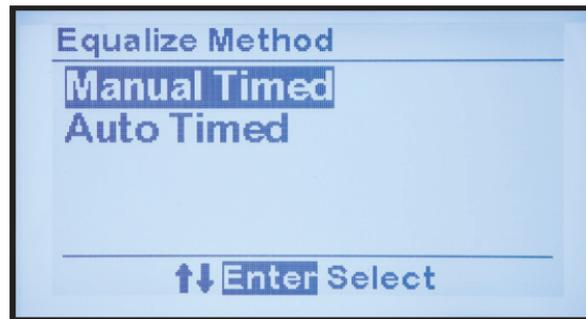
https://www.youtube.com/embed//H8zGOGu_EyE?rel=0&start=8

The EQUALIZE METHOD button switches the equalize method between MANUAL TIMER and AUTOMATIC TIMER. The present equalize method is displayed at the top right of the HOME screen

- 'Eqlz Mthd: Man' specifies MANUAL TIMER
- 'Eqlz Mthd: Auto' specifies AUTOMATIC TIMER.

To change the Equalize Method:

EQUALIZE METHOD > select other displayed option



When AUTOMATIC TIMER is selected, ATevo will:

- Automatically switch to EQUALIZE mode when power is restored after a loss of AC power for greater than 12 seconds.
- Start EQUALIZE TIMER.
- Remain in EQUALIZE mode until either the EQUALIZE TIMER expires or the charge mode is switched back to float mode manually.

When MANUAL TIMER is selected, ATevo will only switch to EQUALIZE MODE when the mode is manually changed.

* EQUALIZE METHOD button is in same relative location as EQLZ MTHD button on legacy AT10.1 chargers. Functionality is equivalent in that when pressed, it changes the equalize method. The Manual Equalize Method (no timer) available in legacy AT10.1 chargers is not supported by ATevo.

Last modified: 8 September 2023

5.1.4. Lamp Test & Display of Firmware Versions

ATevo has a Lamp Test mode that is activated by pressing and holding the DOWN arrow button. The Lamp Test will turn ON all front panel LEDs (except for the AC ON LED) and keep them on until the DOWN arrow button is released. The AC ON LED will be lit during normal operating conditions because it is driven by the power supply, and is not under software control.

When DOWN is released, ATevo will briefly display the charger’s installed firmware versions, then return to the HOME screen and resume normal operation.



* The ATevo Lamp Test is identical to the Lamp Test on legacy AT10.1 Series battery chargers.

Last modified: 27 September 2023

5.1.5. Resetting Latched Relays (legacy method)

Latched relays can be RESET (or cleared) by pressing and holding the UP arrow button until ATevo displays the RESET LATCHED ALARMS confirmation screen.

* ATevo's Reset Latched Alarms function is identical to the Reset Latching Alarms function on legacy AT10.1 chargers.

To select between clearing individual relays, or all relays, use the RELAYS menu icon as described in [Section 7.6, Resetting Latched Alarm Relays](#).

Last modified: 8 September 2023

5.2. High Voltage Shutdown

ATevo has a High Voltage Shutdown feature similar to the High Voltage Shutdown feature in legacy AT10.1 chargers. With this software feature the Main Control Board (A1) monitors the dc voltage and will turn OFF the output drivers (rectifier controllers) if the dc output voltage is too high.

Output voltage must exceed and stay above the High DC Voltage Alarm set point for 30 seconds in order for High Voltage Shutdown to occur. If it does, the High Voltage Shutdown Alarm and the Common Alarm Relay are activated. ATevo must be restarted with both AC and DC circuit breakers to clear the shutdown and turn ON the rectifier controls.

The High Voltage Shutdown feature can be enabled or disabled as described in [Section 4.3.2](#).

* ATevo also has a **hardware High Level Detect (analog)** feature that is described in [Section 5.4](#).

Last modified: 8 September 2023

5.3. Low Level Detect

ATevo has a Low Level Detect feature similar to the Low Level Detect feature in legacy AT10.1 chargers. This feature is a dedicated hardware circuit that detects if the dc bus voltage is below a configurable set point. If so, the Low Level Detect circuit will force the Common Alarm Relay to the alarmed state.

The Low Level Detect circuit functions independently of the microprocessor. It will trigger the Common Alarm if a catastrophic microprocessor failure should occur to indicate that the dc bus voltage is critically low and immediate attention is required. The circuit includes a dedicated Analog Low Level alarm LED that illuminates if the Low Level Detect condition is triggered.

The Analog Low Level alarm LED (DS2) is on the back of the Main Control Board (A1). Open ATevo's front panel door to view the Analog Low Voltage Alarm LED.



Refer to [Section 4.3.4](#) for instructions on how to configure the threshold for the Low Level Detect feature.

Last modified: 8 September 2023

5.4. High Level Detect

ATevo High Level Detect has a dedicated hardware circuit that detects if the dc bus voltage is above a configurable set point. If the dc voltage rises above the set point threshold for more than 30 seconds, the circuit disables the output drivers (rectifier controllers) and forces the Common Alarm Relay to the active state.

The High Level Detect is a true failsafe feature in that it can shut down the charger by disabling the rectifier control signals. This circuit works independent of the microprocessor and will override the rectifier control. The High Level Detect will shut down the charger output circuitry should a catastrophic microprocessor failure occur, turning the rectifier to the full on condition.

If the High Level Detect shutdown occurs, the circuit latches until the charger is restarted by recycling both the AC Input (CB1) and DC Output (CB2) Circuit Breakers. The High Level Detect circuit has a dedicated Analog High Level Detect Shutdown alarm LED, that illuminates if the High Level Detect condition is triggered. The Analog High Voltage Shutdown alarm LED is on the Main Control Board. You will need to open ATevo's front panel door to view the Analog High Voltage Shutdown alarm LED.



Refer to the following sections to learn about:

- [Section 4.9, Enabling/Disabling High Level Detect](#)
- [Section 4.3.3, Setting High Level Detect Threshold](#)

Last modified: 3 August 2023

5.5. Disabling Ground Detection

Depending on installation, users may wish to temporarily (or permanently) disable the ATevo ground detect feature. If so:

1. Shut down ATevo, and allow internal voltages to dissipate.
2. Open the ATevo front panel door, and remove the safety shield.
3. Locate the Power Board (A2).
4. Identify the 3-pin shorting block (JP102), marked 'GROUND DETECT' on A2.
5. Move the 2-pin jumper from the ENABLED to DISABLED position.
6. Restart ATevo with ground detection disabled.



Last modified: 3 August 2023

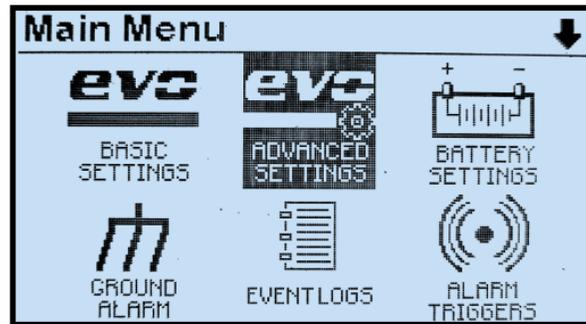
6. Advanced Operation

SECTION TOPICS
ATevo Main Menu
Alarms Button
Health Button
Security & Passwords
SD Memory Card Features

Last modified: 3 August 2023

6.1. ATevo Main Menu

Press 'MENU' to access the Main Menu. The first six (6) menu selection icons appear. Use the UP, DOWN, LEFT, or RIGHT arrow buttons to navigate. Icons appear in inverse video when selected.



The top of the screen indicates the Main Menu is being displayed and to the far right of 'Main Menu' an up and/or down arrow icon is displayed. The arrow icon(s) indicate that more menu selection icons are available if you continue to navigate in the direction of the arrow.

If a down arrow navigation icon is displayed, and any of the menu icons on the bottom are selected, pressing DOWN again will display the next three menu icons. Pressing the EDIT/ENTER button will activate the selected feature or function. Pressing the ESC button will return back one (1) menu level.

If the Main Menu is being displayed and the ESC button is pressed, the display will return to the HOME screen. If you have selected and entered the SYSTEM SETTINGS mode, pressing the ESC button while in the SYSTEM SETTINGS screen will return to the Main Menu. Pressing ESC again will return to the HOME screen.

The headings below describe the function of all of the buttons in the Main Menu:

6.1.1 Basic Settings Icon

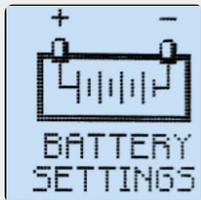
	<p>Opens Basic Set Points and Alarms screens beginning with the first parameter. These are the legacy ATevo settings. Refer to Section 4.2 for details. Selecting this icon is equivalent to pressing EDIT/ENTER from the HOME screen - the direct path to Basic Set Points and Alarms screens, a feature that ensures backward compatibility with legacy ATevo Series battery chargers.</p>
---	--

6.1.2 Advanced Settings Icon



Opens configurable options for Advanced Settings. See [Section 4.3](#) for instructions on advanced setting configurations.

6.1.3 Battery Settings Icon



Opens configurable options for Battery Settings. Refer to [Section 4.11](#) for instructions.

6.1.4 Ground Alarm Icon



Opens configurable options for Ground Fault Alarm Settings. Refer to [Section 4.10](#) for instructions.

6.1.5. Events Log Icon



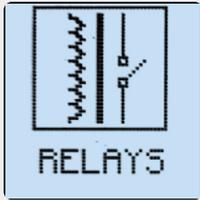
Opens a list of Event Log functions. The user can view and clear logged events and copy logs to SD memory card. See [Section 9](#) for instructions.

6.1.6 Alarm Triggers Icon



Used to exclude alarms from the Common Alarm activation list. By default, all alarms, when active, will annunciate the Common Alarm. See [Section 4.6](#) for instructions.

6.1.7 Relays Icon

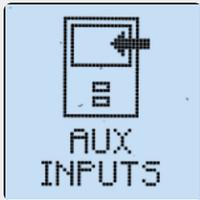


Shows relay configuration and control options. Use it to configure relays and reset or clear any latched alarm relays. To change a relay configuration, execute the 'Relay configuration' command then select the relay you wish to configure.

Refer to the following sections for details on:

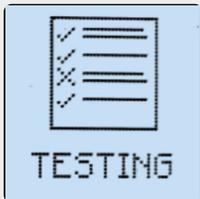
- Changing Main Board Relay Parameters - [Section 4.5](#)
- Changing Auxiliary Board Relay Parameters - [Section 12.4](#)
- Resetting Latched Alarm Relays - [Section 7.6](#)

6.1.8 Aux Inputs Icon



Used to configure Binary Inputs and Analog Inputs for up to four (4) Auxiliary I/O Boards. Each board may have up to four (4) generic Binary Inputs and four (4) generic Analog Inputs. See [Section 12.5](#) for Binary Inputs, and [Section 12.6](#) for Analog.

6.1.9 Testing Icon



Displays the Battery Open Test configuration and controls. See [Section 7.7](#) for instructions on how to start, schedule, and set up parameters for the Battery Open Test.

6.1.10 Communication Icon



Used to configure optional communications ports. ATevo supports three serial communications ports and one Ethernet port. The menu displays all ports, and whether or not they are assigned and configured. Two (2) of the serial ports support DNP3 and Modbus communications for SCADA applications. Refer to the supplementary [ATevo Communications Manual](#) for port configuration instructions.

6.1.11 Save|Reset Configuration Icon



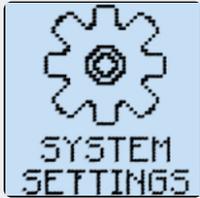
Permits a system backup or restore using an optional SD memory card. All configuration set points, alarm thresholds, and communications settings can be stored on and retrieved from SD memory card. See [Section 6.5](#) for instructions.

6.1.12 Security Icon



Opens a list of ATevo password and login functions. See [Section 6.4](#) for instructions.

System Settings Icon



Opens configurable options for System Settings such as time, date, and display backlight intensity. See [Section 4.4](#) for instructions.

System Information Icon



Allows you to scroll through a screen of system information, including:

- Vdc/Adc (charger output)
- Firmware version
- Display version
- PGA version
- AUX versions (4)
- Time since last reset
- Charger ID
- MAC

Last modified: 27 September 2023

6.2. Alarms Button



The ALARMS button shows the Active Alarm List – four (4) alarms per page. If more than four alarms are active, use UP and DOWN arrows to scroll through the list.

Not all ATevo alarms have a dedicated LED alarm indicator on the front panel. Alarms without a dedicated LED indicator will light the COMMON alarm LED on the front panel.

Last modified: 3 August 2023

6.3. Health Button



The HEALTH button initiates the Hindle Health System. The user is prompted through a series of tests that verify the ATevo is working properly. The Hindle Health System will verify set points, test alarms and relays, verify calibration, and test hardware.

Test results are logged with a time and date stamp. The health test can be aborted at any point by pressing the ESC button. See [Section 8](#) for instructions on how to run the Hindle Health System test.

Last modified: 3 August 2023

6.4. Security & Passwords

ATevo protects against unauthorized users modifying charger set points, accessing critical features, and changing alarm settings. This protection is implemented by assigning and enabling passwords to authorize access to different levels of ATevo functionality.

- [Three \(3\) Levels of Password Protection](#)
- [Access Security Features & Configure Passwords](#)
- [Setting Passwords](#)
- [Setting Default Permission](#)
- [Logging into a Password Authorization Level](#)
- [Logging Out](#)

Last modified: 26 September 2023

6.4.1. Three (3) Levels of Password Protection

ATevo incorporates three (3) levels of password authorization, each of which requires a unique password to access its functions and features:

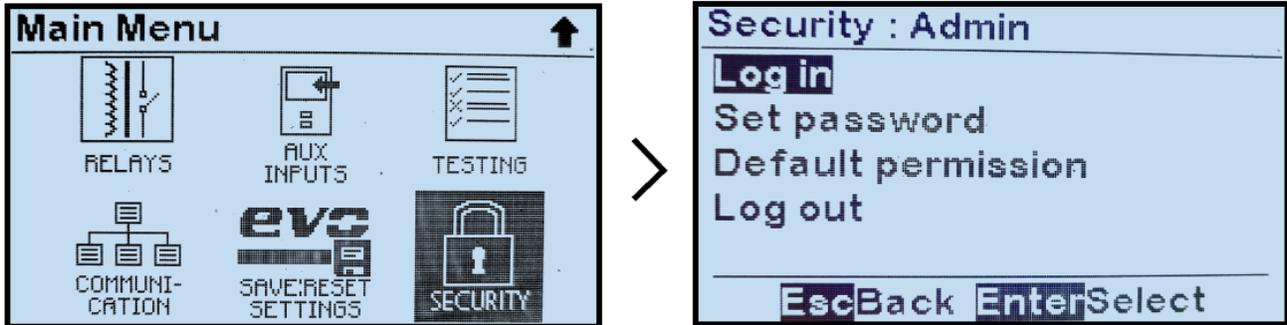
- **READ** is the lowest level; it permits:
 - viewing charger's data and status,
 - observing measurements and set points, but
 - it does not permit configuration changes.
- **READ/WRITE** is the mid level; it permits:
 - viewing charger's data and status as in READ level, and
 - changing charger's configuration and all set points except for passwords.
- **ADMINISTRATOR** is the highest level; it permits you to use and/or configure all charger functions, features, set points and passwords.

Last modified: 27 September 2023

6.4.2. Access Security Features & Configure Passwords

Each authorization level has a unique password - a text string of up to fourteen (14) characters. DEFAULT PERMISSION level is factory set to ADMINISTRATOR. You need ADMINISTRATOR privilege to change any password or change the DEFAULT PERMISSION level.

To access the security features and password configuration: MENU > SECURITY



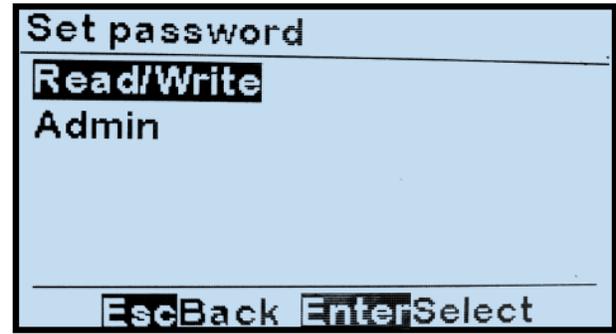
ATevo Security Screen prompts you to choose from one of the security and password configuration selections.

Last modified: 26 September 2023

6.4.3. Setting Passwords

To change passwords, refer to [Section 6.4.2](#) and ensure you have ADMINISTRATOR privilege then:

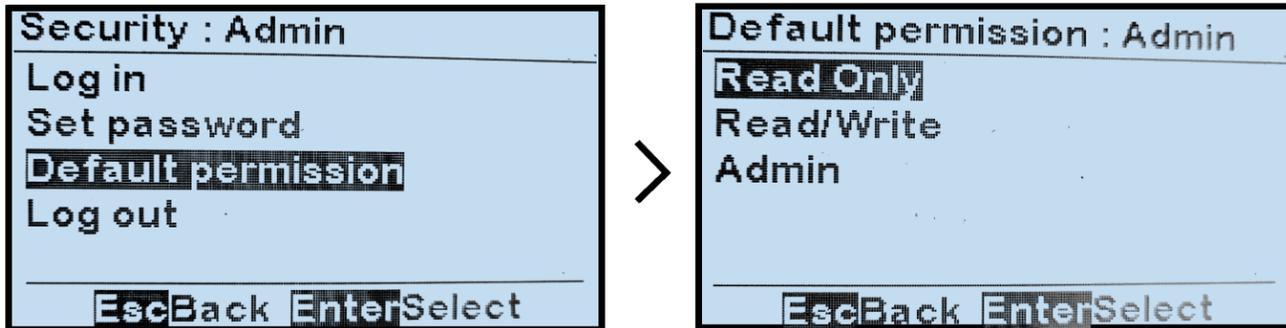
'Set passwords' > select from password authorization levels > set characters for that authorization level's password



Last modified: 22 September 2023

6.4.4. Setting Default Permission

The DEFAULT PERMISSION setting determines the authorization and password level when there is no log in. If you do not wish to implement password security, DEFAULT PERMISSION should be set to ADMINISTRATOR, the default factory setting.

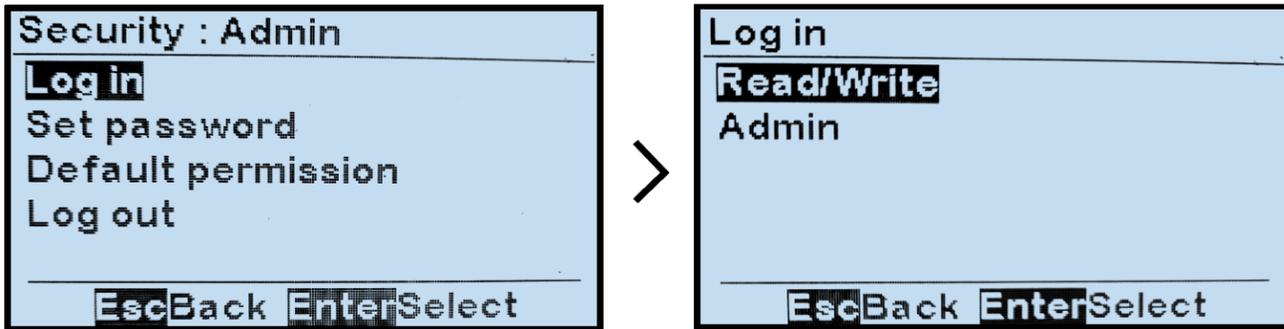


Last modified: 26 September 2023

6.4.5. Logging into a Password Authorization Level

If you attempt to access a feature or change a parameter that is configured at a higher privilege level than the DEFAULT PERMISSION (or the present level), ATevo will prevent the action. You will need to log in at the configured privilege level (or higher) to proceed.

To LOG IN to a privilege level, select 'LOG IN', select the level you wish to access, and enter the password.



If the entry is correct, you will be able to access all features at the privilege level. However, if no buttons are pushed for more than ten minutes, ATevo will switch back to the DEFAULT PERMISSION level.

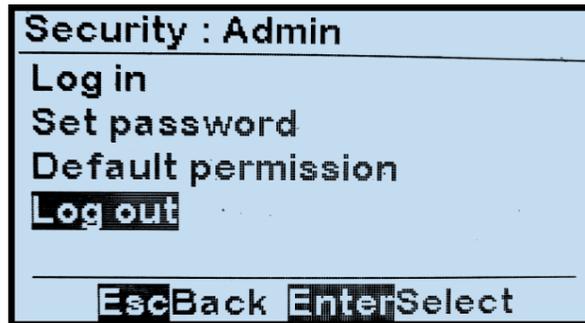
Last modified: 26 September 2023

6.4.6. Logging Out

You must log out after completing operations at a higher privilege level, or protected operations will be available for anyone to access.

To LOG OUT of the present privilege level, select 'LOG OUT'. The user will receive a confirmation message and return to DEFAULT PERMISSION privilege level.

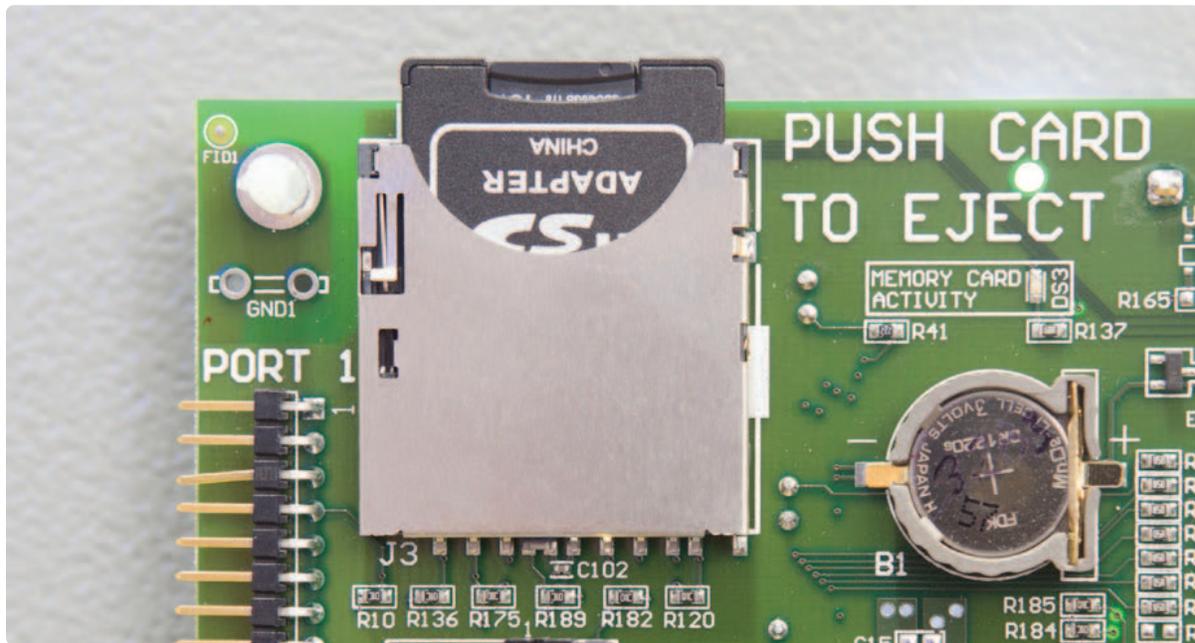
- * ATevo automatically logs out of any authorization level above DEFAULT PERMISSION after ten (10) minutes of inactivity.



Last modified: 26 September 2023

6.5. SD Memory Card Features

ATevo provides a socket for an SD Memory Card on the Main Control Board (A1). To access it, open the front panel door. Locate the socket at the top-left corner of the Main Control Board's back side.

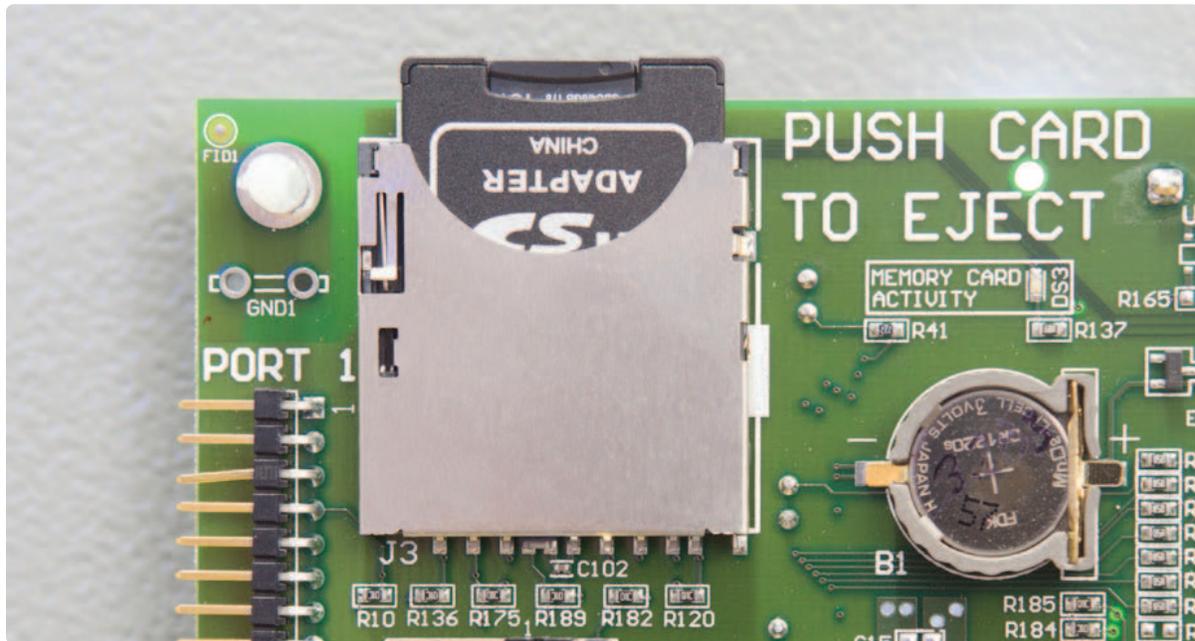


Last modified: 3 August 2023

6.5.1. Installing SD Memory Card

Purchasing the SD card through an ATevo supplier will ensure that it has been tested and verified to work with the ATevo.

When installing the SD card, face the contacts down toward the Main Control Board. Gently press the card into the socket until you feel the card locking mechanism 'click'. To remove, gently press the card further into the socket then allow it to 'snap' back to disengage from the locking mechanism. Pull the SD card out.



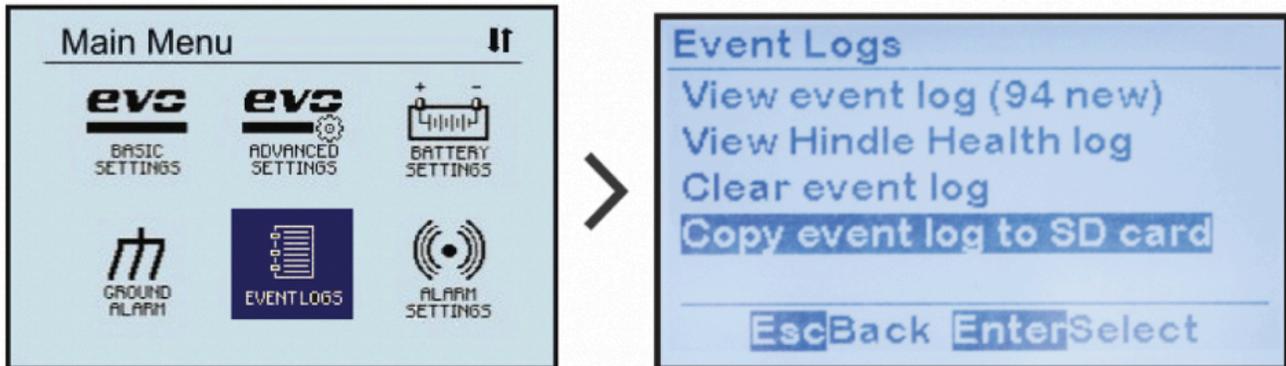
Last modified: 27 September 2023

6.5.2. Storing Event Log File to SD Card

ATevo Event Log can be transferred onto SD Memory Card then to a Personal Computer (PC) or other electronic device for archiving or evaluation. The file is stored in ASCII text format for easy import into spreadsheets or other third party software.

To copy the Event Log to SD Memory Card:

MENU > EVENT LOGS > 'Copy event log to SD card'



The screen will briefly confirm the file was copied successfully. The event log file is written to a file named **ATgvaixx.LOG** where:

- 'g' specifies charger family: (1) Single Phase ≤ 25 A, (2) Single Phase > 25 A, (3) = 3 phase 16-1000 Adc.
- 'v' specifies dc voltage: (A) = 12V, (B)= 24V, (C) = 48V, (D) = 130V, (E) = 260V.
- 'a' specifies dc current: (C) = 16A, (E) = 25A, (F) = 30A, (G) = 40A, (H) = 50A, (I) = 75A, (J) = 100A.
- 'i' specifies charger iD (A-Z): per SYSTEM INFO menu.
- 'xx' is a sequential number.

Each time the event log file is stored it is written to a new file whereby 'xx' increments by one. This prevents previous event log files stored on the SD Memory Card from being overwritten.

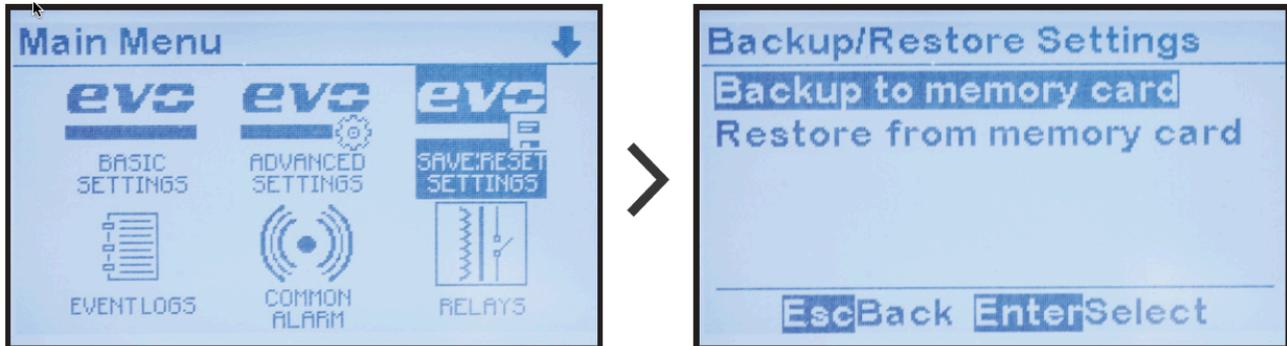
Last modified: 8 September 2023

6.5.3. Storing/Recalling Settings to/from Memory Card

All settings can be stored onto SD Memory Card, including voltage and current set points, alarm thresholds, and relay configuration.

To copy ATevo Configuration to SD Memory Card:

MENU > SAVE:RESET SETTINGS > 'Backup to Memory Card'



The screen will briefly confirm the file was copied successfully. The configuration file is written to a file named [ATgvai00.EVO](#) where:

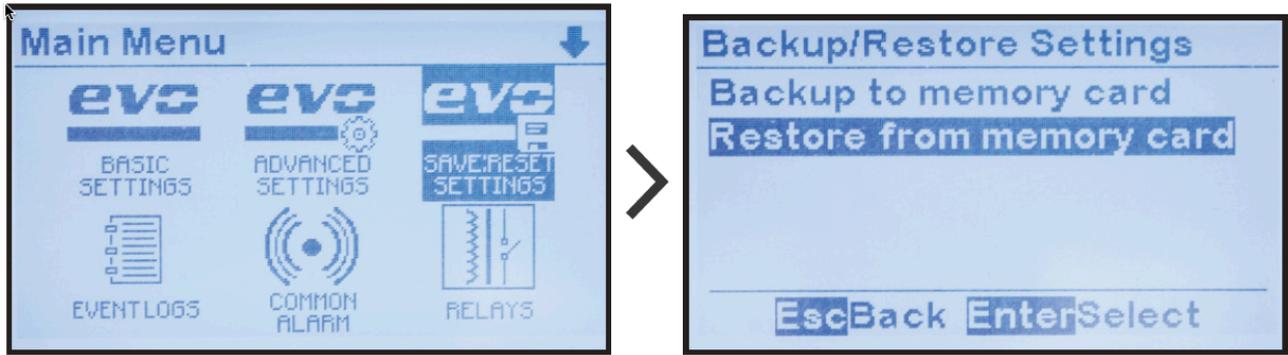
- 'g' specifies charger family: (1) Single Phase <= 25 A, (2) Single Phase > 25A, (3) = 3 phase 16-1000 Adc.
- 'v' specifies dc voltage: (A) = 12V, (B) = 24V, (C) = 48V, (D) = 130V, (E) = 260V.
- 'a' specifies dc current: (C) = 16A, (E) = 25A, (F) = 30A, (G) = 40A, (H) = 50A, (I) = 75A, (J) = 100A.
- 'i' specifies charger iD (A-Z): per SYSTEM INFO menu.

You may use this saved configuration file to:

- restore configuration in case someone inadvertently changes a setting and doesn't remember the original setting.
- clone configuration to a similar charger to eliminate need to set up parameters manually.
- configure a replacement Main Control Board (A1) automatically.

To copy ATevo Configuration from SD Memory Card to the Main Control Board (A1):

MENU > SAVE:RESET SETTINGS > 'Restore from Memory Card'



The screen will briefly confirm the file was copied successfully. The charger will restart with the restored configuration settings.

Last modified: 8 September 2023

6.5.4. Upgrading Firmware via Memory Card (v2.6.6 & earlier)

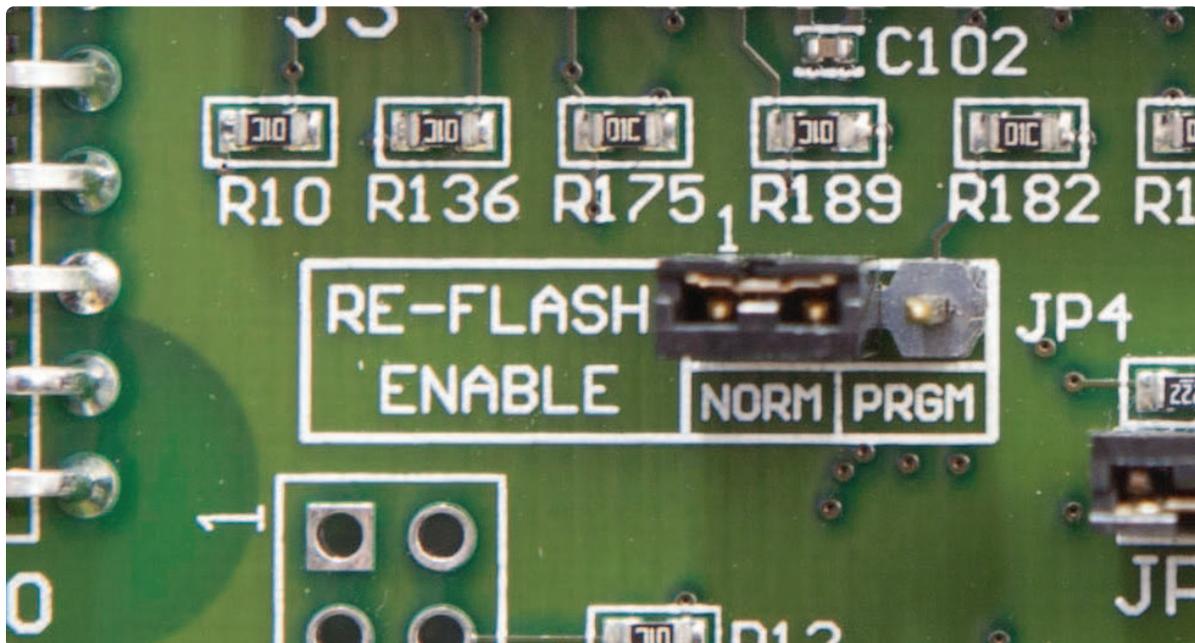
A powerful ATevo charger feature is that the Main Control Board (A1) firmware (or software) can be easily updated in the field without uninstalling the charger or any boards. The process takes minutes.

The first step in upgrading ATevo is to obtain the latest two (2) program files from the supplier:

- mainapp.bin = Main Control Application program
 - bruno.bin = Display Application program
- These can be updated independently or at the same time.

Next, copy these files onto an SD Memory Card, using either a personal computer (PC) with an SD Memory Card slot, or a USB to SD Memory Card adapter. When the files are on the SD Memory Card transfer them to ATevo.

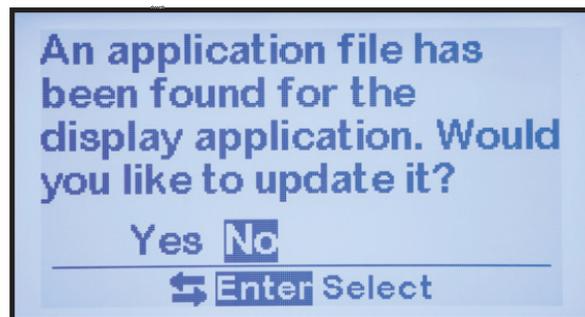
- Open the ATevo front panel door, and locate the SD Memory Card socket on the back of the Main Control Board (A1).
- Directly below the socket will be a 'RE-FLASH ENABLE JUMPER'.



- Move shorting block on jumper to 'PRGM' position.
- Insert ATevo-compatible SD Memory Card with program files into socket.
- Press RESET button (SW13) located 3in / 76mm below RE-FLASH JUMPER.
- If mainapp.bin is stored on the card, the message below will appear.
- Select 'Yes' if desired. A message will confirm that the Main Application program has updated.



- If the SD Memory Card contains the bruno.bin file, you will be prompted to upgrade the Display Application program.
- Select 'Yes' if desired, and a message will confirm the update.



- The charger will reset and prompt you to upgrade the Main Application program again.
- Move the RE-FLASH JUMPER shorting block back to the 'NORM', normal operating position and press RESET.
- The ATevo will re-boot.
- When it restarts, it will be running the new installed program(s).

Frequently Asked Questions (FAQs)

Since the introduction of firmware v2.7.0 with ATevo units that began being sold in 2021, changes to the process and the format of files used for upgrading firmware have been made – as detailed in the [next topic](#). If your ATevo was originally supplied with firmware v2.6.6 or earlier, these changes will mostly not affect you. However, some customers have asked the following questions.

Q: Can I upgrade my ATevo that was purchased with v2.6.6 or earlier to firmware v2.7.0+?

A: Yes. Contact the manufacturer.

Q: Can an ATevo running firmware prior to v2.7.0 use the single file with the new file format?

A: No. If your ATevo runs firmware prior to v2.7.0, contact the manufacturer and request the two old-format firmware upgrade files, then follow the directions above.

Q: What if new and old format firmware files are on a memory card used to update an ATevo?

A: If the card is in an ATevo running v2.6.6 and prior, it will only recognize the older file types. An ATevo running 2.7.0 and later will first look for the newer file types (.HPB extension) and display a list to choose from. The update will be performed using one of those files if the user selects one. The older files will be ignored in this case. If the user presses ESC rather than choosing one of the new file types it will then check for the older file types. If they are found, the UI will offer to update using them.

 To learn about the enhanced features that firmware v2.7.0 has brought to the ATevo, see Appendix topic, [Firmware v2.7.0 Enhancements](#).

Last modified: 3 August 2023

6.5.5. Upgrading Firmware via Memory Card (v2.7.0 onward)

The process for updating firmware is further simplified on ATevo chargers supplied with firmware v2.7.0 onward. Improvements that are discussed below include:

- Firmware updates are supplied as a single firmware file rather than individual files.
- Firmware filename can be unique as opposed to a fixed name.
- Usability Improvements:
 - Update screens no longer reappear after firmware update is complete, as they did in prior firmware versions.
 - Users are prompted to return jumper JP4 to “NORM” when the update is complete.

 To learn about the enhanced features that firmware v2.7.0 has brought to the ATevo, see Appendix topic, [Firmware v2.7.0 Enhancements](#).

Update With a Single File

Firmware updates are now supplied as a single file. In firmware prior to v2.7.0 there were 2 files, mainapp.bin and bruno.bin to update the main processor and ui processor respectively. These files are now packed into a single file.

File Name Convention

Firmware update files can now have a unique name which makes it possible to store multiple firmware update files on an SD card. Firmware files are named to indicate the firmware version contained in the file. The output file is still in 8.3 format (not a long filename). Firmware files distributed for release will employ a file name that uses the following convention:

xxMMNNBB.hpb

In this convention, xx is “ev” for ATevo. MMNNBB represents the version where MM is the major version, NN the minor version and BB build (i.e., minor minor version). The version numbers are padded with a leading 0 for consistency. The extension “hpb” is an acronym for Hindle Power Binary.

Here are some firmware filename examples that use this convention:

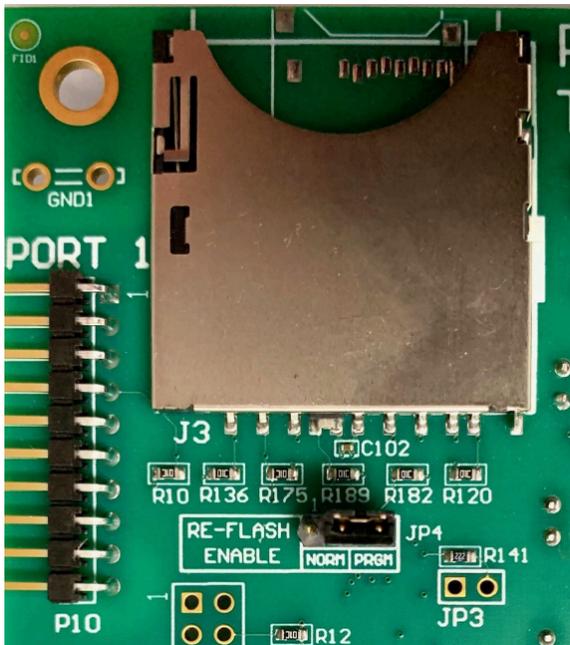
ATevo firmware filename examples

- ev020606.hpb – v2.6.6
- ev020502.hpb – v2.5.2

An SDHC memory card 32GB or less is required. The procedure can take up to 4.5 minutes to perform.

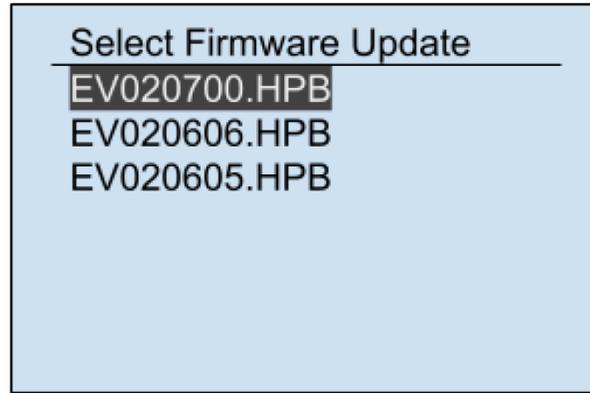
Update Procedure

1. Copy the firmware update file received from your supplier to the SD card using either a personal computer (PC) with an SD Memory Card slot, or a USB to SD Memory Card adapter.
2. Open the ATevo front panel door, and locate the SD Memory Card socket on the back of the Main Control Board (A1).
3. Insert the SD card into the SD Memory Card socket on the ATevo main board.
4. Directly below the socket will be a jumper JP4 (RE-FLASH ENABLE), as seen in the image below. Move the jumper to the PGM position.

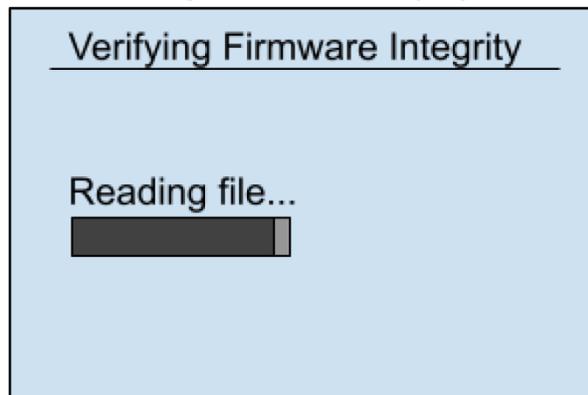


The SDHC card shown above is an adapter for a micro SD card which is also acceptable as long as its capacity is 32GB or less.

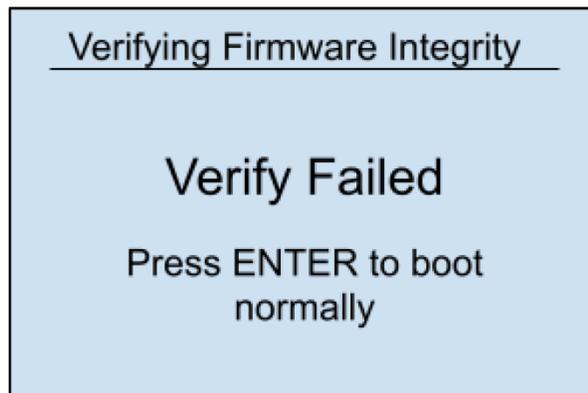
5. If the charger is already powered, press the RESET button on the main board, otherwise simply power the charger. The screen below will list all available firmware updates from the latest to the earliest. Use the UP/DOWN arrow keys to select the update to apply, then press ENTER.



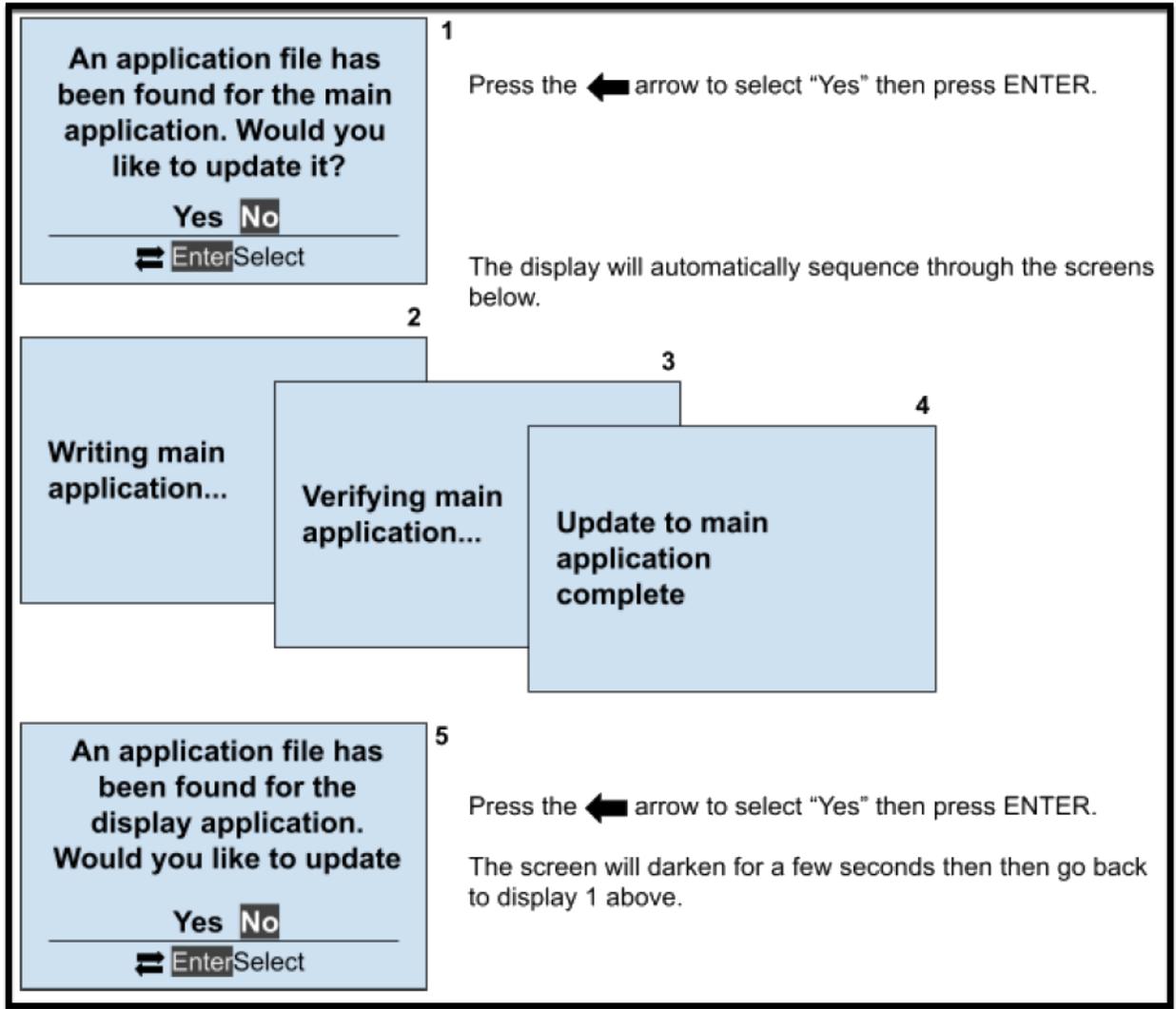
- 6. Navigate the "Update UI" screens explained below.
 - a. While firmware integrity is being checked, ensuring that none of the data has accidentally changed, the following screen will display.



- b. If the verify step fails, you will need to follow the instructions shown in the following screen.



- c. Once the verify step passes, update screens are the same as in previous versions. The sequence of screens and how to proceed is explained in the graphic below.



- Once the updated programming has been completed, move the jumper JP4 back to the NORM position as instructed on the screen below.

Move JP4 jumper back to "NORM" position then press ENTER

- Remove the memory card and press the RESET button.
- Verify the the new firmware is installed by observing the new version displayed on the splash screen.

Frequently Asked Questions (FAQs)

Q: Can an ATevo running firmware prior to v2.7.0 use the new file format?

A: No. If your ATevo runs firmware prior to v2.7.0, the manufacturer must supply you with the two old-format firmware upgrade files. You can reference [the previous topic](#) for more information.

Q: Does ATevo firmware v2.7.0 recognize the older file format? Is it possible to upgrade the firmware using the two old-format upgrade files?

A: Yes and yes. ATevo firmware v2.7.0 can be updated using the older, separate files. Support for the older file format will eventually be removed. At that time, the single file using the new format must be used.

Q: What if new and old format firmware files are on a memory card used to update an ATevo?

A: If the card is in an ATevo running v2.6.6 and prior, it will only recognize the older file types. An ATevo running 2.7.0 and later will first look for the newer file types (.HPB extension) and display a list to choose from. The update will be performed using one of those files if the user selects one. The older files will be ignored in this case. If the user presses ESC rather than choosing one of the new file types it will then check for the older file types. If they are found, the UI will offer to update using them.

Last modified: 3 August 2023

7. Alarms & Indicators

SECTION TOPICS
Legacy AT10.1 Alarms & Indicators
Common Alarm Indicator & Other Alarm Triggers
Alarm LED Summary Table
Viewing Alarms
Advanced Alarms
Resetting Latched Alarm Relays
Battery Open Test
AC Metering - optional
Battery Discharge Alarm / Meter - optional

Last modified: 8 September 2023

7.1. Legacy AT10.1 Alarms & Indicators

ATevo alarms can be divided into two (2) groups:

- Legacy AT10.1 Alarms
- Advanced Alarms (covered in [Section 7.5](#))

The Legacy Alarm group is a superset of the standard alarm group recommended by the NEMA-PE5 and IEEE standards for stationary battery chargers. These alarms have dedicated front panel LED indicators and are referred to as 'legacy' alarms since they have the same functionality as the standard alarms available on legacy AT10.1 and AT30 Series battery chargers.



The **GREEN** AC ON LED indicator, and the six (6) **RED** Legacy Alarm LED indicators are summarized in the table in [Section 7.3](#).

The table identifies:

- alarm active while LED is lit
- condition that is detected
- possible causes of the condition (where applicable)
- configurable set point that controls when alarm becomes active (where applicable), and section where such configuration is discussed
- relay which alarm activates

* All Legacy Alarms will activate the Common Alarm relay (as discussed in [Section 7.2](#)), thereby changing to the alarmed state after a configured time delay.

Alarms will also be reported by any installed optional protocol communications board and may also be configured to activate a discrete relay on optional Auxiliary I/O Boards. [Section 12.4](#) gives instructions on how to configure relays.

Last modified: 27 September 2023

7.2. Common Alarm Indicator & Other Alarm Triggers

The **RED** Common Alarm LED will illuminate when any ATevo alarm (legacy alarms and/or advanced alarms) is activated. With the exception of the six (6) legacy alarms mentioned in the previous section, advanced alarms do not have individual LED indicators.

When the Common Alarm LED is - by itself - illuminated, this indicates that one (1) or more of the advanced alarms are active. These advanced alarms are summarized in [Section 7.3](#).

When the Common Alarm is active, the Common Alarm relay on the Main Control Board will change to the alarmed state after a configured time delay. The Common Alarm will also be reported by any installed optional protocol communications board. It may also be configured to activate a discrete relay on optional Auxiliary I/O Boards (A4x). [Section 12.4](#) gives instructions on how to configure relays.

7.2.1 Configuring Common Alarm

By default, all ATevo alarms (when active) are configured to annunciate the Common Alarm. In some applications, it may be desirable to prevent alarm(s) from triggering the common. [Section 4.6](#) describes how any alarm can be individually removed from the list of alarms that, when active, will trigger a Common Alarm.

7.2.2 High Priority Alarm & Low Priority Alarm

The ATevo always had the user configurable “Common Alarm”. Beginning with v2.7.0 firmware which was released 5/3/2021, alarms named “High Priority Alarm” and “Low Priority Alarm” became available to a user who wishes to further customize alarm priority. These alarms can be configured to close a relay on an AUX I/O and are also readable over SCADA.

If your ATevo shipped with, or has been upgraded to v2.7.0+ firmware, you will see the ALARM TRIGGERS icon instead of the COMMON ALARM icon, and will be able to configure the triggers for these new alarms in the same menu that the common alarm is configured. This is described further in Appendix topic, [Firmware v2.7.0 Enhancements](#).

Last modified: 27 September 2023

7.3. Alarm LED Summary Table

The following table summarizes all alarm LEDs:

LED	Alarm Active	Condition Detected	Possible Cause(s)	Configurable Set Point	Relay Activated
AC ON	N/A	AC power present on AC Input Breaker (CB1) & breaker closed	N/A	N/A	N/A
High DC Voltage	High DC Voltage	DC bus voltage sensed by Main Control Board is higher than High DC Voltage alarm set point	Rectifier failure	High DC Alarm (V), Sect. 4.2	Common Alarm
Low DC Voltage	Low DC Voltage	DC bus voltage sensed by Main Control Board is lower than Low DC Voltage alarm set point	Rectifier failure, battery discharged, shorted DC bus	Low DC Alarm (V), Sect. 4.2	Common Alarm
DC Output Failure	DC Output Failure	Charger cannot support connected load, DC bus voltage is below desired set point voltage and charger is NOT in current limit	Improperly tapped AC input or defective rectifier	N/A	Common Alarm
AC Input Failure	AC Input Failure	AC input voltage is detected to be below 75% of nominal	Improperly tapped AC input or a missing phase	N/A	Common Alarm
Positive (+) Ground Fault	Positive (+) Ground Fault	Main Control Board (A1) senses leakage path from positive (+) DC bus to earth ground	Dirt or electrolyte on battery surface or connections	Positive (+) Ground Fault Sensitivity, Sect. 4.10	Common Alarm
Negative (-) Ground Fault	Negative (-) Ground Fault	Main Control Board (A1) senses leakage path from negative (-) DC bus to earth ground	Dirt or electrolyte on battery surface or connections	Negative (-) Ground Fault Sensitivity, Sect. 4.10	Common Alarm
Common Alarm	One or more	Any one (1) legacy alarm in previous six (6) rows, or	Any of above	Can set which Advanced	Common Alarm

	Legacy or Advanced Alarms	advanced alarms that do not have a dedicated LED		Alarms activate Common Alarm	
--	---------------------------	--	--	------------------------------	--

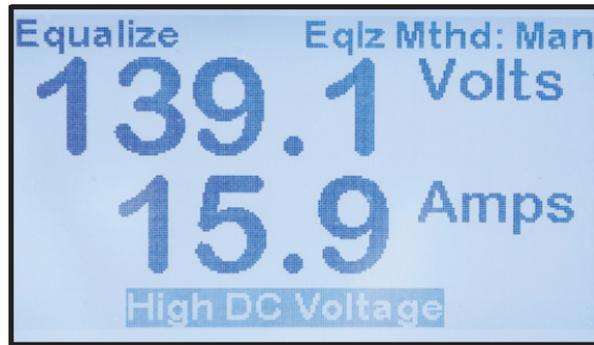
Last modified: 7 September 2023

7.4. Viewing Alarms

Alarms can be viewed in the three different ways:

7.4.1 Active Alarm Bar

The Active Alarm Bar is located at the bottom of the Home Screen.

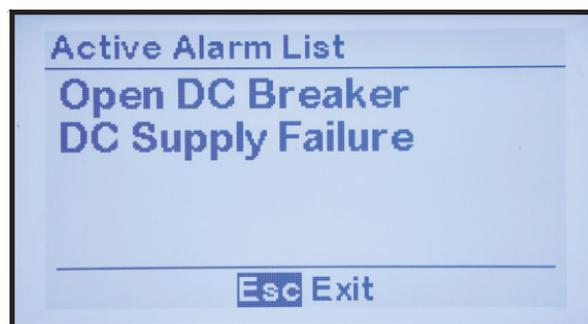


Key points regarding the Active Alarm Bar:

- It reports any and all active alarms, and is blank if there are none.
- If multiple alarms are active, it cycles through each alarm.

7.4.2 Active Alarm List

The Active Alarm List displays all active alarms. To view the Active Alarm List, press the ALARMS button.



The Active Alarm List can display up to four active alarms at once but it is scrollable to view any additional alarms present.

7.4.3 Alarm Logs

Alarms are system events that are stored in ATEvo's event log with a time and date stamp. The same is true for alarm clearing (return to non-alarm state). [Section 9](#) contains information on

event logs.

Last modified: 3 August 2023

7.5. Advanced Alarms

ATEvo alarms can be divided into two groups: Legacy ATEvo Alarms (described in [Section 7.1](#)) and Advanced Alarms (described below):

Advanced Alarms:

- Do not have dedicated LEDs to indicate when they are active.
- Illuminate the COMMON ALARM LED and activate the common alarm relay
- Appear on the Active Alarm Bar and Active Alarm List.
- Get stored in the event log along with the time and date they occur and clear.
- Will be reported by any installed optional protocol communications board.
- May be configured to activate a discrete relay on optional Auxiliary I/O Boards.

7.5.1 High Voltage Shutdown Alarm

This alarm is activated when ATEvo initiates a High Voltage Shutdown, provided that feature has been enabled. See [Section 4.3.2](#) for details. High Voltage Shutdown is initiated by the micro-controller when the dc bus voltage sensed by the Main Control Board (A1) is higher than the High DC Voltage set point for a minimum of thirty (30) seconds. [Section 5.2](#) describes High Voltage Shutdown in detail.

7.5.2 Low Level Detect Alarm

This alarm is activated when the dc bus voltage sensed by the Main Control Board (A1) is lower than the Low Level Detect set point. See [Section 4.3.4](#) for details. The Low Level Detect feature contains dedicated hardware, and operates independent of microprocessor control. The Low Level Detect is a true *failsafe* feature that activates the common alarm relay in response to a catastrophic failure, such as microprocessor failure. The Low Level Detect hardware will illuminate a dedicated LED located on the Main Control Board (A1) when alarm is active.



7.5.3 End of Discharge (EOD) Alarm

This alarm is activated when the dc bus voltage sensed by the Main Control Board (A1) is lower

than the End of Discharge Alarm set point. See [Section 4.11.2](#) for details.

✿ The End of Discharge alarm may be used to activate a battery disconnect contactor by mapping the alarm to a discrete relay of an optional Auxiliary I/O Board (A4).

7.5.4 High AC Ripple Alarm

This alarm is activated when the ac ripple voltage measured by the Main Control Board (A1) is higher than the Ripple Voltage Alarm set point. See [Section 4.3.5](#) for details.

7.5.5 Battery Temperature Probe Failure Alarm

This alarm is activated when the Main Control Board (A1) senses an out-of-range value from the battery temperature probe (A10). ATEvo will switch to non-temperature compensated mode, adjusting output voltage for 25 °C. Set points for this alarm are not adjustable.

7.5.6 Rectifier Over-Temperature Alarm

The Rectifier Over-Temperature alarm is activated when the Main Control Board (A1) senses that one or more of the SCRs are too hot. Set points for this alarm are not adjustable.

7.5.7 External Feedback Failure Alarm

This alarm is activated when the Main Control Board (A1) senses the (post-filtered) external voltage is out-of-range. The external voltage may be measured at the output breaker or at the battery if the remote sense option is connected. This failure typically indicates a problem with the voltage-sense resistors. Set points for this alarm are not adjustable.

7.5.8 Internal Feedback Failure Alarm

This alarm is activated when the Main Control Board (A1) senses the (pre-filtered) internal voltage is out-of-range. The internal voltage is always measured inside the ATEvo, before the dc output filter circuitry. This failure typically indicates a problem with the voltage-sense resistors. Set points for this alarm are not adjustable.

7.5.9 Open DC Breaker Alarm

This alarm is activated when the Main Control Board (A1) senses that the DC Output Circuit Breaker (CB2) is open. The set point for this alarm is not adjustable.

7.5.10 Open AC Breaker Alarm – optional

This alarm is activated when the Main Control Board (A1) senses that AC Input Circuit Breaker (CB1) is open. The set point for this alarm is not adjustable.

7.5.11 DC Power Supply Failure Alarm

This alarm is activated when the Main Control Board (A1) is not sensing power from its internal dc voltage source. ATevo is powered by both ac and dc sources. It uses the ac power source when one is available, but its dc source (P/S-9V) when there is no ac.

ATevo may be operating when this alarm is active, but it may fail when the ac power is removed. Set points for this alarm are not adjustable.

7.5.12 SCR Failure Alarm

This alarm is activated when the Main Control Board (A1) detects that the Rectifier Assembly (A6) is not working. This may indicate a defective SCR or issues with the SCR firing control or driver. Set points are not adjustable.

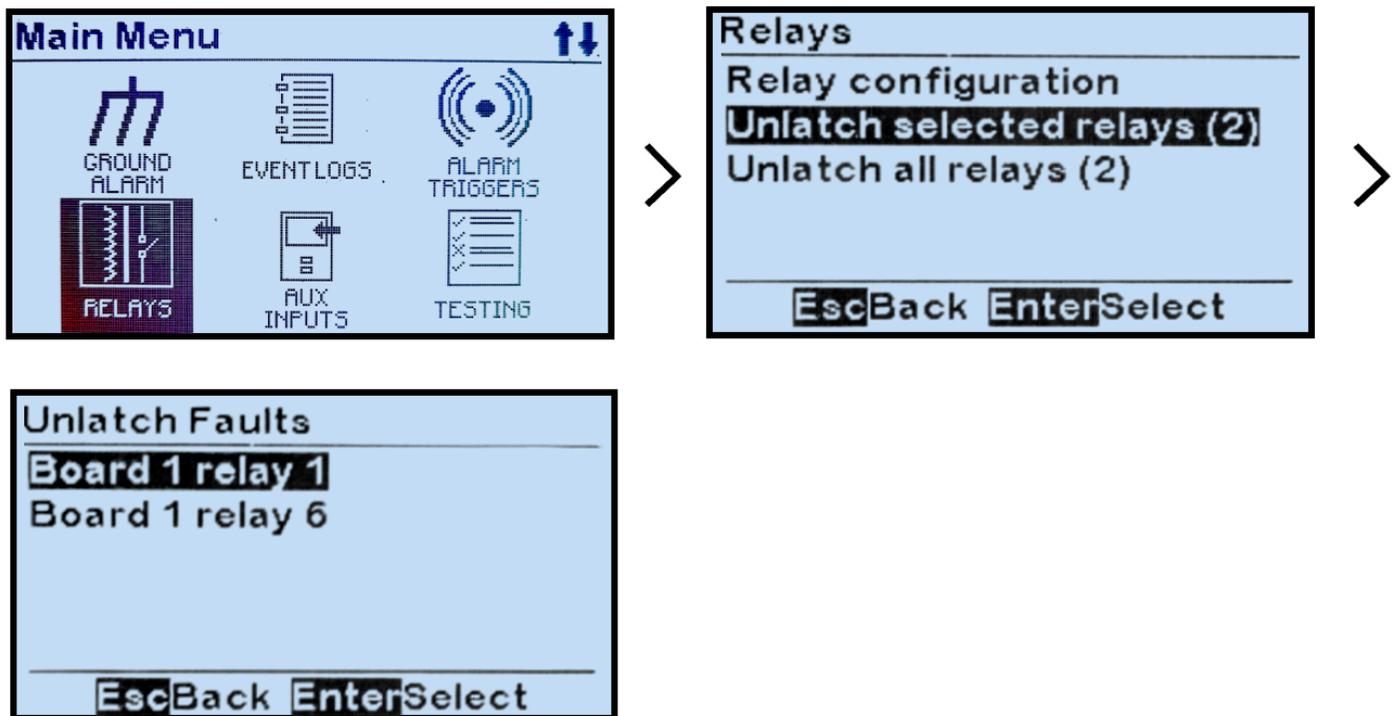
Last modified: 26 September 2023

7.6. Resetting Latched Alarm Relays

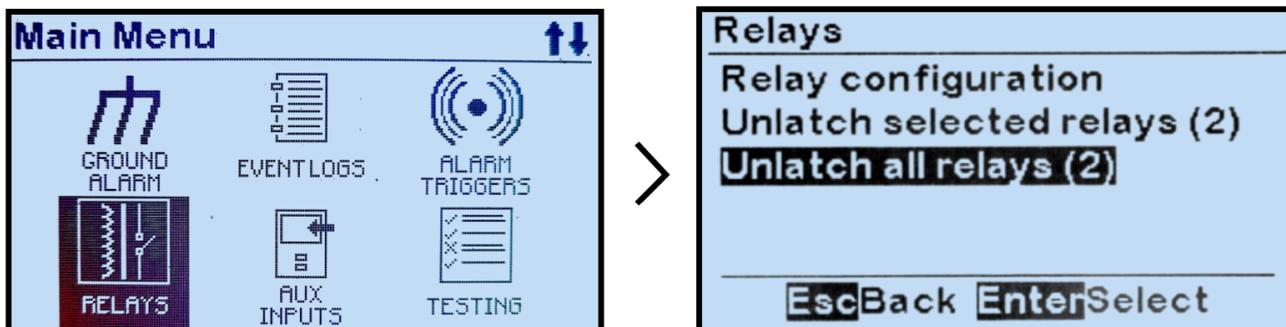
Latched alarm relays can be reset or cleared two (2) different ways.

- The Legacy ATevo method may be used by pressing and holding the UP arrow button for a few seconds. This will reset or clear all latched alarm relays. A brief confirmation message will display.
- Individual latched alarm relays or all latched alarm relays may also be reset via the RELAYS icon from the Main Menu.

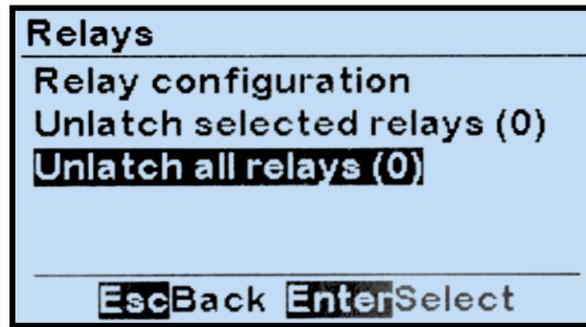
To reset an individual latched alarm relay: MENU > RELAYS > 'Unlatch selected relays' > select latched relay from list



To reset all latched alarm relays: MENU > RELAYS > 'Unlatch all relays (x)', where 'x' represents the number of presently latched relays.



After executing this command the number between '()' will change to '0' indicating all latched relays are cleared.



Last modified: 27 September 2023

7.7. Battery Open Test

The Battery Open Test feature will detect if the connection between the battery and ATevo has been lost, or if there is a weak or faulty battery. The test lowers the charger voltage and verifies whether the battery can assume the present dc load. This test can be run manually or according to a set schedule.

The Battery Open Test will fail if the dc bus drops below a configurable voltage set point. When such occurs the test aborts immediately and ATevo will raise output voltage back to the present Float or Equalize setting. Test duration is configurable as seen below.

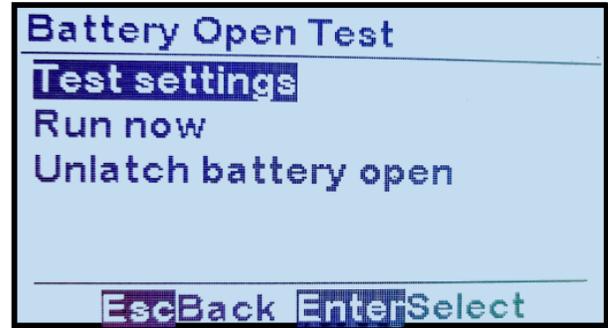
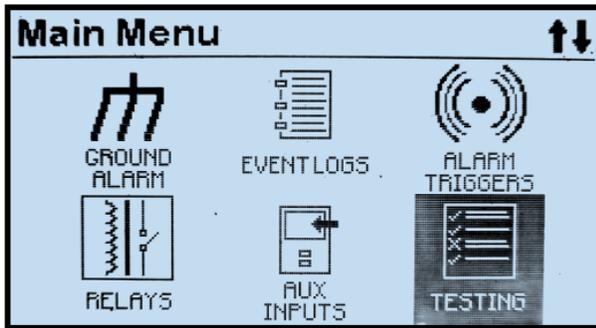
If the test fails, a Battery Open alarm is generated and can only be cleared by the Unlatch Battery Open Alarm control.

- [Battery Open Test Settings](#)
- [Running Battery Open Tests Periodically](#)
- [Running Battery Open Test Manually](#)
- [Resetting Battery Open Alarm](#)

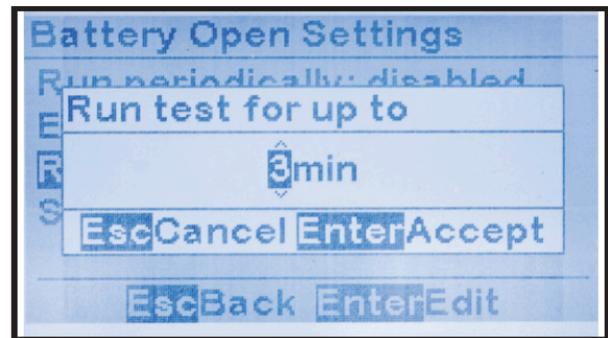
Last modified: 3 August 2023

7.7.1. Battery Open Test Settings

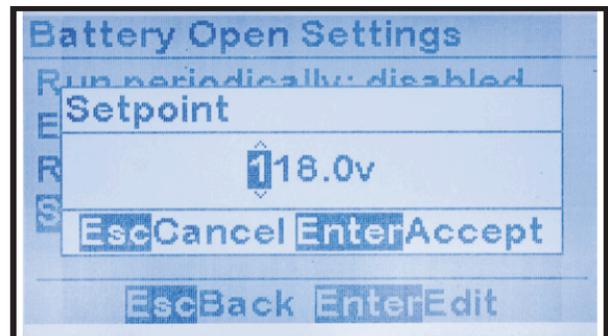
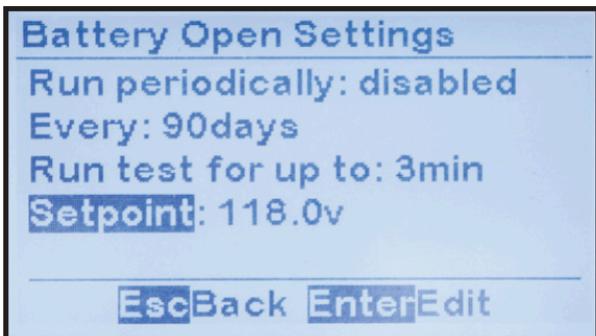
To access and configure Battery Open Test settings:
MENU > TESTING > 'Test Settings'



To configure test duration:
'Run test for up to:' > adjust duration



To configure the voltage set point at which to terminate the test if no battery is present:
'Setpoint' > adjust voltage

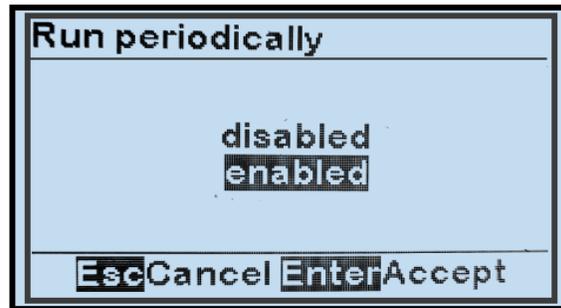
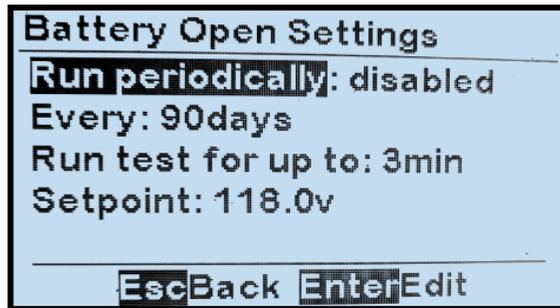
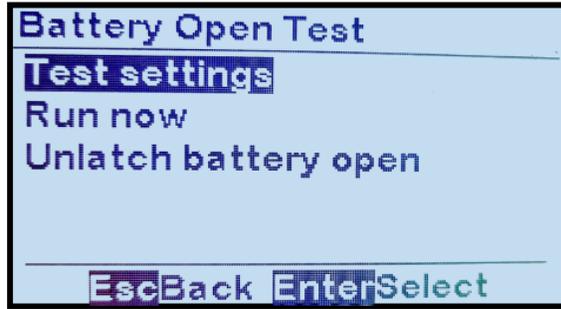
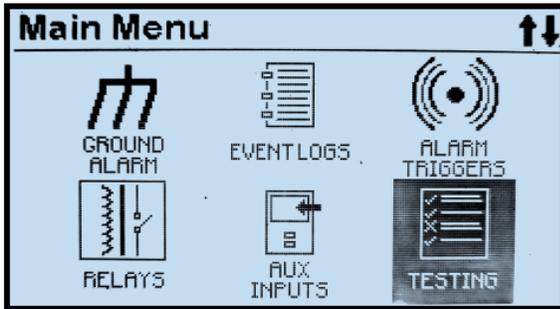


Last modified: 22 September 2023

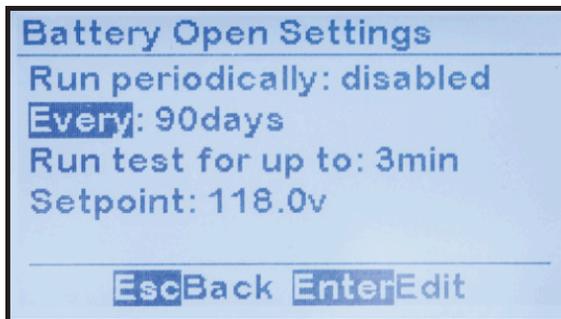
7.7.2. Running Battery Open Tests Periodically

To schedule periodic Battery Open Tests:

MENU > TESTING > 'Test Settings' > 'Run periodically:' > 'Enabled'



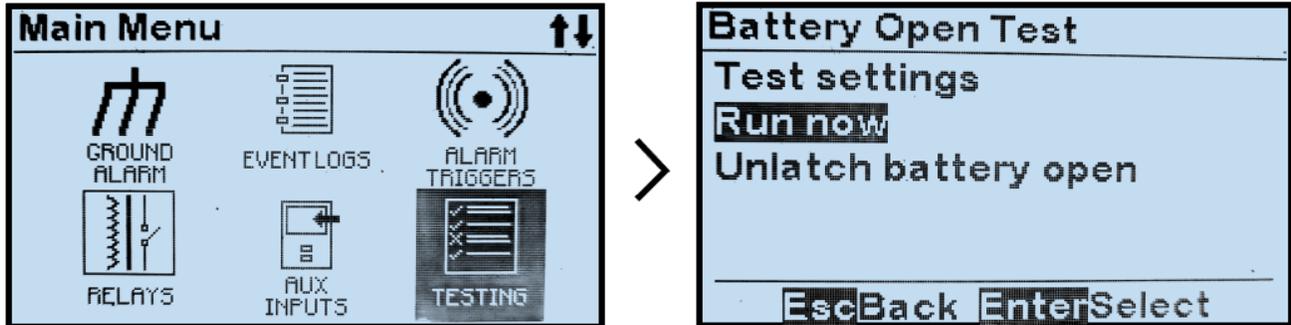
'Every:' > change desired digits



Last modified: 22 September 2023

7.7.3. Running Battery Open Test Manually

To run the Battery Open Test manually on demand:
MENU > TESTING > 'Run now'

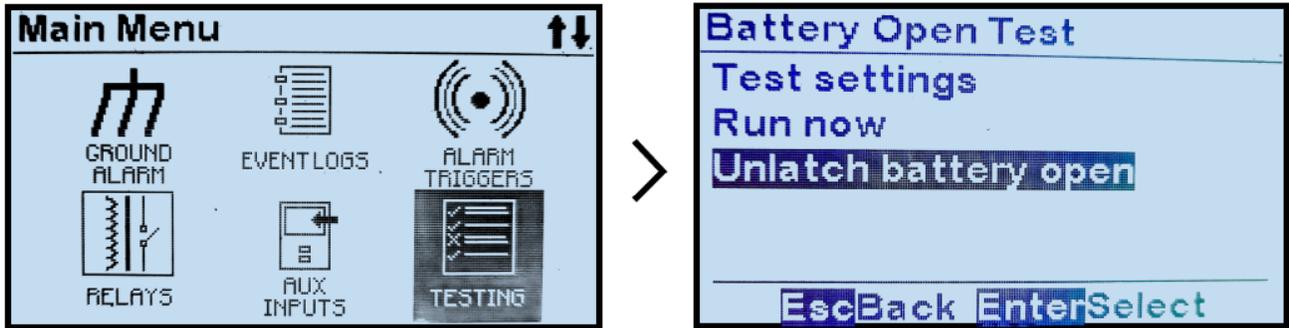


Last modified: 22 September 2023

7.7.4. Resetting Battery Open Alarm

If ATevo detects a battery open condition and the Battery Open Test alarm is activated, it can only be cleared by the Unlatch Battery Open Alarm control.

To initiate the Unlatch Battery Open Alarm control and reset the Battery Open Alarm:
MENU > TESTING > 'Unlatch battery open'



Last modified: 22 September 2023

7.8. AC Metering – optional

If an optional ac metering module is supplied with ATevo, voltage level(s) and current flow from the ac input power source can be measured. For further information regarding ATevo ac metering, refer to supplemental instructions ([JA5124-03](#)).

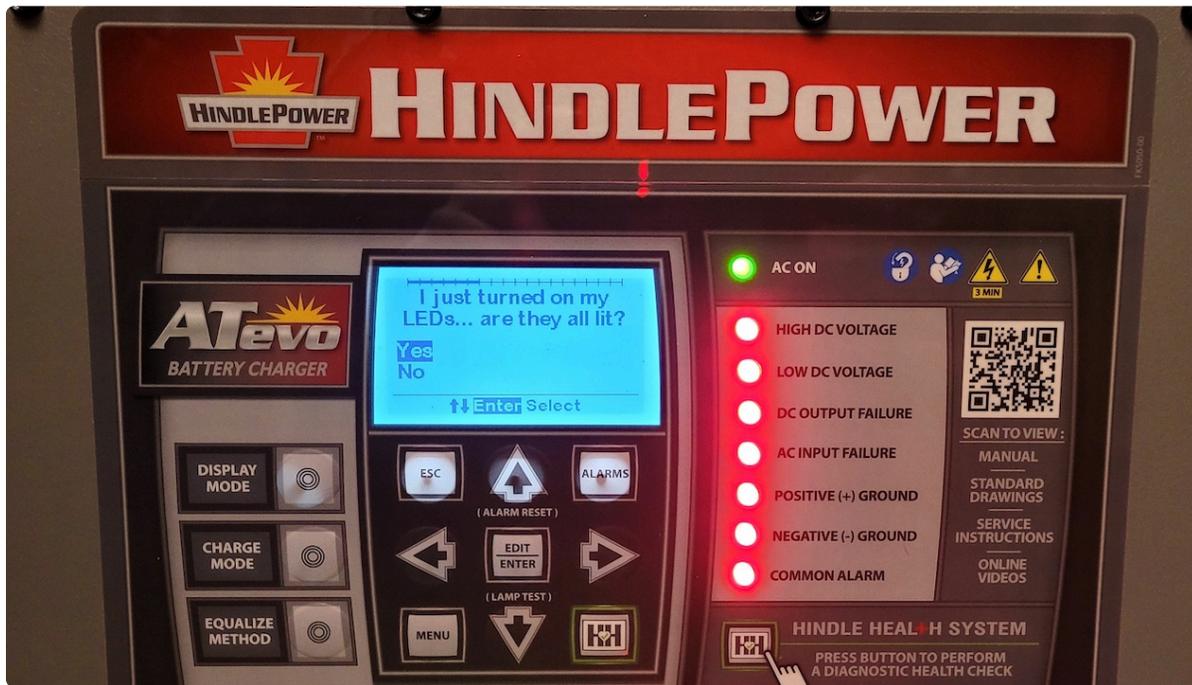
Last modified: 27 July 2023

7.9. Battery Discharge Alarm / Meter – optional

If an optional battery shunt is supplied with ATevo, current flow to and from the battery can be monitored. With this feature installed, the firmware logic can trigger a battery discharge alarm, and/or measure battery current (+/- Adc). For further information regarding ATevo battery shunt, refer to supplemental instructions ([JA5124-07](#))

Last modified: 27 July 2023

8. Hindle Health System



SECTION TOPICS
Hindle Health System - Overview
Hindle Health System - Components
Hindle Health System - Screens
Hindle Health+ - Optional

Last modified: 27 September 2023

8.1. Hindle Health System – Overview

Overview

The Hindle Health System (HHS) is a powerful, user friendly, standard feature that tests and reports on ATevo's operational health. Some portions of the HHS continuously run in the background. Other parts require user intervention.

Last modified: 27 July 2023

8.2. Hindle Health System – Components

The Hindle Health System is composed of four (4) major components:

- Self-Diagnostics utility running in the background
- Hindle Health Button
- Hindle Health LEDs
- Hindle Health Screens

8.2.1 Self-Diagnostics Utility (runs in background)

ATevo microprocessors continuously run utilities that check hardware component operation including: memory, communications interfaces, parameters, and discrete devices such as relays.

They also test that all input values and measurements are within tolerance of reasonable ranges. Some critical parameters such as dc voltage and dc current are sampled by multiple processors and have redundant qualification requirements. Any errors detected are reported immediately by alarms and/or status updates. The utilities provide possible causes and proposed solutions to resolve issues found.

8.2.2 Hindle Health Button



The Hindle Health Button is on the lower-right corner of the control panel overlay. When pressed, it starts the user-assisted portion of the Hindle Health System. This process will check areas of the battery charger that the continuous self-diagnostics cannot. For example, ATevo cannot test a relay's performance without forcing it to change state. The user will be guided through the test procedure via the Hindle Health Screens described later in this Section.

8.2.3 Hindle Health LED Indicators

Hindle Health LED Indicators are at the bottom of the front panel overlay.

- **GREEN LED**, when lit, indicates ATevo is healthy.
- **RED LED**, when lit, indicates ATevo has an issue. Urgency of action required depends upon if it is:
 - **Blinking** – Immediately replace Main Ctrl Board (A1). There is a critical failure of the microprocessor driving the display and front panel controls. LCD display may be blank, frozen, or displaying corrupted data. Core microprocessor responsible for charging the battery may still be operational.
 - **Solid** – ATevo requires attention, but the condition is not critical. In most cases, LCD display will operate and be able to report the issue and give instructions on how to

resolve it. RED LED is illuminated when ATevo detects any error condition, when any alarm is active, or when the Hindle Health System detects any non-normal operating condition.

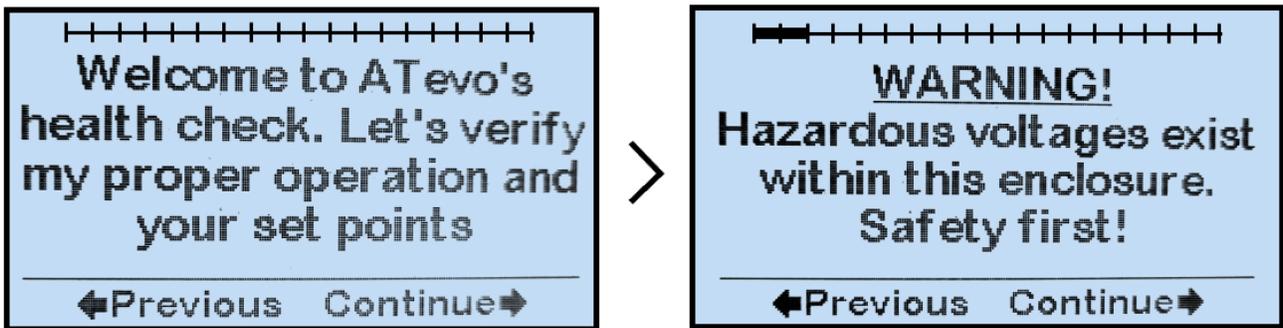
Last modified: 26 September 2023

8.3. Hindle Health System – Screens

Hindle Health System screens allow the user to test ATevo to ensure it is operating correctly. Screens permit the user to simulate alarm conditions, check set points and parameters, exercise relays, and verify indicators are working as designed. Step-by-step guidance is provided through the testing process. To start the Hindle Health System, press the Hindle Health Button.

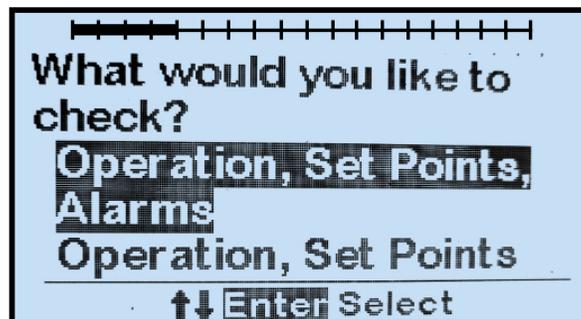
8.3.1 Introduction & Warning Screens

The first few health screens inform the user of how to navigate through the testing process and how to track progress. The next screens warn about any hazardous conditions and identify any tools required. To exit testing at any point, press ESC.



8.3.2 Test Selection

After the initial introduction and safety screens, a screen prompts the user to select the tests to run.



There are two (2) test selections. The second will not test alarms or relays:

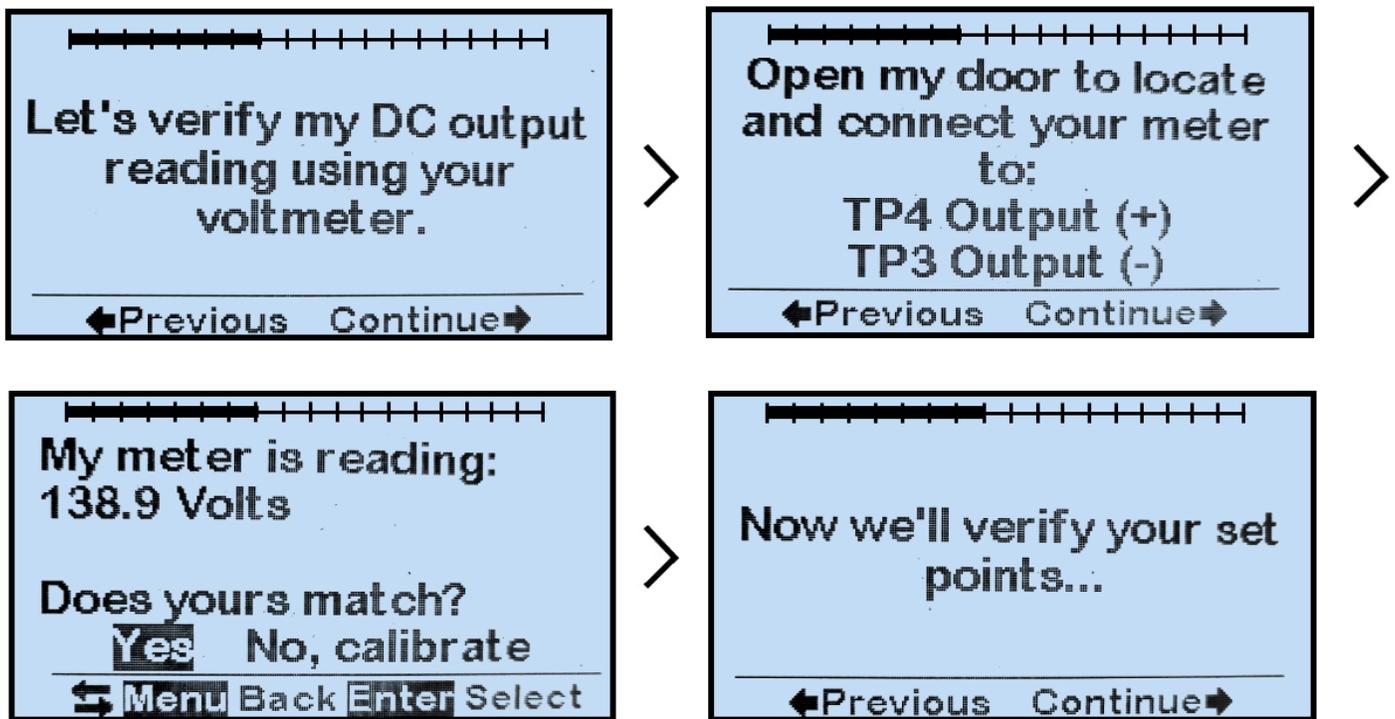
- Operation, Set points, Alarms

- Operation, Set points

8.3.3 Test Screens

The remaining screens are test screens. They prompt the user through an interactive process to verify ATevo’s operation. The process will:

- Require the user to confirm that LED indicators are lit, that relays change state, and that the set points are correct.
- Simulate alarm conditions and prompt the user to verify the alarms operate and are confirmed by any connected SCADA devices.
- Explain how to verify ATevo calibration and automatically enter calibration mode if required.



After the Hindle Health System completes testing, ATevo will return to the Home Screen. An event will be added to the log file along with a time and date stamp. The results of each test are included in the log file. The result status will indicate that each test PASSED, FAILED, or was NOT RUN. The resulting log file can be used to prove NERC compliance requirements for things such as verifying correct float voltage.

Last modified: 27 September 2023

8.4. Hindle Health+ – optional

Unrelated to the Hindle Health System, ATevo can also communicate with an optional external dc 'smart shunt' (p/n EJ5178-00). This provides remote battery monitoring. For further details, refer to supplemental HindleHealth+ user instructions ([JA5136-00](#)).

Last modified: 27 July 2023

9. Event Logs

Health Log

Test: LED Test
Date: 2005-02-15
Time: 09:27:51
Result: pass

 Next/Prev  Back

Event Log 

Date: 2017-01-25
Time: 15:37:35
Event: Charger mode set to Float

Event 1029 of 1030

SECTION TOPICS
Event Log Types
Viewing Event Log
Viewing Hindle Health Log
Clearing Event Logs
Copying Event Logs to SD Memory Card

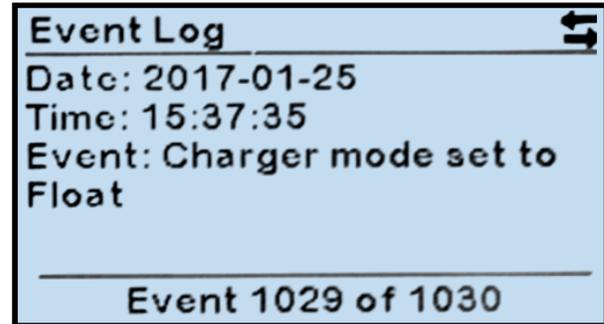
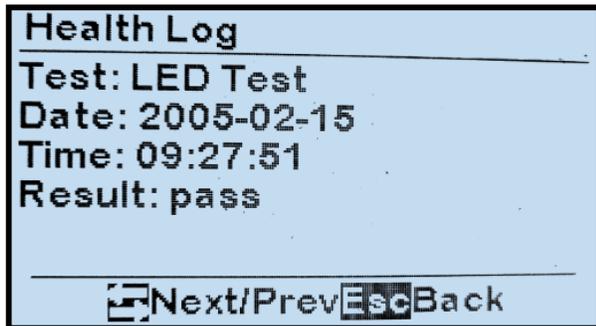
Last modified: 27 September 2023

9.1. Event Log Types

Event Logging is accessed via the EVENT LOG Main Menu.

There are two (2) event logs.

- Hindle Health events
- All other events



In addition to the logs, there are two (2) controls associated with event logging:

- Clearing the event log
- Saving the event log to SD memory card.

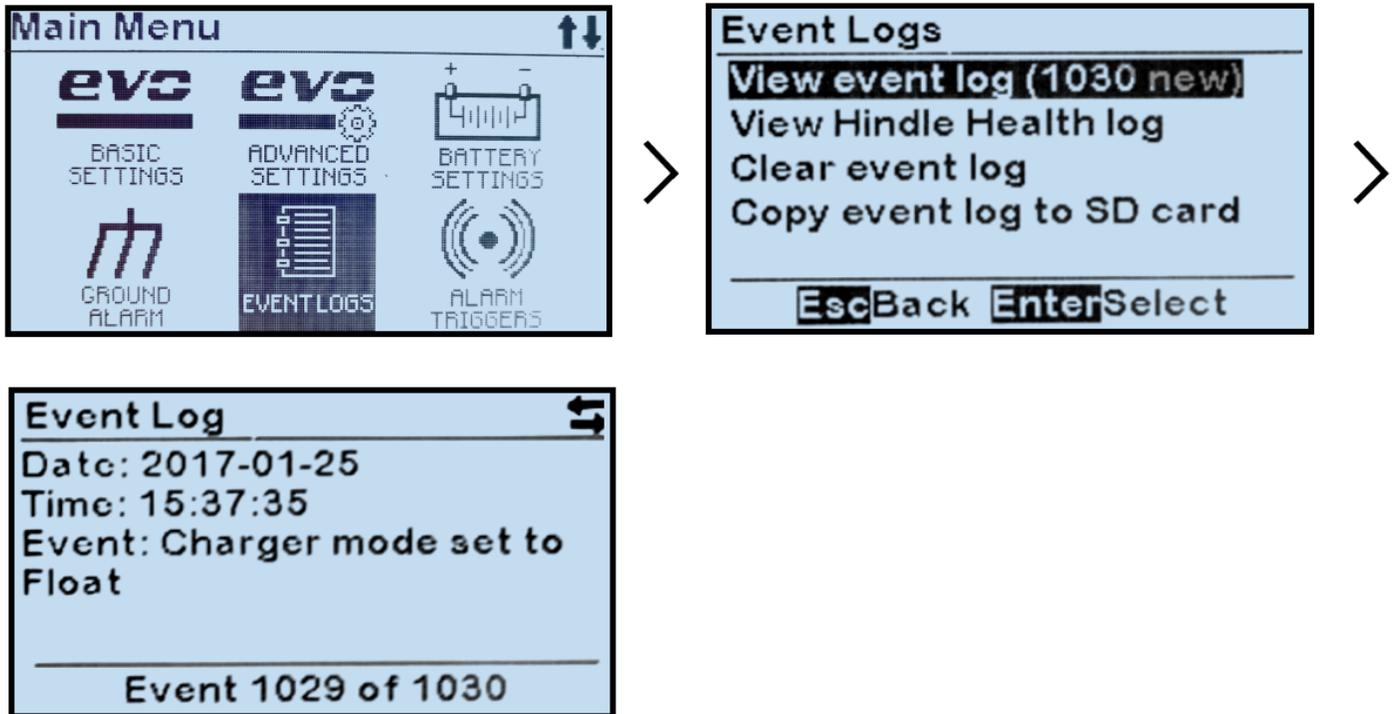
Last modified: 26 September 2023

9.2. Viewing Event Log

To view the event log:

MENU > EVENT LOGS > 'View event log (X)'.

The number of new events since the log was last read are in the '()'.



The most recent event stored will appear, but you can scroll through events with the RIGHT/LEFT arrows. Events include set point changes, and when an alarm becomes active and when the alarm is cleared. The log will show the date and time the event occurred, the event name, and the status change that created the event.

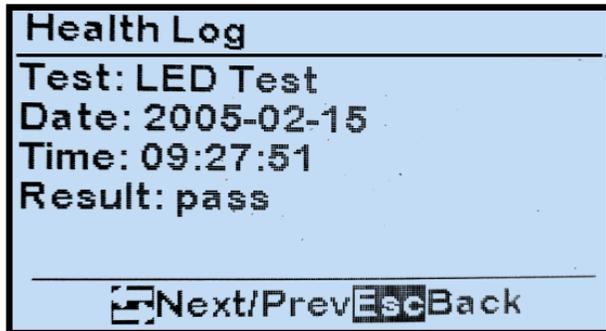
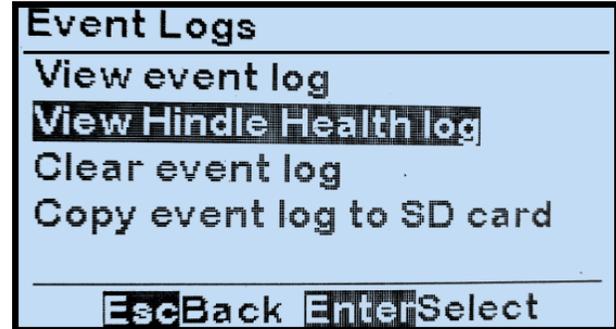
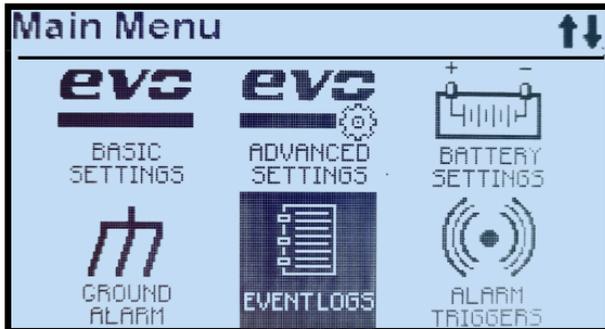
For more information on the alarms listed in the charger event log, see [Section 7](#).

Last modified: 26 September 2023

9.3. Viewing Hindle Health Log

To view the Hindle Health log:

MENU > EVENT LOGS > 'View Hindle Health log'



The most recent event or test stored will appear, but you can scroll through them with the RIGHT/LEFT arrows. The log will show the date and time the event occurred, the event name, and the pass or fail status of the test.

Last modified: 27 September 2023

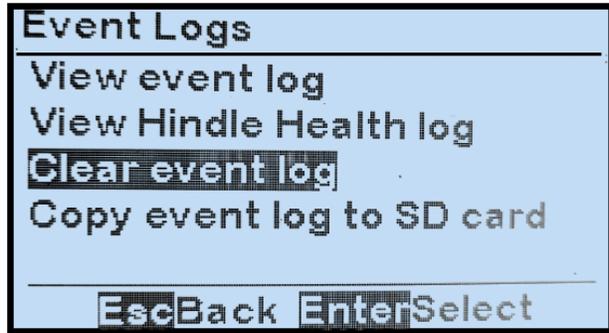
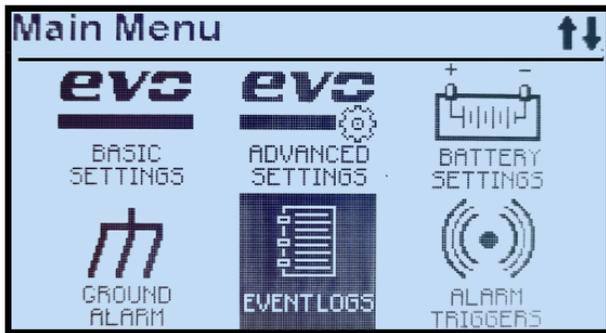
9.4. Clearing Event Logs

! All stored event history will be deleted. It is strongly recommended that you transfer a copy of the event logs to the SD memory card prior to deleting the event logs or all of the event history will be lost.

Event logs are stored in internal nonvolatile memory on the Main Control Board (A1). They can be erased by selecting 'Clear Event Log' which will clear both the Event Log and the Hindle Health Log.

To clear the logs:

MENU > EVENT LOGS > 'Clear event log' > 'Yes' to confirm



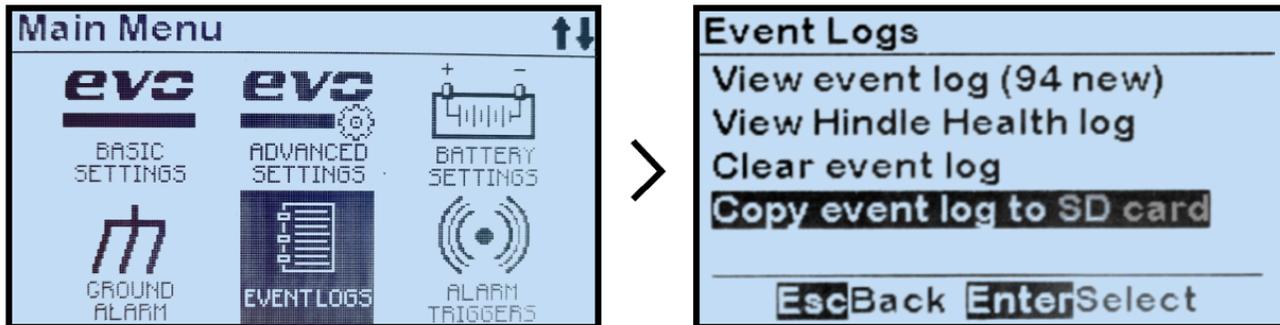
Last modified: 27 September 2023

9.5. Copying Event Logs to SD Memory Card

Event logs can be copied to a removable SD memory card located on the Main Control Board (A1). They will be stored in a standard ASCII text file format that can be read by most Personal Computers (with a USB adapter) or other similar devices.

To copy event log files to SD memory card:

MENU > EVENT LOGS > 'Copy event log to SD Card'.



The log files are now stored on SD memory card. If no card is present in ATevo, an error message will appear.

Last modified: 27 September 2023

10. Battery Temperature Compensation

SECTION TOPICS

[ATevo Battery Temperature Compensation](#)

[Installing the TempCo Option](#)

[Using the TempCo Option](#)

[Temperature Compensation Curves](#)

Last modified: 1 August 2023

10.1. ATevo Battery Temperature Compensation

Battery manufacturers specify recommended float and equalize voltages at 25 °C (77 °F) for their product. Temperatures above or below the *nominal* 25 °C require a slightly lower or higher voltages (respectively), in order to prolong battery life and ensure reliable operation. The ATevo Battery Temperature Compensation (or TempCo) option automatically adjusts the charger's dc output voltage, based upon battery temperature. In addition to the voltage compensation feature, the battery probe also allows ATevo to provide battery temperature monitoring, and a battery over-temp alarm.

The ATevo TempCo option (ordering p/n EJ5304-##) consists of a bagged kit, including a Battery Temperature Probe (A10), and a signal cable to connect the probe to the ATevo. The A10 probe contains a temperature-dependent resistor in an epoxy module, that is installed on (or near) the battery. The TempCo option can be purchased with ATevo, or field installed later.

The bagged TempCo accessory also contains a separate user Installation & Operating Instructions (p/n [JA5015-51](#)). An abbreviated version of that text is listed in the following sections.

Last modified: 3 August 2023

10.2. Installing the TempCo Option

In overview, there are four (4) stages. The full detailed procedure is found below:

- Mount probe assembly (A10) on or near battery.
- Install interconnection cable from probe assembly to ATevo.
- Wire charger-end of cable to ATevo Power Board (A2-TB8).
- Configure ATevo to recognize the TempCo option.

The TempCo probe (A10), or 'puck', is the same for all battery types and all ATevo models, regardless of dc output voltage. TempCo accessory kits (p/n EJ5304-##) differ, depending on cable length (25ft, 50ft, 100ft, etc.).

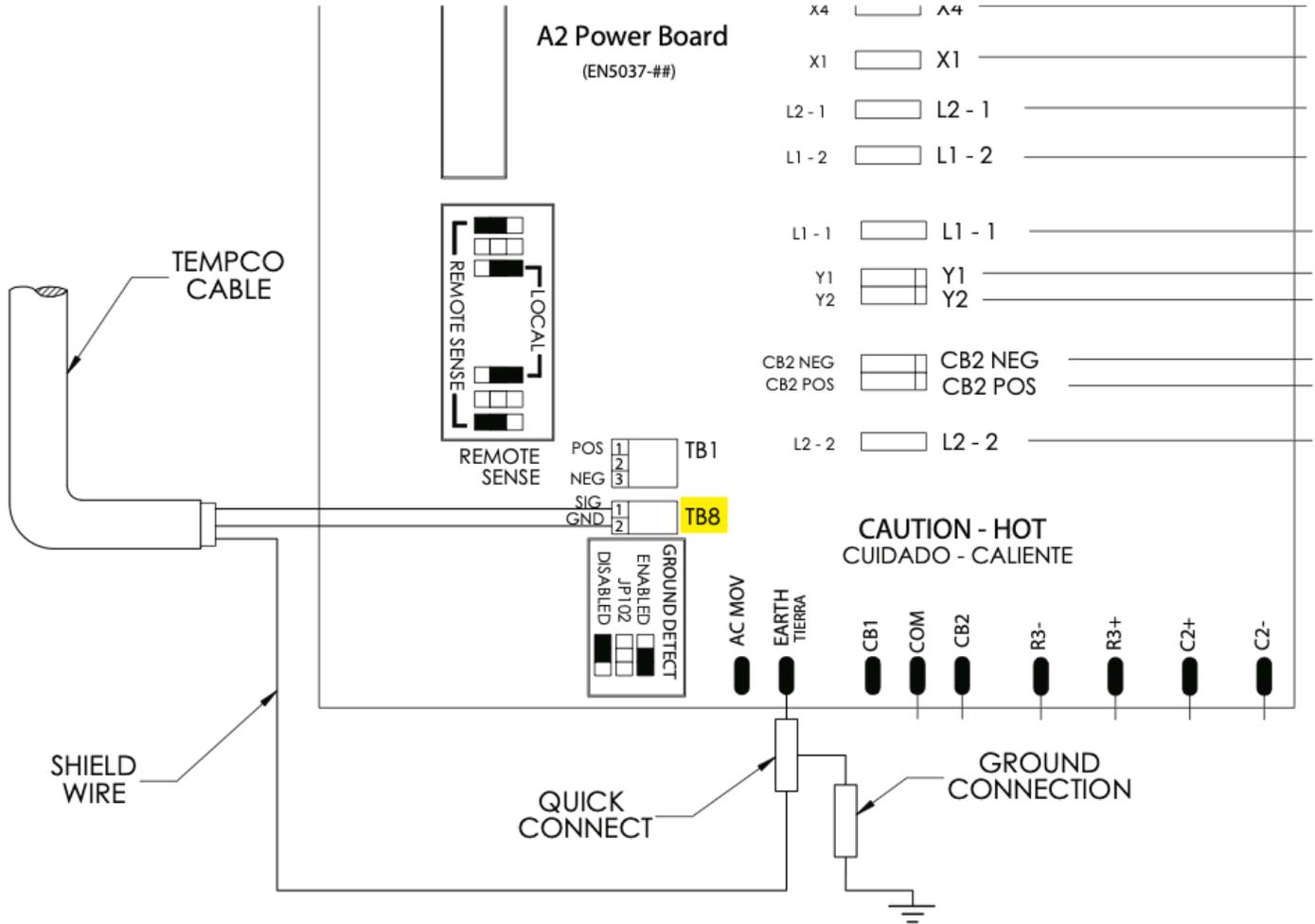
PROCEDURE

1. Turn off (open) both ATevo front panel breakers (CB1/CB2).
2. De-energize and lock out all ac and dc voltages to ATevo.
3. Allow internal voltage potentials to dissipate.
4. Remove safety shield and verify no hazardous voltages are present with a voltmeter.
5. At the battery location, mount the probe (A10) on a clean, dry surface on or as close to battery as possible.

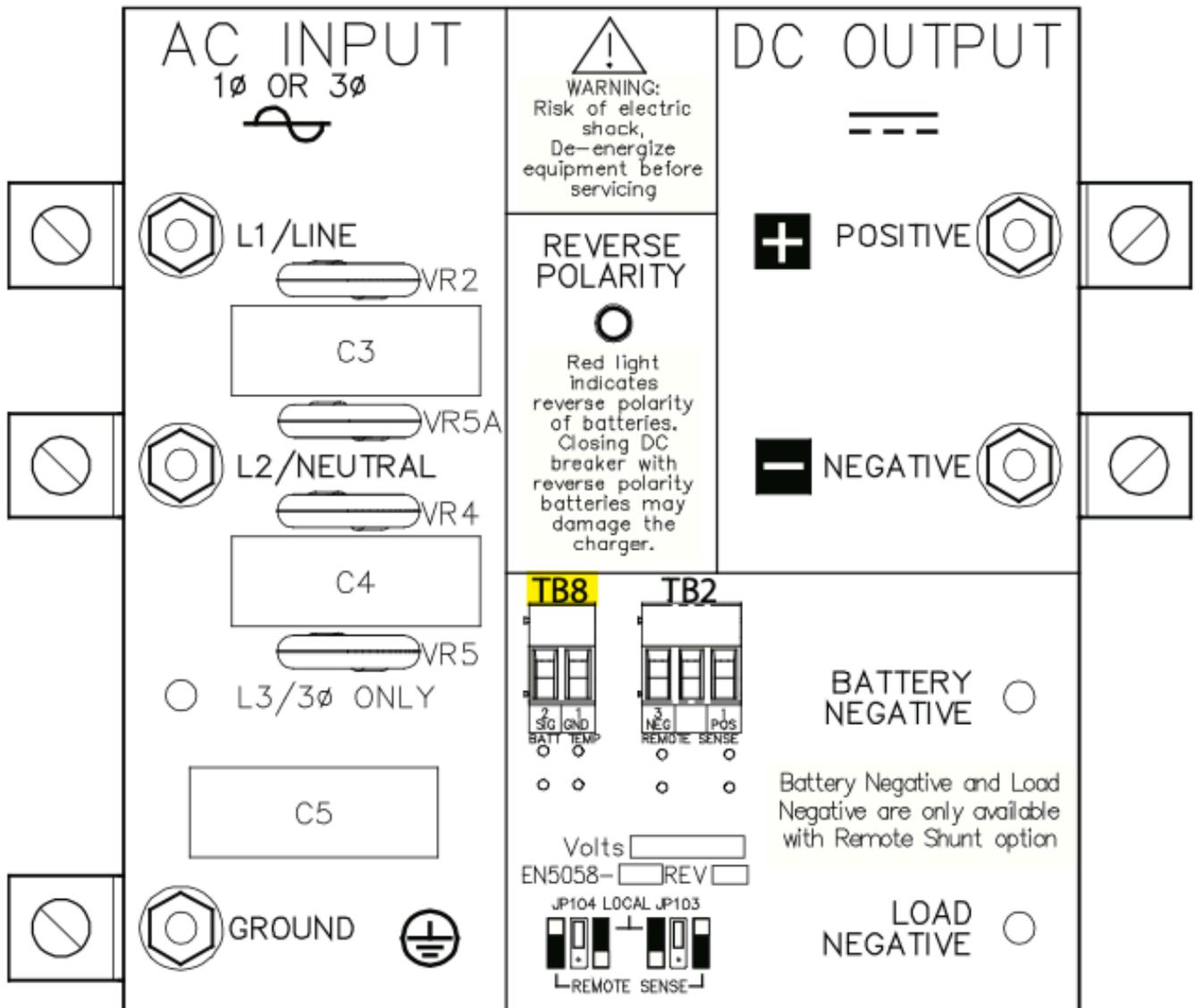
! Do NOT mount probe on: unpainted wood, bare galvanized metal, or plastic surfaces. Consult battery manufacturer for mounting restrictions and adhesive compatibilities.

6. To apply probe, clean mounting surface with isopropyl alcohol and dry thoroughly.
7. Remove protective backing from double-faced adhesive tape on probe.
8. Press adhesive onto surface.
9. Install supplied cable:
 - Route end of cable that has two (2) stripped wires and a quick-connect terminal to the inside of ATevo enclosure.
 - Leave 30in / 762mm of cable inside enclosure.
 - Run cable through a conduit that does not contain power wiring.
 - Route other end of cable to probe at the battery.
 - Coil up excess cable.
 - Make sure all wiring conforms to NEC, local, and site requirements
10. Route the interconnection cable to ATevo signal terminal block (TB8) marked 'BATT TEMP' as shown in the images below:

Style-5054



Style-5070



11. Connect the TempCo cable to ATevo.

- Locate TB8 and insert one (1) of the stripped wires from the twisted pair into each position of terminal block (A2-TB8). Connection Points are not polarity sensitive.
- Locate the EARTH quick-connect terminal. Carefully pull off the quick-connect terminal and wire from the EARTH terminal.
- Plug the quick-connect terminal attached to the end of the TempCo cable’s shield wire onto the Power Board’s EARTH terminal.
- Connect the quick-connect terminal removed from the EARTH terminal to the Piggy Back terminal on the end of the TempCo cable’s shield wire.
- Fasten the TempCo cable to existing wire harness with plastic wire ties.

12. At the battery, connect the quick-connect terminals to the TempCo probe (A10).

Connection points are not polarity sensitive.

13. Coil up and wire-tie any excess wire to prevent damage.
14. Confirm that:
 - All connections are secure.
 - Both the TempCo shield and the original ground wire are connected to the EARTH quick-connect terminal (A2-EARTH).
 - The twisted-pair wires of the TempCo cable are connected to the 2-position terminal block on the Power Board (A2-TB8).
15. Replace the safety shield and close the front panel door.
16. Restart the ATevo.

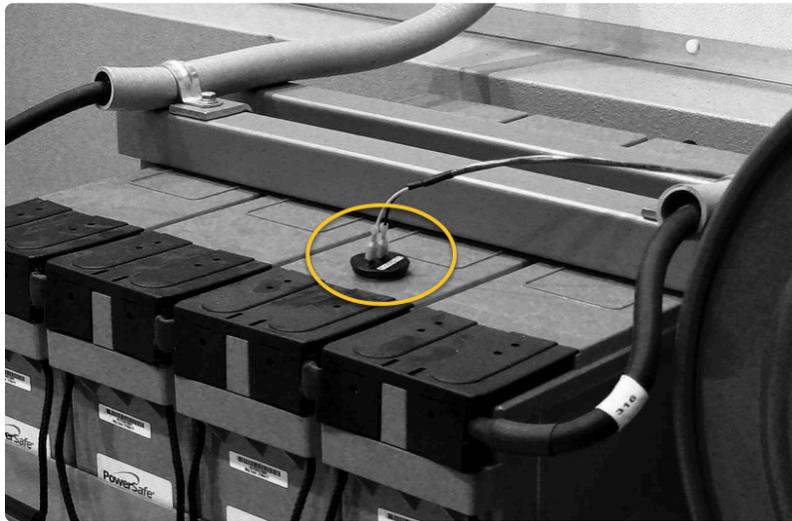
10.2.1 Configuring the TempCo Option

ATevo will need to be configured to enable the TempCo probe (A10) and to select the battery type. Refer to [Section 4.11 Configuring Battery Settings](#) for both.

Last modified: 12 September 2023

10.3. Using the TempCo Option

When ATevo is equipped with a temperature compensation probe, it auto-adjusts output voltage applied to the battery to keep float current constant, thereby avoiding overcharging and undercharging.



The probe senses battery temperature variation and adjusts output float/equalize voltages to compensate. If battery temperature increases, ATevo's output voltage decreases. If you are experiencing any inconsistencies in ATevo when the probe is installed, temporarily disable the TempCo Option per [Section 4.11](#).

NOTES

- Set Float Voltage and Equalize Voltage to the values recommended by the battery manufacturer for 77 °F / 25 °C.
- When you enter or adjust Float or Equalize voltage, the front panel meter displays the 77 °F / 25 °C value, even if the battery is warmer or cooler than 77 °F / 25 °C.
- ATevo's actual output voltage may be different from the set point, if the battery is warmer or cooler than 77 °F / 25 °C.
- Use a digital multi-meter to measure the actual dc output voltage. Determine temperature at the compensation probe, and use the graph in [Section 10.4](#) to verify that output voltage is correct.
- If battery temperature falls below 32 °F / 0 °C, there will be no further increase in ATevo output voltage. Likewise, if battery temperature rises above 122 °F / 50 °C, there will be no further decrease in output voltage.

10.3.1. HOME Screen with TempCo Option

Additional parameters appear on the HOME SCREEN when the TempCo option is installed and enabled.

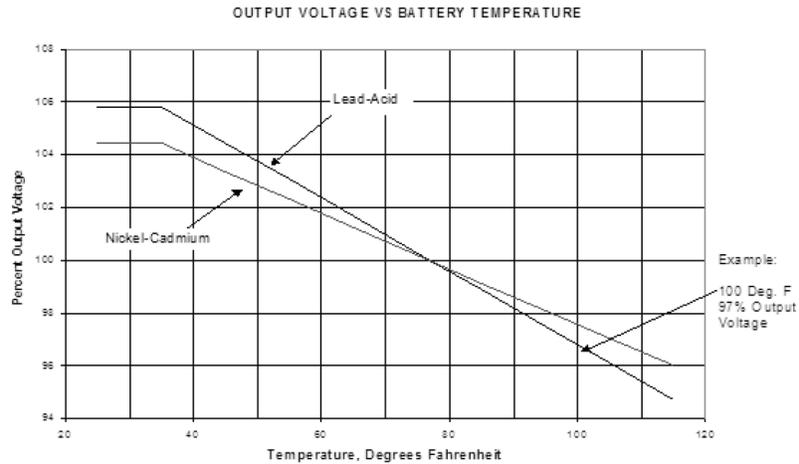
- The LARGE FONT voltage value is the actual charger output voltage, compensated for the present battery temperature.
- Present battery temperature (in °C) appears in small font to the right of the actual charger voltage.
- The charger set point voltage (at 25 °C) appears in small font directly below the present battery temperature.



Last modified: 27 September 2023

10.4. Temperature Compensation Curves

The following graph depicts the dc voltage correction applied to ATevo output based on battery temperature sensed by the TempCo probe (A10).



EXAMPLE

Suppose you are dealing with a lead-acid battery whose temperature is 100 °F / 37.8 °C. As shown on the graph, the dc output voltage should be approximately 97% of the 77 °F voltage. If the float voltage is set on the front panel to 132 Vdc, the actual output voltage will be:
 $132 \times 0.97 = 128 \text{ Vdc}$

Last modified: 27 September 2023

11. Remote Sense

SECTION TOPICS
ATevo Remote Voltage Sense
Remote Sense Connection
Procedure for Wiring Remote Sense
Configuring Remote Sense Jumpers
Disabling Remote Sense
Enabling Remote Sense Compensation

Last modified: 2 August 2023

11.1. ATevo Remote Voltage Sense

ATevo regulates dc output voltage as measured at the charger's output connection (CB2+/-). The Remote Voltage Sense feature permits ATevo to monitor and regulate the dc output voltage at the battery. This feature is useful when long battery cables, causing resistive voltage-drop, connect ATevo to the battery. All ATevo chargers can be wired to utilize this feature.

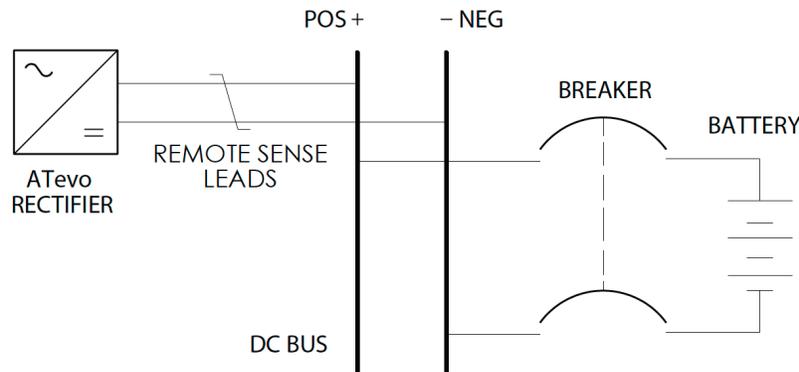
Last modified: 1 August 2023

11.2. Remote Sense Connection

Remote sensing:

- Compensates for voltage drop in dc wiring between ATevo and the battery.
- Directly monitors battery or dc bus voltage. The front panel meter displays actual voltage at the battery or dc bus.

SCHEMATIC



To wire ATevo for remote sensing, install twisted-pair cabling from the remote sense terminals to the battery terminals or dc bus. ATevo control circuitry measures dc voltage at the battery terminals and controls charger output to maintain battery voltage at the desired float or equalize voltage.

CAUTION

ATevo cannot protect against short circuits in remote sense wiring. Install a 1.0A fuse at the battery or dc bus end of each remote sense cable.

Last modified: 27 September 2023

11.3. Procedure for Wiring Remote Sense

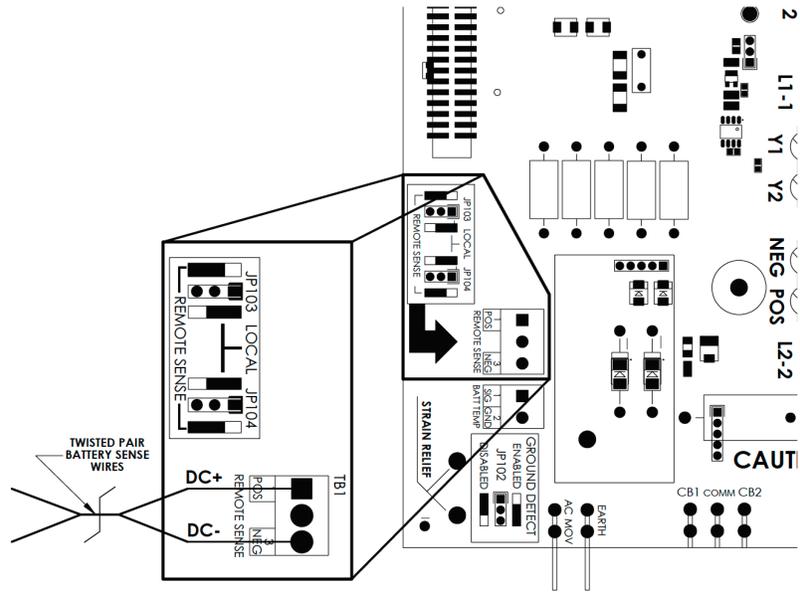
Route twisted-pair cable between the battery and ATevo. Make the connections listed below before moving the Remote Sense enable jumpers to enable the Remote Sense.

Preparation:

- Open both front panel breakers (CB1/CB2).
- De-energize and lock out all ac and dc voltages to ATevo.
- Allow internal voltages to dissipate.
- Use #16 AWG twisted-pair wire, of appropriate length to reach from the battery to ATevo.
- Designate, or label, one (1) wire of twisted pair as 'DC(+)'.
- Designate the other wire of the twisted pair as 'DC(-)'.
- Route one (1) end of the twisted pair remote sense wiring to BATTERY, at the desired battery sense location.
- Open ATevo front panel door, and remove safety shield.
- Verify no hazardous voltages are present with a voltmeter.
- Locate Remote Sense terminal block inside ATevo:
 - Style-5054: on bottom-front of Power Board (A2-TB1)
 - Style-5070: on center-front of I/O panel, next to BATT TEMP
- Route other end of twisted pair wiring to Remote Sense terminal block.

Wiring

- Connect wire from twisted-pair designated as 'DC(+)' to POS (positive) terminal of REMOTE SENSE (TB1).
- Connect wire designated as 'DC(-)' to NEG (negative) terminal of TB1.
- Observing correct polarity, connect battery end of 'DC(+)' wire to a positive (+) sense location on the battery.
- Confirm polarity, and connect battery end of 'DC(-)' wire to a negative(-) sense location on the battery.
- Verify polarity of POS and NEG battery connections.
- DO NOT energize ATevo until you configure Remote Sense jumpers per [Section 11.4](#).
- After Remote Sense Jumpers have been correctly configured, replace the safety shield and re-energize ATevo.



Notes

- Maximum current is 150mA.
- Run the twisted-pair cable with the sense leads in a dedicated conduit.
- Fuse each of the sense wires.

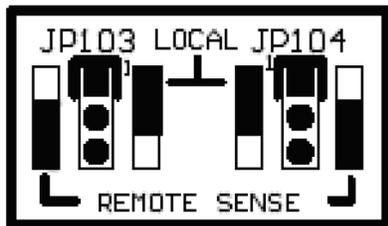
Last modified: 12 September 2023

11.4. Configuring Remote Sense Jumpers

ATevo must be configured to sense dc output voltage used for regulation at either the charger's dc output or at the voltage present on the Remote Sense terminal block (A2-TB1). This configuration is accomplished by moving shorting block jumpers located on ATevo's Power Board (A2).

11.4.1 Locating Remote Sense Configuration Jumpers

Remote Sense Configuration Jumpers (JP103 and JP104) are located on the Power Board next to the Remote Sense terminal block (A2- TB1). Each jumper consists of a 3-pin header and a SHORTING BLOCK that shorts (or connects) two (2) pins of the header together.



11.4.2 Enabling Remote Sense

To have ATevo regulate dc output to the voltage present at the Remote Sense leads, move both the Remote Sense SHORTING BLOCKs (JP103 and JP104) to the REMOTE SENSE side of the pin headers. The SHORTING BLOCKS should be installed on the two (2) pins closest to the edge of the board.

11.4.3 Enabling Local Sense

Local Sense is the factory default configuration. Unless otherwise specified, all ATevos are shipped configured to use local sense. In this configuration, ATevo regulates dc output to the voltage present at the charger output terminals (CB2+/-).

Jumper configuration will have both Remote Sense SHORTING BLOCKs (JP103 and JP104) at the LOCAL SENSE side of the pin headers. SHORTING BLOCKS will be installed on the two (2) pins farthest from the edge of the board.

Last modified: 27 September 2023

11.5. Disabling Remote Sense

If you need to temporarily disable Remote Sense:

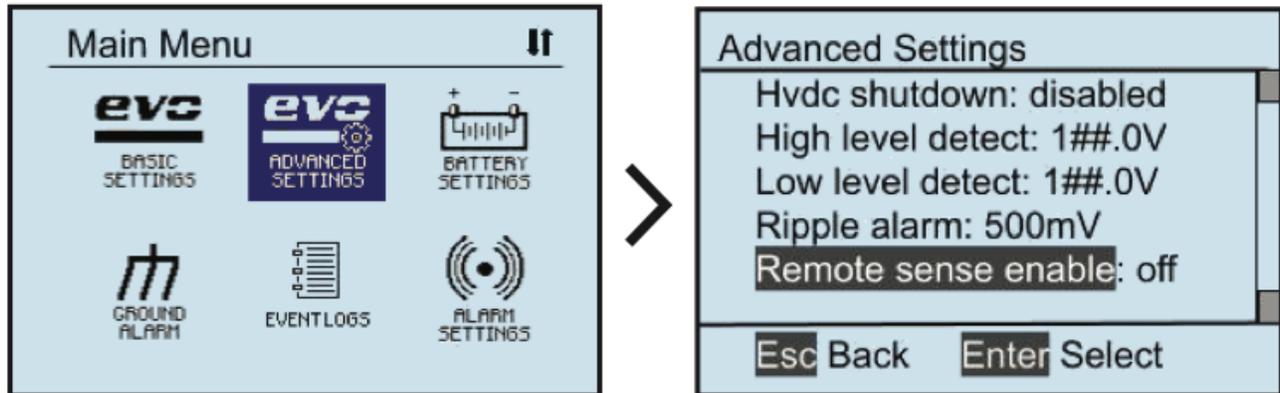
- De-energize and lock out all ac and dc voltages within the ATevo enclosure.
- Check with a voltmeter.
- Remove the safety shield.
- Move SHORTING BLOCKS to Local Sense configuration per [Section 11.4.3](#).
- Replace safety shield and close front panel door.
- Re-energize ATevo.

* If Remote Sense is to be disabled for extended periods of time or permanently disabled, it is highly recommended that the sense leads (the twisted pair cable) be disconnected from both the battery and terminal block (A2-TB1).

Last modified: 2 August 2023

11.6. Enabling Remote Sense Compensation

ATevo monitors charger voltage on the inside of the DC Output Circuit Breaker (CB2). The construction of this component features a small amount of internal resistance. In certain (24Vdc & 48Vdc) models, breaker types, or depending on required sensitivities, this may affect remote sense voltage calculations.



To enable Remote Sense Compensation, press MENU, then select ADVANCED SETTINGS.

- Navigate to Remote Sense Enable using UP and DOWN.
- Select it with EDIT/ENTER.
- Press UP and DOWN to change setting to on.
- Once desired setting is displayed, press EDIT/ENTER to store it.

Last modified: 1 August 2023

12. Auxiliary Inputs/Outputs

SECTION TOPICS
Auxiliary Input/Output (I/O) Board
Connections to Auxiliary I/O Board
Hardware Configuration
Software Configuration for Relays
Software Configuration for Binary Inputs
Software Configuration for Analog Inputs

Last modified: 1 August 2023

12.1. Auxiliary Input/Output (I/O) Board

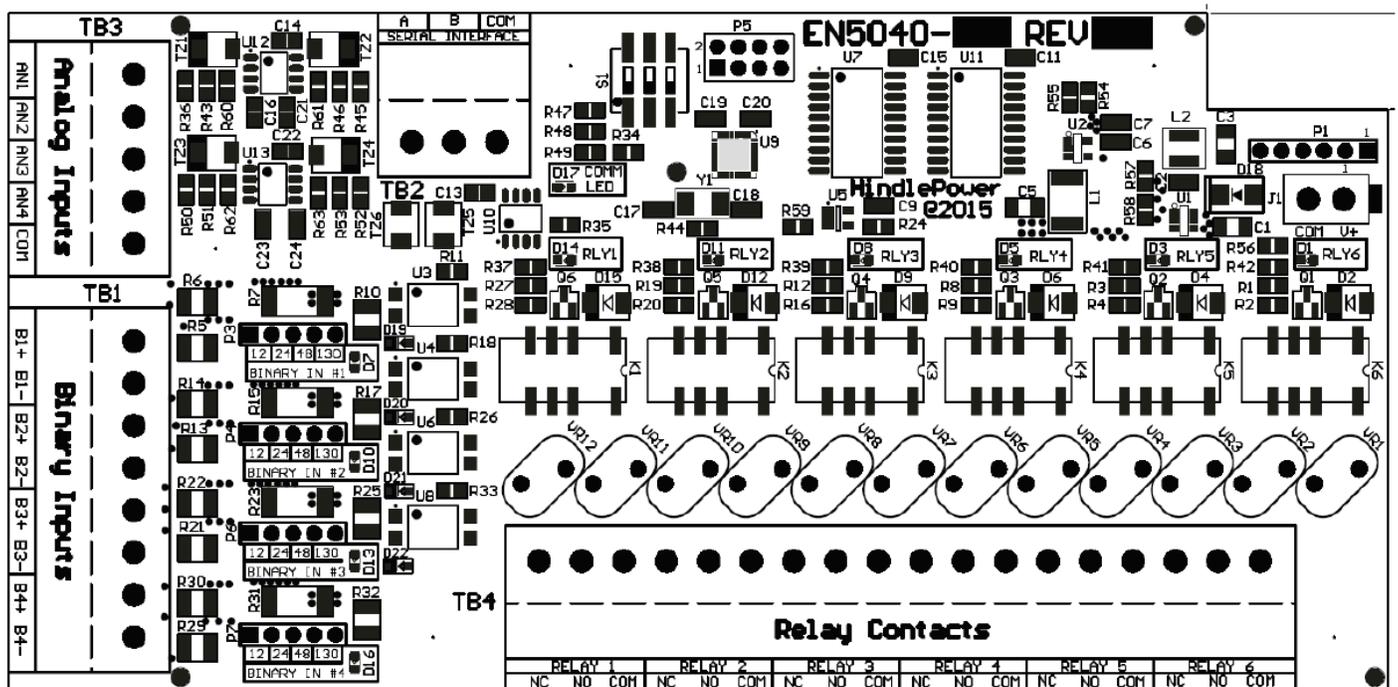
The Auxiliary I/O Board (A4) is an optional component, supplied when local communication to and from ATEvo is required. Each board is equipped with:

- Six (6) relays
- Four (4) generic Binary Inputs
- Four (4) generic Analog Inputs

When supplied, the Auxiliary I/O Board (A4) is electrically connected to and mounts on the Power Board (A2). The Auxiliary I/O Board (A4) links to the Main Control Board (A1), via serial communications, through the ribbon cable connected from the Power Board (A2).

A **GREEN** communications LED on the Auxiliary I/O Board (A4) is located adjacent to terminal block (A4-TB2). This LED blinks to indicate active communication between the Aux I/O Board and the Main Board.

All relays on the Auxiliary I/O Board (A4) are 'failsafe'. If communication is lost between the Main Control Board (A1) and the Auxiliary I/O Board (A4), the relays will switch to the alarm state.



For component details of the Auxiliary I/O Board (A4), refer to standard drawings:

- [JE5253-29](#) (Style-5054, up to 50Adc, w/options)
- [JE5313-19](#) (Style-5070, up to 50Adc, w/options)
- [JE5313-29](#) (Style-5070, 75-100Adc, w/options)

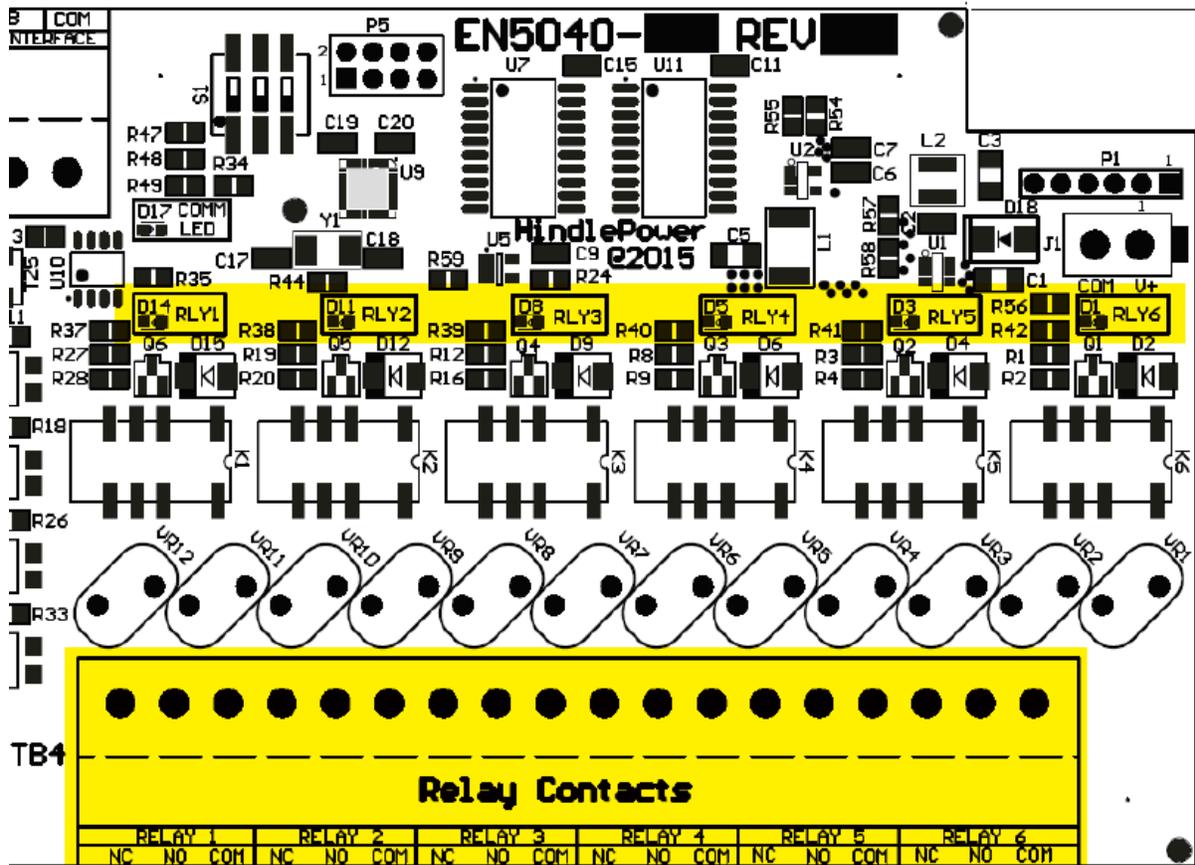
Last modified: 12 September 2023

12.1.1. Relays

The Auxiliary I/O Board (A4) contains six (6) configurable one (1) form-C relays. Relay contacts are rated for 0.5A @ 125 Vac/Vdc.

Each relay has:

- a **RED** LED that serves as a debugging aid that illuminates when the relay is in alarmed state
- a second contact set which feeds back the relay's state to ATevo's main processor



Each relay is configurable to:

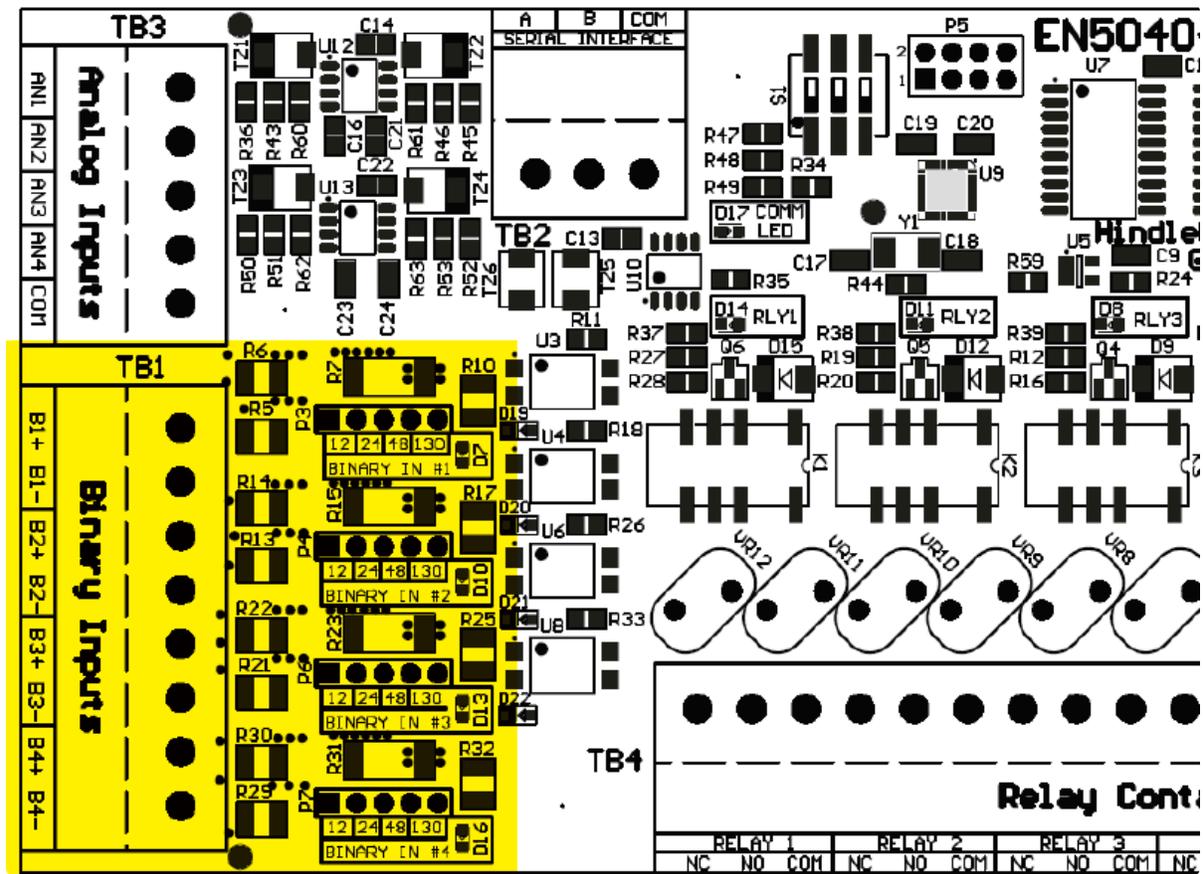
- change states based on any alarm condition or status point
- be latching or non-latching
- switch to active state after a pre-programmed delay

Last modified: 3 August 2023

12.1.2. Binary Inputs

The four (4) Binary Inputs are optically isolated from ATEvo and each other. They can be configured via jumper selection to accept input voltages of 12Vdc, 24Vdc, 48Vdc, or 130Vdc. Each Binary Input has an associated yellow LED and a jumper selection block. The LED serves as a debugging aid as it will illuminate when the associated Binary Input is high (in the 'ON' state).

The Binary Inputs may be configured to be active high or active low and generate alarms and controls such as charger shutdown. The configuration also permits each input to be assigned a custom name (such as '2% Hydrogen', or 'Vent Fan Fail'). ATEvo will report all activity of the input (status, alarms or log files) by the generic default name or the custom configured name.



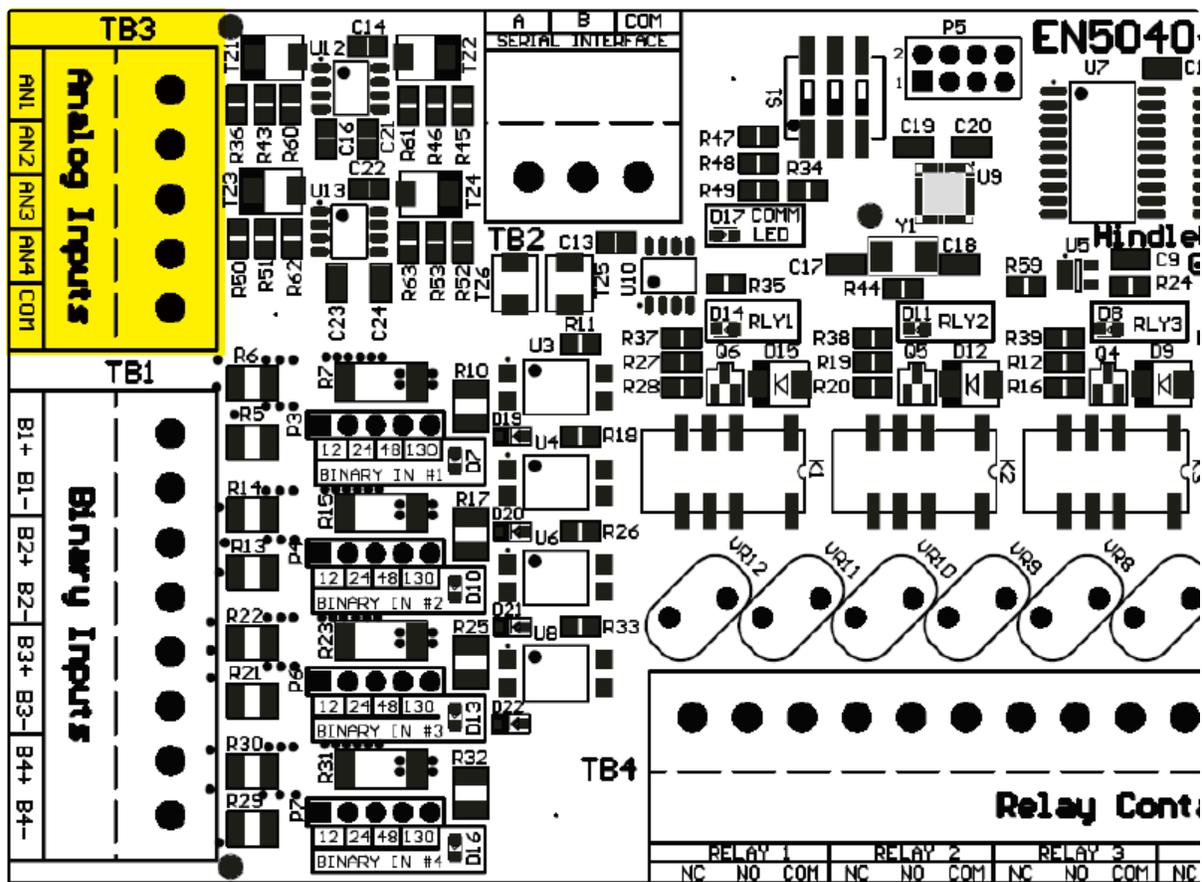
Last modified: 1 August 2023

12.1.3. Analog Inputs

The four (4) Analog Inputs are rated for 0-10 Vdc. They utilize a common ground, referenced to DC OUTPUT NEG, and can be used to import generic analog values. ATevo assigns each Analog Input a unique generic name such as 'AUX 1 input AN1'. This name can be changed to be readily identifiable by the end user (e.g. 'Ambient Temp'). ATevo will report all status and alarms with the default name or the custom name assigned.

The Analog Inputs include scaling configuration such that ATevo can report their values in primary units. For example, a temperature transducer with a 0 to 10 Vdc output can be configured to scale the voltage value directly to the associated temperature represented by the dc voltage. The associated 'units' name can also be configured such that when the Analog Input value is displayed, it will display as '80.3 F' instead of '6.2 Vdc'.

Each Analog Input can be configured to generate alarms based on its value. Available trigger conditions to generate an alarm include below a threshold, above a threshold, within a range, or outside a range. Threshold and range values are configurable, and are entered in the primary units (such as °F) based on scaling configuration.



Last modified: 1 August 2023

12.2. Connections to Auxiliary I/O Board

- [System Connections](#)
- [Wiring Relay Connections](#)
- [Wiring Binary Input Connections](#)
- [Wiring Analog Input Connections](#)

Last modified: 1 August 2023

12.2.1. System Connections

The Auxiliary I/O Board (A4) plugs into the top of the Power Board (A2). All system connections are factory wired when the Auxiliary I/O option is ordered with the ATevo.

Last modified: 1 August 2023

12.2.2. Wiring Relay Connections

Connections to the relays are made through an 18-position terminal block (A4-TB4). Connections to the six (6) programmable relay contacts are clearly labeled on the board.



Procedure

1. De-energize and lock out all external ac and dc voltages to ATevo.
2. Allow internal voltages to dissipate.
3. Remove safety shield and verify no hazardous voltages are present with a voltmeter.
4. Route remote annunciator wiring to Auxiliary I/O Board (A4) through an unused enclosure knockout.
5. Connect wiring (#22-14 AWG) to appropriate terminals on the Auxiliary I/O Board (A4-TB4).
6. Strip each wire 0.25in / 6.4mm, and tighten terminal screws.
7. Replace the safety shield and close the front panel door.
8. Restart ATevo.

Notes

- Alarm contacts are rated at 0.5A @ 125 Vac/Vdc.
- Signal terminal block (A4-TB4) is compression screw type, accepting #22-14 AWG wire.
- Terminals are labeled in the *non-alarm* condition, with ATevo operating 'normally' and relays energized.

* Not 'shelf state'

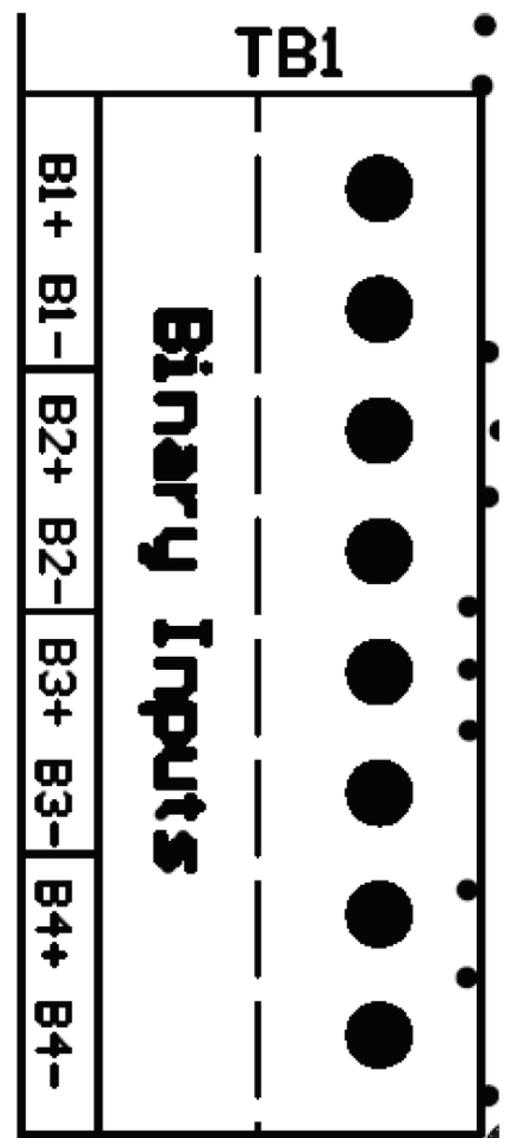
- If user alarm contacts (A4-TB4) are to drive inductive dc loads (e.g. a larger dc relay) an external protective diode must be installed at the dc relay to avoid equipment damage. Refer to *Application Note* ([JD5011-00](#)).

Last modified: 12 September 2023

12.2.3. Wiring Binary Input Connections

Connections to Binary Inputs are made through an 8-pos terminal block (A4-TB1). The terminal block is removable to simplify wiring.

The terminal connections are labeled along the edge of the Auxiliary I/O Board next to terminal block (A4-TB1). Each Binary Input is optically isolated and has a polarized pair of terminals. Observe the pos(+) and neg(-) designators when wiring the terminal block.



* Before wiring the Binary Inputs, verify the Binary Input voltage selection jumpers are configured for the correct input voltage (see [Section 12.3.2](#)). Incorrect voltage configuration may damage the Auxiliary I/O Board (A4).

Procedure

1. De-energize and lock out all ac and dc voltages to ATevo.
2. Allow internal voltages to dissipate, and check with a voltmeter.
3. Remove safety shield.
4. Route Binary Input wiring to Auxiliary I/O Board (A4) through an unused enclosure knockout.

5. Connect wiring (#22-14 AWG) to appropriate terminals on the Auxiliary I/O Board (A4-TB1).
6. Strip each wire 0.25in / 6.4mm, and tighten terminal screws.
7. Replace the safety shield.
8. Re-energize ATevo.

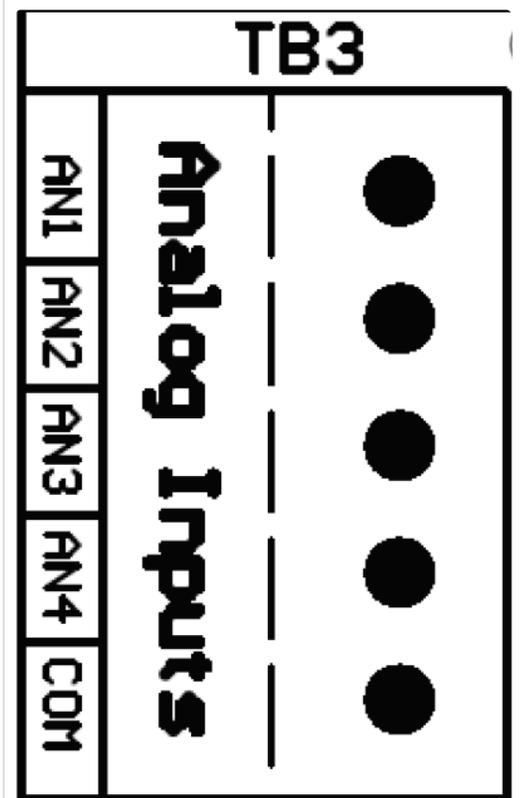
Notes

- Binary Inputs are configurable for 12Vdc, 24Vdc, 48Vdc, or 130Vdc.
- Terminal block (A4-TB1) is compression type, accepting #22-14 AWG wire.
- Correct polarization is required.

Last modified: 1 August 2023

12.2.4. Wiring Analog Input Connections

Connections to the Analog Inputs are made through 5-pos terminal block (A4-TB3). The terminal block is removable to simplify wiring. Terminal connections are labeled along the edge of the Auxiliary I/O Board next to terminal block (A4-TB3). The Analog Inputs are NOT isolated and must be referenced to the negative(-) dc bus.



Procedure

1. De-energize and lock out all ac and dc voltages to ATevo.
2. Allow internal voltages to dissipate and verify with a voltmeter.
3. Remove safety shield.
4. Route remote analog inputs to the Auxiliary I/O Board (A4) through an unused enclosure knockout.
5. Connect signal wiring (#22-14 AWG) to appropriate terminals (A4-TB3) of the Auxiliary I/O Board.
6. Strip each wire 0.25in / 6.4mm, and tighten terminal screws.
7. Replace the safety shield.
8. Re-energize ATevo.

Notes

- Analog Inputs are rated at 0-10Vdc.
- Terminal block is compression type and accepts #22-14 AWG.
- All Analog Inputs (AN1, AN2, AN3, AN4) must be referenced to the ATevo negative(-) bus voltage (COM) terminal.

Last modified: 1 August 2023

12.3. Hardware Configuration

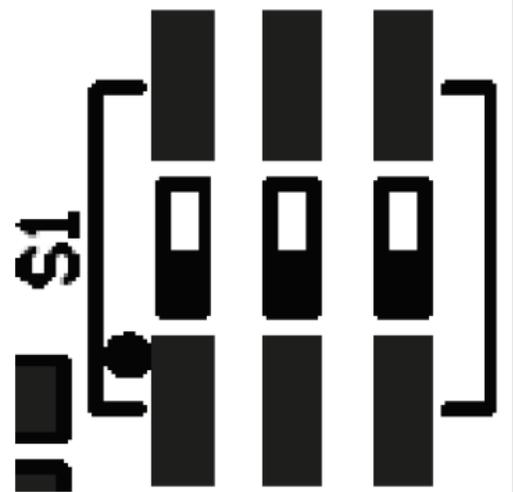
The Auxiliary I/O Board (A4) requires two (2) hardware configurations:

- the Auxiliary I/O Board Address
- the Binary Input Voltage settings

12.3.1 Auxiliary I/O Board Address

The ATEvo will support up to four (4) Auxiliary I/O Boards (A4). Each Auxiliary I/O Board connected to ATEvo must have a unique address setting to identify it to the system. The Auxiliary I/O dipswitch determines the Auxiliary I/O Board Address.

The Auxiliary I/O dipswitch (A4-S1) contains three (3) switches, and is located near the top center of the board. Viewing the board with the "S1" silkscreen label to the left (as shown), the switch UP position is ON, and the DOWN position is OFF.



The Auxiliary I/O Board address is determined as follows:

- Auxiliary I/O Board #1: 1-ON, 2-ON, 3-ON
- Auxiliary I/O Board #2: 1-OFF, 2-ON, 3-ON

When supplied, ATEvo is normally equipped with one (1) or two (2) Auxiliary I/O Boards. However, for special units equipped with more:

- Auxiliary I/O Board #3: 1-ON, 2-OFF, 3-ON
- Auxiliary I/O Board #4: 1-OFF, 2-OFF, 3-ON

The switch setting will be factory set for your system. It should not need to be changed unless an Auxiliary I/O Board is being replaced or added. If a board is being replaced, set the dipswitch settings on the new board to match the board being replaced.

12.3.2 Binary Input Voltage Configuration

Each Binary Input has an associated input voltage configuration jumper. The configuration jumpers (P3, P4, P6, and P7) are located adjacent to the Binary Input Terminal Block (A4-TB1) on the Auxiliary I/O Board. The voltage jumper for Binary Input #1 is shown below.



To configure the Binary Input Voltage, move the SHORTING BLOCK to connect the two (2) header pins directly above the voltage rating (12, 24, 48, or 130). Repeat this process for the remaining three (3) Binary Inputs using the associated configuration jumpers for Binary Input #2, #3, and #4.

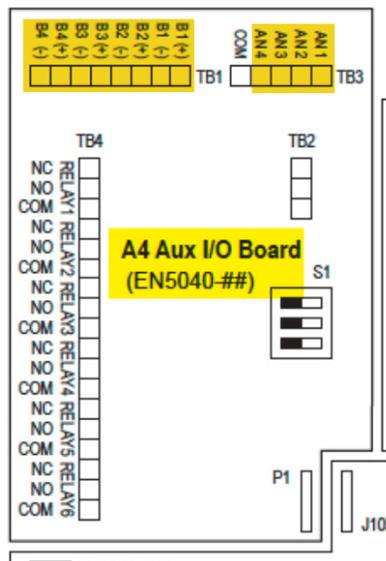
Last modified: 1 August 2023

12.4. Software Configuration for Relays

The Auxiliary I/O Board's inputs are generic and do not require any configuration. Analog Inputs and Binary Inputs are defined by their associated numbers.

- Binary Input #1 through Binary Input #4
- Analog Input #1 through Analog Input #4

These will reside on the Auxiliary I/O Board (A4) with its dip-switch configured for Auxiliary I/O Board #1.



Each relay has a dedicated configuration for:

- alarm condition or status point mapping
- latching or non-latching
- time delay

Auxiliary I/O Board Relays can be mapped to indicate the state of any ATevo alarm or status point. Each relay can be independently configured to latch when the alarm or status point associated with the relay becomes active. Once latched, the relay must be cleared manually by initiating the RESET LATCHED RELAY feature (see [Section 7.6](#)). All relays have a time delay configuration. The relay will not change to active state until the associated alarm or status point has changed to active state and remains in active state for the configured time delay.

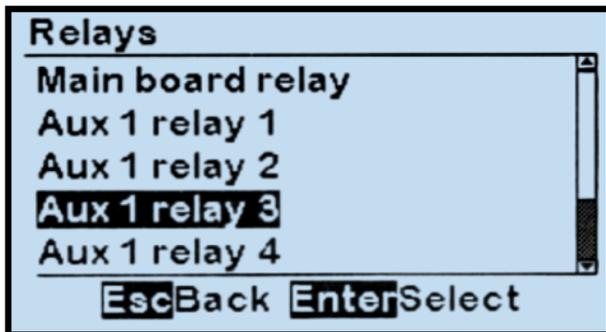
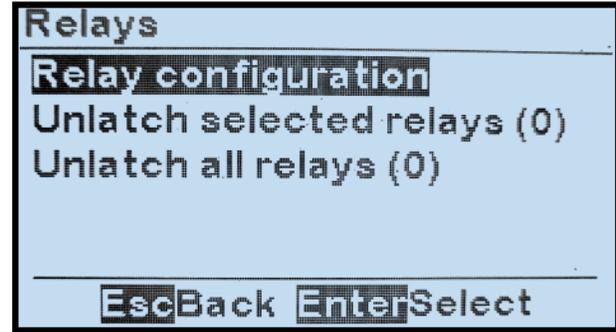
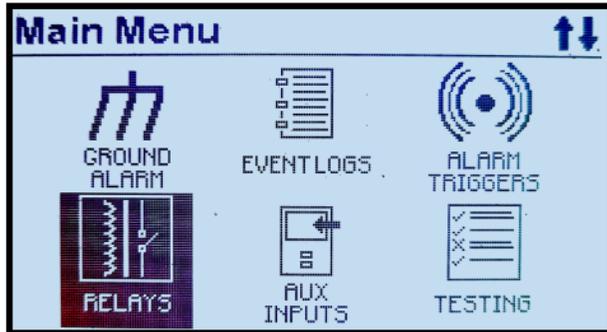
✿ Software Configuration Naming: In the following subsections, Auxiliary I/O Board relays are specified by “A4” board number plus relay number on the associated board. For example: ‘Aux 1 relay 3’ specifies Relay #3 on Auxiliary I/O Board #1.

Last modified: 27 September 2023

12.4.1. Auxiliary I/O Board Relay Configuration

To make changes to parameters for a relay on an Aux I/O Board:

MENU > RELAYS > 'Relay Configuration' > select relay from options > select parameter (refer to Sections [12.4.2](#) through [12.4.4](#))



Last modified: 22 September 2023

12.4.2. Auxiliary I/O Board Relay Alarm Configuration

To change the alarm condition assigned to the relay:

MENU > RELAYS > 'Relay Configuration' > select relay from options (refer to [Section 12.4.1](#)) > 'Fault:' > select condition from list

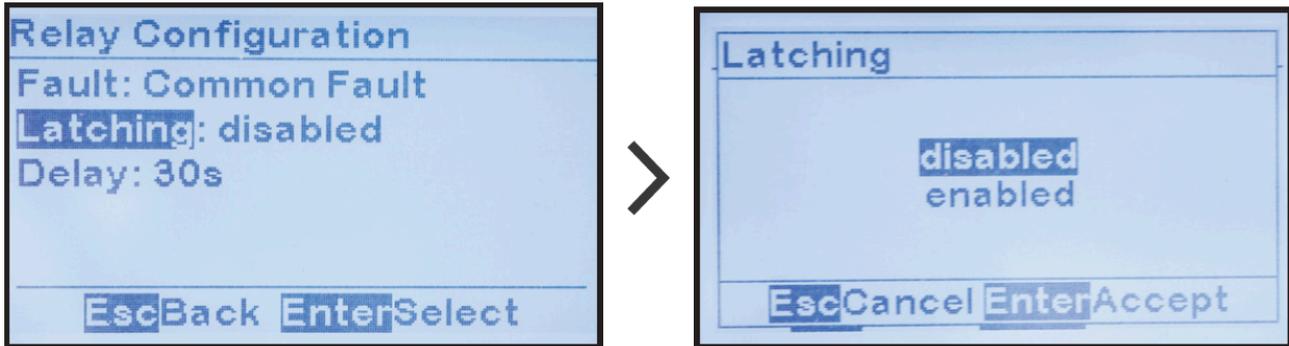


Last modified: 1 August 2023

12.4.3. Auxiliary I/O Board Relay Latch Configuration

To change the latching control configuration for a relay on the Auxiliary I/O Board:

MENU > RELAYS > 'Relay Configuration' > select relay from options (refer to [Section 12.4.1](#)) > 'Latching:' > select from 2 latching options

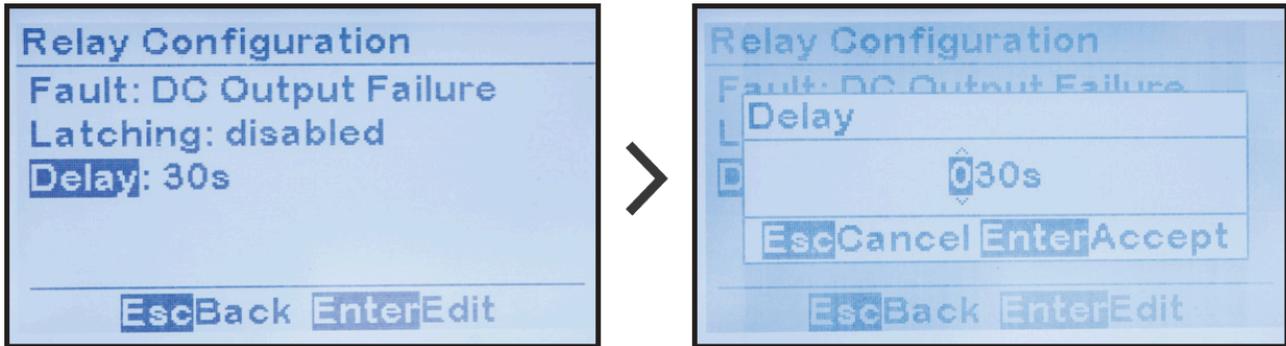


Last modified: 3 August 2023

12.4.4. Auxiliary I/O Board Relay Time Delay Configuration

To change the delay time configuration for a relay on the Auxiliary I/O Board:

MENU > RELAYS > 'Relay Configuration' > select relay from options (refer to [Section 12.4.1](#)) > 'Delay:' > set digits as desired



Last modified: 1 August 2023

12.4.5. Factory Default Alarm Relay Configuration

Unless otherwise specified, the ATevo Auxiliary I/O Board (A4) will ship from the factory with the following Alarm Relay Configuration:

Factory Default Alarm Relay Configuration			
Relay	Name	Latching	Delay
. #1	High DC Voltage	disabled	30 seconds
. #2	Low DC Voltage	disabled	30 seconds
. #3	DC Output Failure	disabled	30 seconds
. #4	Low AC Supply	disabled	30 seconds
. #5	Positive Ground Fault	disabled	30 seconds
. #6	Negative Ground Fault	disabled	30 seconds

Last modified: 1 August 2023

12.5. Software Configuration for Binary Inputs

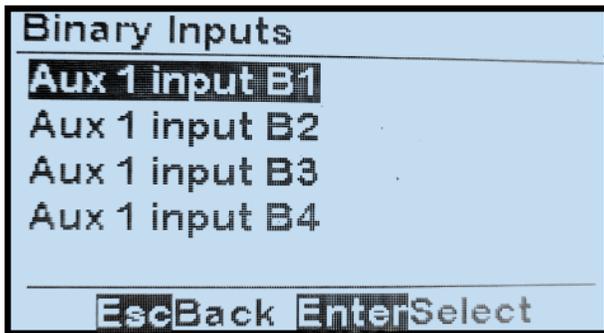
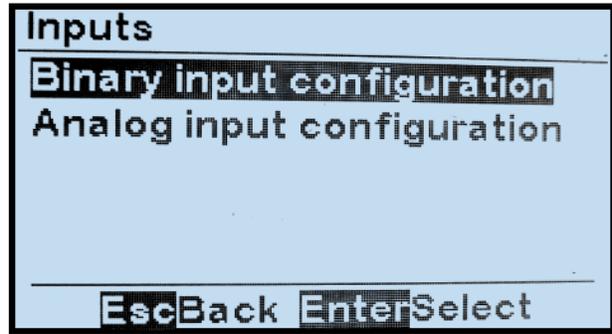
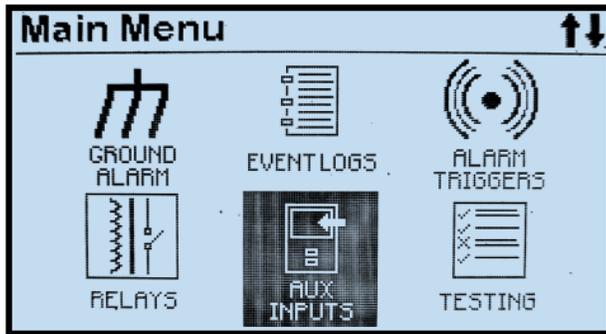
The Auxiliary I/O Board (A4) binary inputs are used to monitor, alarm, and/or report on the status of any external switch or contact. Each input can be independently configured to be active high or low, activate an alarm, and/or activate a control. ATevo assigns each input a unique generic name that may be replaced by the user.

* Software Configuration Naming: In the following subsections, Auxiliary I/O Board binary inputs default names are specified by board number (see [Section 12.3.1](#)), and binary input number on the associated board. For example: 'Aux 1 input B2' specifies binary input #2 on Auxiliary I/O Board #1.

Last modified: 1 August 2023

12.5.1. Binary Input Configuration

To make changes to parameters for any binary input on the Auxiliary I/O Board:
MENU > AUX INPUTS > 'Binary Input Configuration' > select input from options > select parameter (refer to Sections [12.5.2](#) through [12.5.5](#))

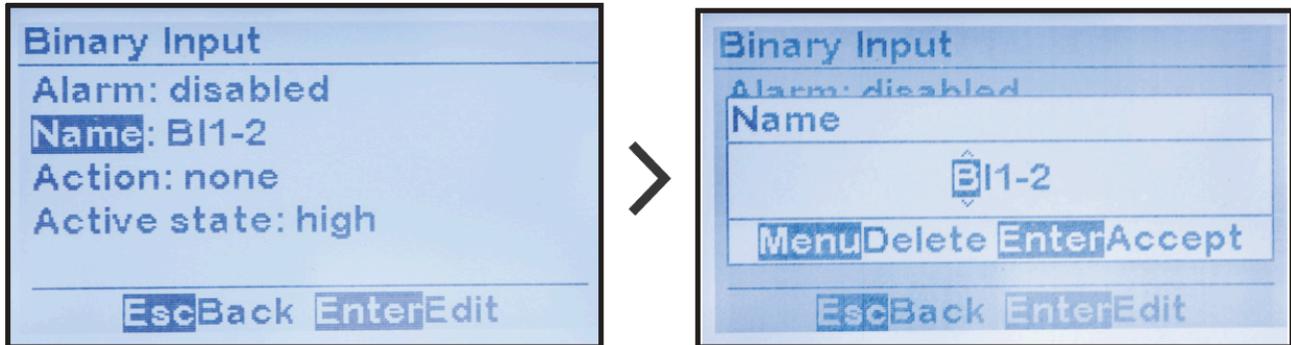


Last modified: 22 September 2023

12.5.2. Binary Input Name Assignment

To change the name of a binary input on the Auxiliary I/O Board:

MENU > AUX INPUTS > 'Binary Input Configuration' > select input from options (refer to [Section 12.5.1](#)) > 'Name:' > set characters as desired



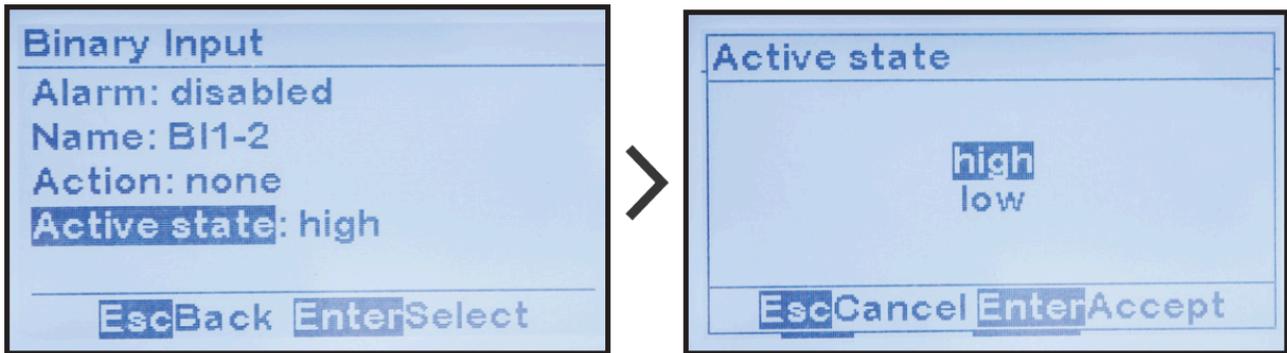
Last modified: 1 August 2023

12.5.3. Binary Active State Assignment

The Binary Active State assignment determines the normal and alarm state of the input.

To change the active state of a binary input on the Auxiliary I/O Board:

MENU > AUX INPUTS > 'Binary Input Configuration' > select input from options (refer to [Section 12.5.1](#)) > 'Active State' > select from 2 alarmed states



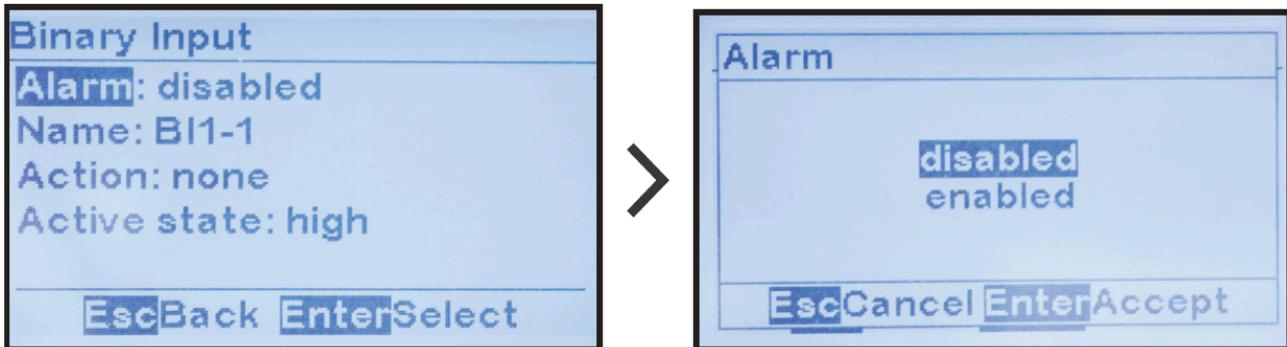
Last modified: 2 August 2023

12.5.4. Binary Input Alarm Enable

The Binary Input Alarm Enable assignment determines whether the binary input will generate an alarm, when it senses the alarmed state. Alarms generated by binary inputs will appear by their configured name in the alarm list and on the bottom of the HOME screen.

To enable or disable the Binary Input Alarm function:

MENU > AUX INPUTS > 'Binary Input Configuration' > select input from options (refer to [Section 12.5.1](#)) > 'Alarm:' > select from 2 alarmed states



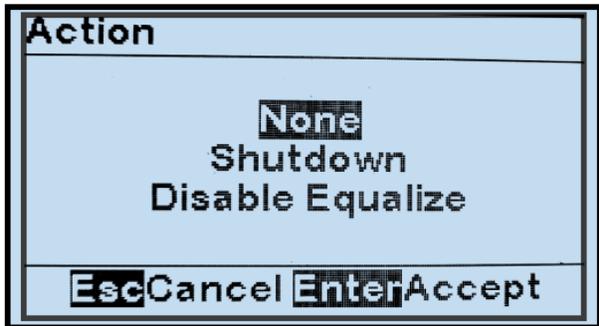
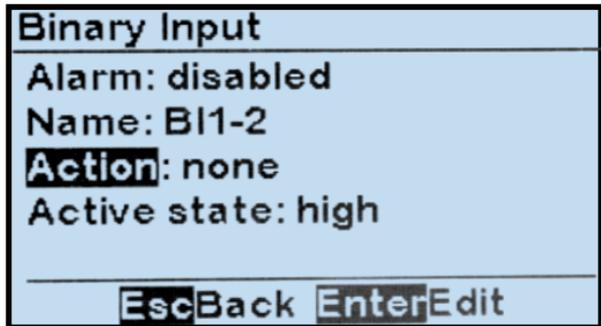
Last modified: 1 August 2023

12.5.5. Binary Input Action Assignment

The Binary Input Action assignment links the binary input to a charger control. Examples of a charger control include rectifier remote shutdown, or float/equalize mode control. ATevo will execute assigned charger control when the binary input is in the active state.

To assign a control to a binary input:

MENU > AUX INPUTS > 'Binary Input Configuration' > select input from options (refer to [Section 12.5.1](#)) > 'Action:' > select from 2 actions



* Midway through 2021, ATevo chargers began shipping with firmware v2.7.0 which includes a new action called "Disable Equalize" which is described further in the Appendix topic, [Firmware v2.7.0 Enhancements](#).

Last modified: 26 September 2023

12.5.6. Factory Default Binary Input Configuration

Unless otherwise specified, the ATevo Auxiliary I/O Board (A4) will ship from the factory with the following binary input configuration:

Factory Default Binary Input Configuration				
Binary Input	Name	Alarm State	Action	Active State
1.	BI1-1	disabled	none	high
2.	BI1-2	disabled	none	high
3.	BI1-3	disabled	none	high
4.	BI1-4	disabled	none	high

Last modified: 1 August 2023

12.6. Software Configuration for Analog Inputs

The Auxiliary I/O Board analog inputs are used to monitor, alarm, and/or report on the status of any external transducer or sensor. Each input can be scaled such that the value is reported in primary units (°C, Vac, etc.).

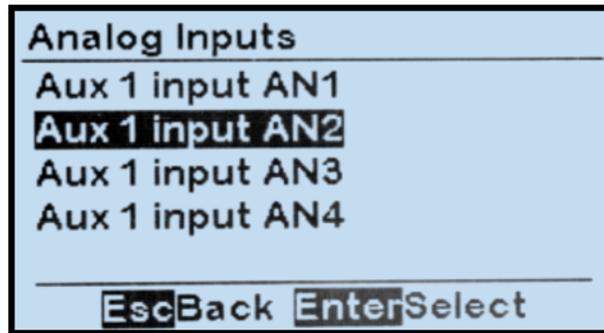
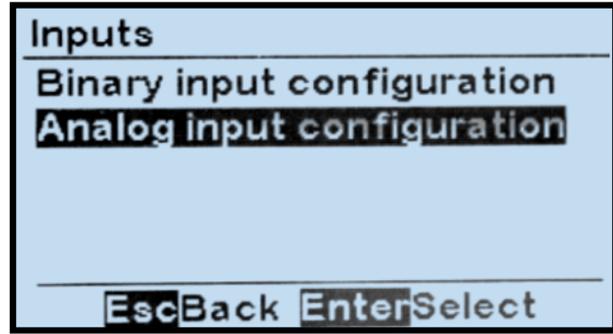
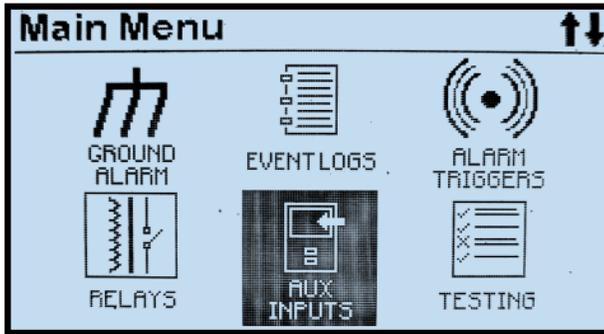
The analog inputs can also generate alarms when their reported values are below, above, or out-of-range of a configured valued. ATevo assigns each input a unique generic name that may be replaced by the user.

* **Software Configuration Naming:** In the following subsections, Auxiliary I/O Board analog inputs' default names are specified by board number (see [Section 12.3.1](#)), and analog input number on the associated board. For example: 'Aux 1 input AN2' specifies analog input #2 on Auxiliary I/O Board #1.

Last modified: 1 August 2023

12.6.1. Analog Input Configuration

To make changes to parameters for any analog input on the Auxiliary I/O Board:
MENU > AUX INPUTS > 'Analog Input Configuration' > select input > select parameter (refer to Sections [12.6.2](#) through [12.6.7](#)).

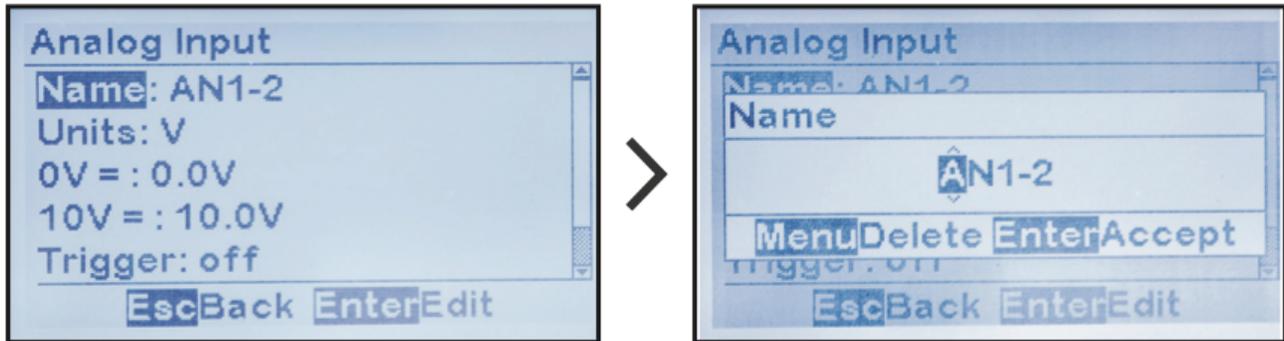


Last modified: 22 September 2023

12.6.2. Analog Input Name Assignment

To change the name of an analog input on an Auxiliary I/O Board:

MENU > AUX INPUTS > 'Analog Input Configuration' > select input (refer to [Section 12.6.1](#)) > 'Name:' > set characters desired



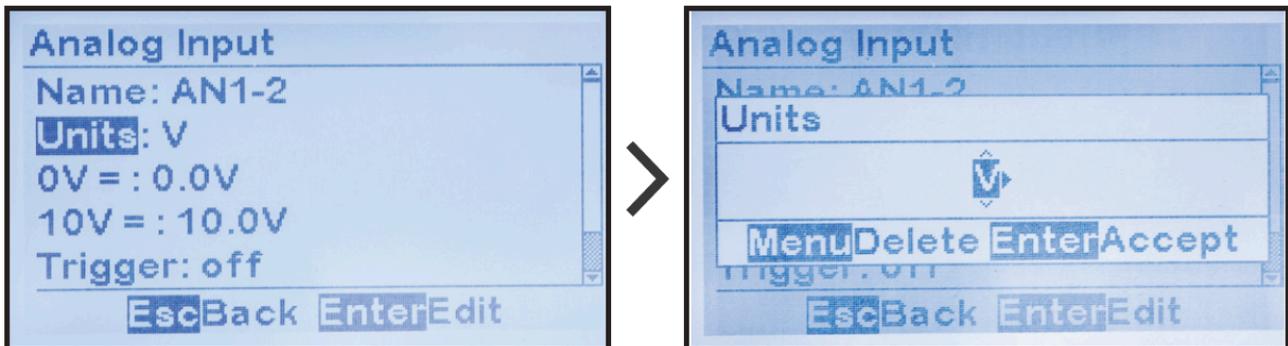
Last modified: 1 August 2023

12.6.3. Analog Input Primary Unit Assignment

ATevo can scale analog input values such that they can be represented in primary units.

To change the name of the primary measurement unit of an analog input on the Auxiliary I/O Board (A4):

MENU > AUX INPUTS > 'Analog Input Configuration' > select input (refer to [Section 12.6.1](#)) > 'Units:' > set desired characters



Last modified: 1 August 2023

12.6.4. Analog Input Scaling Assignment

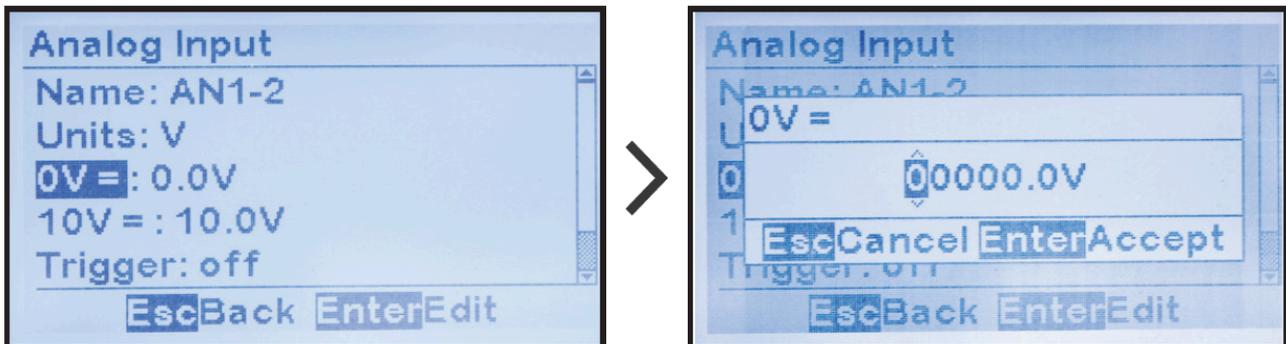
ATevo can scale the analog input values such that the measurement can be represented in primary units.

To adjust the scaling, enter the primary value when the analog input is at 0 V, and the primary value when the analog input is 10.0 Vdc. ATevo will report the measurements and adjust the alarm thresholds in true primary units.

To change the low scale value:

MENU > AUX INPUTS > 'Analog Input Configuration' > select input (refer to [Section 12.6.1](#)) > '0V=:' > set desired digits

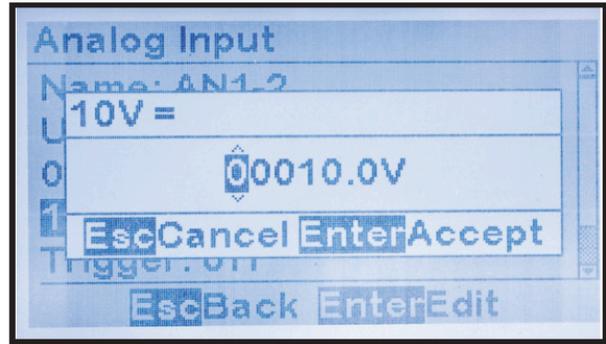
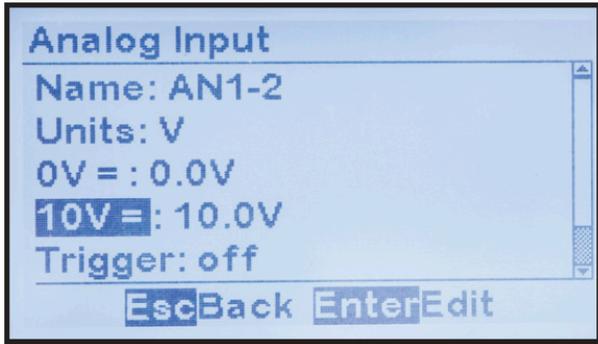
* This number must represent the primary value when the input value is 0 V. If no scaling is required, set 0.



To change the high scale value assigned to the analog input:

'10V=:' > set desired digits

* This number must represent the primary value when the input value is 10.0 Vdc. If no scaling is required, set 10.



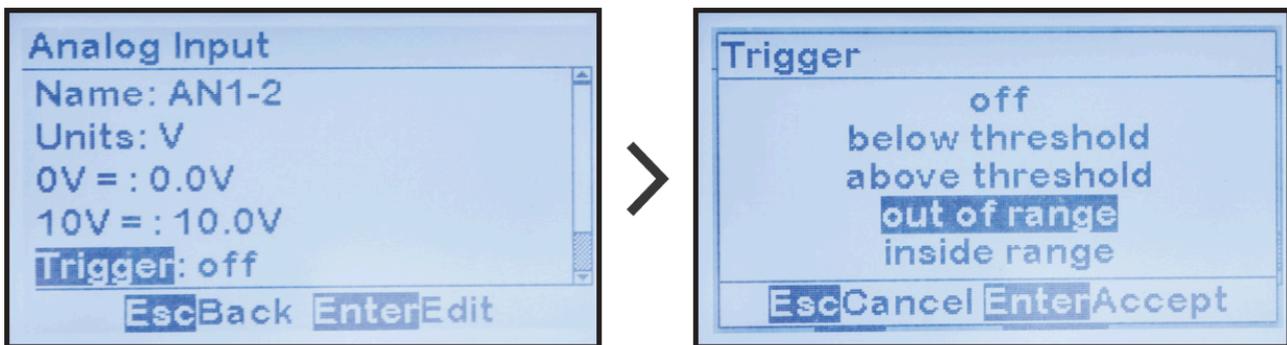
Last modified: 1 August 2023

12.6.5. Analog Input Alarm and Trigger Assignment

The ATevo can generate alarms based on analog input values. There are several triggers that can be assigned to define the alarm condition. An alarm can be generated if the analog value is above a threshold, below a threshold, within a defined range, or outside a defined range. The threshold parameter(s) required will depend on the trigger type selected. Threshold parameters must be entered based on the scaling values such that the thresholds assigned are within the range of the scaling.

To assign an alarm trigger to an analog input:

MENU > AUX INPUTS > 'Analog Input Configuration' > select input (refer to [Section 12.6.1](#)) > 'Trigger:' > select desired option



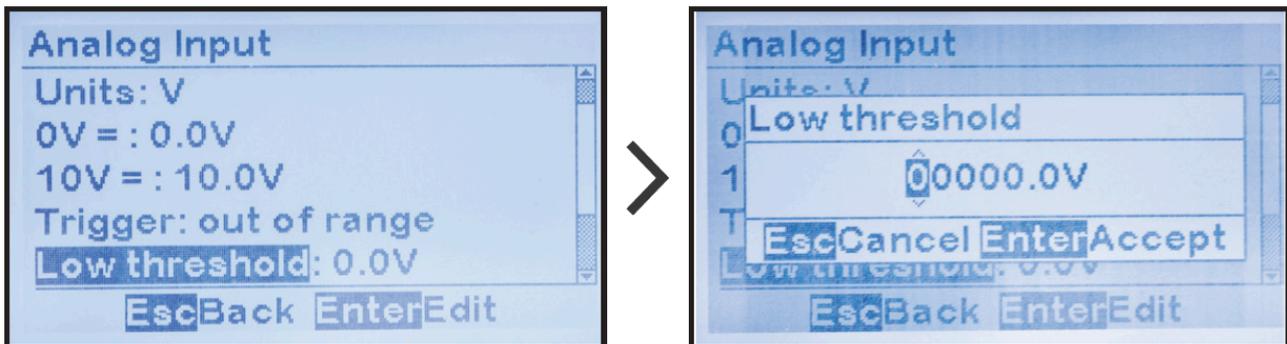
Last modified: 2 August 2023

12.6.6. Analog Input Alarm Threshold Assignment

ATevo can generate alarms based on analog input value. Alarm thresholds are the set points at which an alarm occurs. Each analog input can be assigned an alarm with a trigger. Some triggers only require one threshold. The 'above a threshold' alarm trigger requires a 'high threshold' set point, the 'below a threshold' trigger requires a 'low threshold set point'. Other range based triggers require both a 'low threshold' and a 'high threshold' set point to determine the range. ATevo will automatically determine which thresholds are required based on the trigger selected. Always set the trigger before adjusting the thresholds.

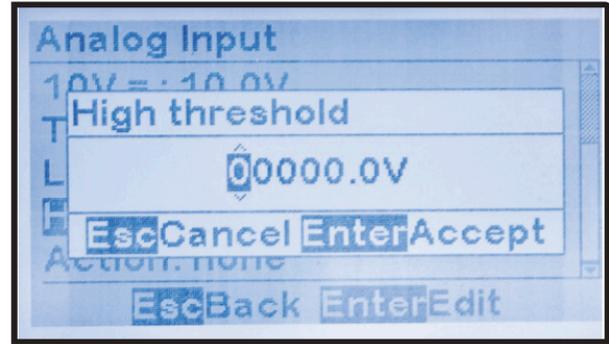
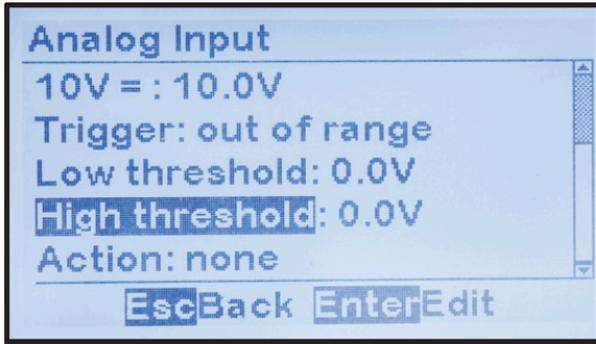
To adjust the low level threshold set point for a trigger for an analog input alarm:
MENU > AUX INPUTS > 'Analog Input Configuration' > select input (refer to [Section 12.6.1](#)) > 'Trigger:' > 'Low threshold:' > set digits

- * This number may be in primary values based on the scaling settings for the associated analog input. The threshold set point configured will be scaled by the associated analog input scaling.



To adjust the high level threshold set point for a trigger for an analog input alarm:
MENU > AUX INPUTS > 'Analog Input Configuration' > select input (refer to [Section 12.6.1](#)) > 'Trigger:' > 'High threshold:' > set digits

- * This number may be in primary values based on the scaling settings for the associated analog input. The threshold set point configured will be scaled by the associated analog input scaling.



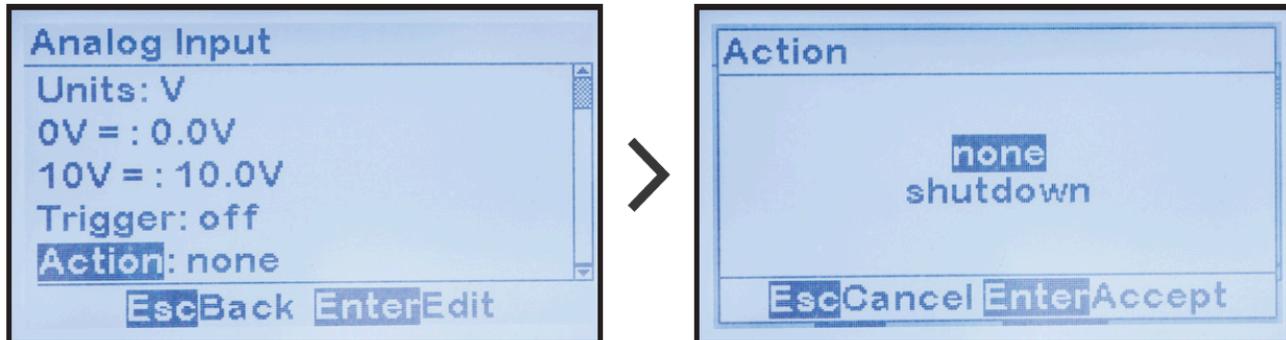
Last modified: 1 August 2023

12.6.7. Analog Input Action Assignment

The Analog Input Action assignment links the analog input alarm to a charger control. Examples of a charger control include charger shutdown or float/equalize mode control. ATevo will execute the charger control when the analog input alarm is in the active state.

To assign a control to an analog input:

MENU > AUX INPUTS > 'Analog Input Configuration' > select input (refer to [Section 12.6.1](#)) > 'Action:' > select action



- * Midway through 2021, ATevo chargers began shipping with firmware v2.7.0 which includes a new action called "Disable Equalize" which is described further in the Appendix topic, [Firmware v2.7.0 Enhancements](#).

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12.6.8. Factory Default Analog Input Configuration

Unless otherwise specified, the ATevo Auxiliary I/O Board (A4) will ship from the factory with the following analog input configuration:

Factory Default Analog Input Configuration						
Input	Name	Units	0V=:	10V=:	Trigger	Action
1.	AN1-1	V	0.0V	10.0V	off	none
2.	AN1-2	V	0.0V	10.0V	off	none
3.	AN1-3	V	0.0V	10.0V	off	none
4.	AN1-4	V	0.0V	10.0V	off	none

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13. Forced Load Sharing

SECTION TOPICS
Forced Load Sharing - Introduction
Forced Load Sharing - System Requirements
Forced Load Sharing - Configuration
Wiring ATevo Chargers for Forced Load Sharing
Forced Load Sharing - Operation
Temperature Compensation with Forced Load Sharing
Battery Open Alarm for Forced Load Sharing
Timed Equalize with Forced Load Sharing
Auto-Equalize with Forced Load Sharing
Firmware Updates with Forced Load Sharing
Troubleshooting Forced Load Sharing ATevoS

Last modified: 3 August 2023

13.1. Forced Load Sharing – Introduction

Multiple battery chargers are sometimes employed in dc power systems to provide redundancy. Two (2) or more chargers of the same voltage rating can be connected in parallel, each of them capable of powering the connected dc load(s) and charging the battery. When two (2) or more chargers operate in parallel, they normally will not share the load current equally. Since any two (2) chargers will usually have slightly different connection paths, one of the chargers in a system will typically have a slightly higher dc output voltage, and will therefore assume more of the burden of providing the necessary load current.

ATevo's forced load sharing feature supports a single 'Primary' charger, and up to three (3) 'Secondary' chargers. The Primary charger communicates with Secondary chargers over a serial connection. Each charger requires a Serial Communications Adapter (A13) set for RS-485, wired to all other chargers, to create the forced load sharing communication network.

The ATevo Forced Load Sharing feature is supplied in a bagged kit (p/n EJ5306-##). It can be ordered with ATevo, or supplied later for field installation. In addition to the A13 pc boards, and a signal interconnection cable, the kit also contains a separate user Installation & Operating Instructions (p/n [JA5054-50](#)). An **abbreviated** version of that text is listed in the following sections.

Last modified: 2 August 2023

13.2. Forced Load Sharing – System Requirements

- All battery chargers must be ATevo Series. The ATevo forced load sharing feature will not operate with legacy AT10.1 and AT30 Series battery chargers.
- All connected chargers must have the same voltage settings, have the same dc output current rating, and have the same version of ATevo Main Control Board (A1) firmware.
- Each ATevo requires a 'FLS' Serial Communications Adapter (A13) to be installed in either Port 2 or Port 3 of the Main Control Board (A1).

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13.3. Forced Load Sharing – Configuration

If the ATEvo is ordered with the forced load sharing feature, the hardware and software configuration will be completed at the factory. The forced load sharing Serial Communications Adapters (A13) and software will be verified during production test.

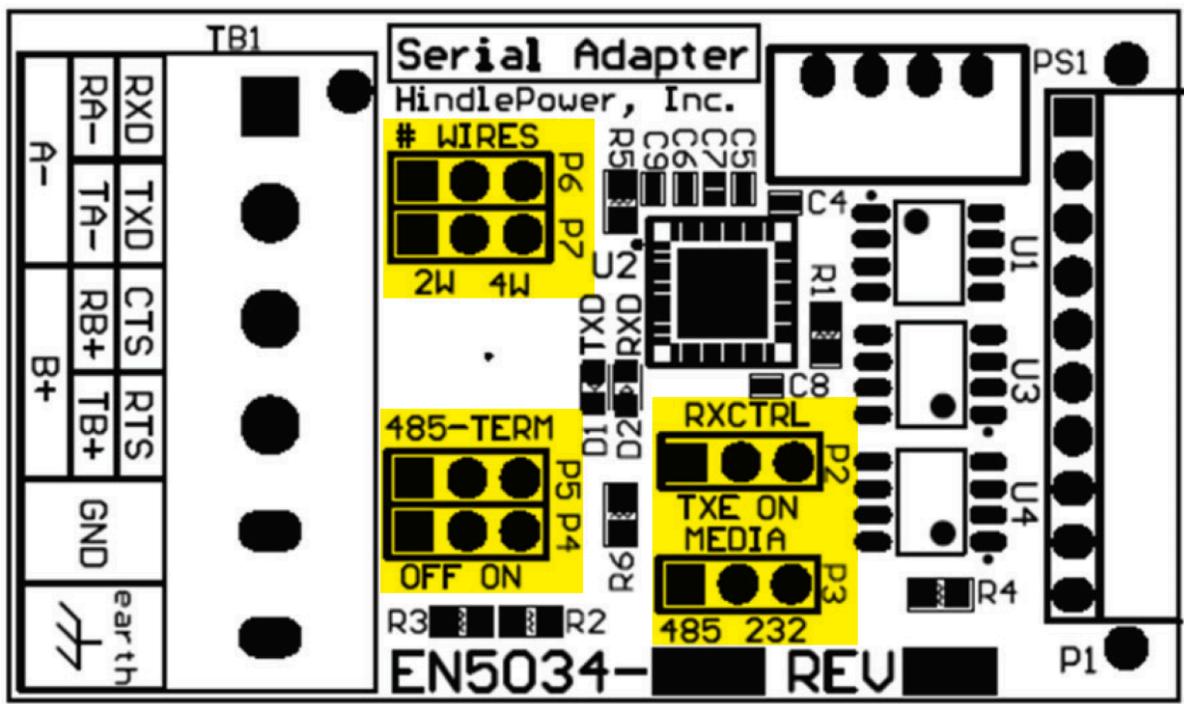
If forced load sharing is added to the ATEvo in the field, the following three (3) hardware and software configurations will be required.

13.3.1 Installing Serial Communications Adapter (A13)

Refer to the supplementary ATEvo Communications Manual ([JA0102-54 PDF](#) or [JA0102-54 online](#)) for more information and how to install and wire the Serial Communications Adapter.

13.3.2 Configuring Serial Communications Hardware

The jumpers on the Serial Communications Adapter (A13) must be configured to operate in 2-WIRE RS-485 mode.



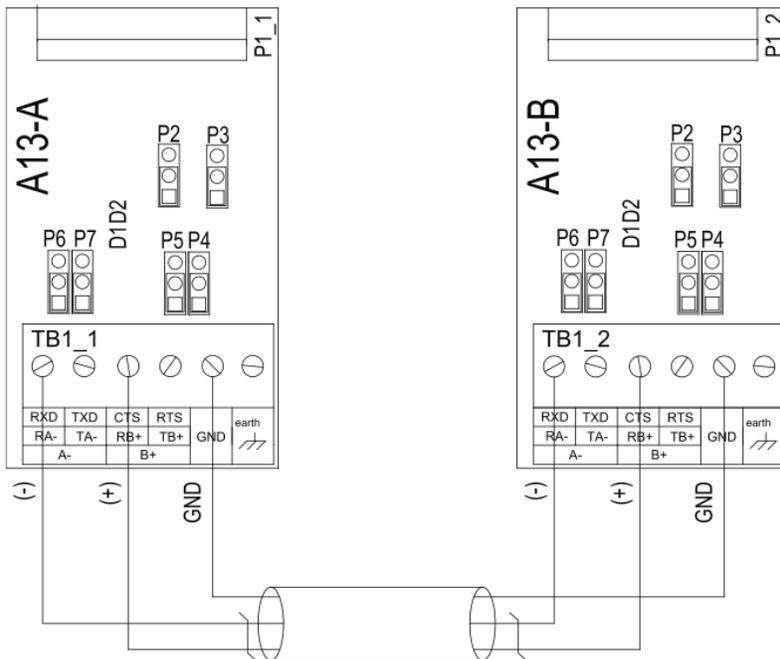
2-Wire RS-485 Settings		
Jumper(s)	Label	Setting

P2	RXCTRL	TXE
P3	MEDIA	485
P4, P5	485-TERM	OFF
P6, P7	#WIRES	2W

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13.4. Wiring ATevo Chargers for Forced Load Sharing

All ATevos required to share load on the same dc bus must be connected to the same network. The network will consist of a twisted pair cable with ground. The Serial Communication Adapters (A13) on each ATevo must be parallel wired, point-to-point as follows:



Wiring for Forced Load Sharing			
Cable	Wire	ATevo-A	ATevo-B
1	(-)	RA(-)	RA(-)
	(+)	RB(+)	RB(+)
	GND	GND	GND

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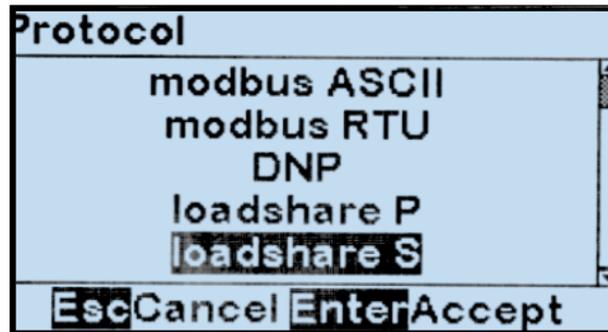
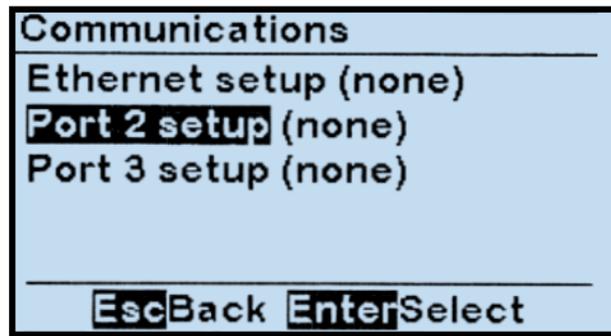
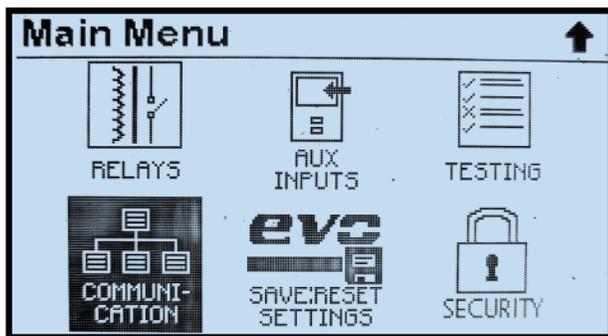
13.4.1. Configuring ATevo for Forced Load Sharing

You must assign a charger ID to each ATevo connected in forced load sharing. Configure one (1) as the Primary and all other chargers as Secondary chargers.

To configure an ATevo for Forced Load Sharing:

MENU > COMMUNICATION > Port 'X' setup

- 'X' is either '2' or '3' for Port 2 or Port 3. The Port configured for forced load share must be the port that the Serial Communications Adapter is plugged into that is wired to the Forced Load Sharing network.
- Select 'loadshare P' for the Primary ATevo, or 'loadshare S' for Secondary ATevos.

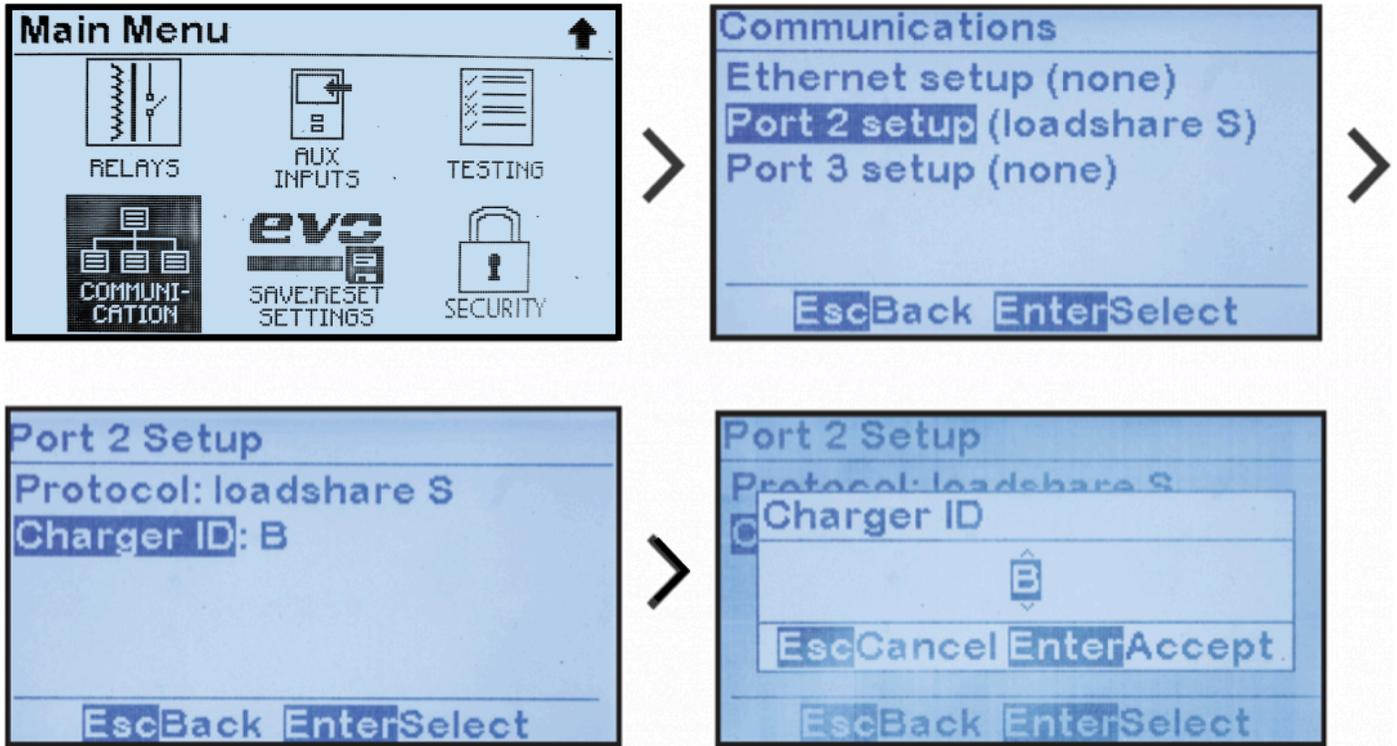


Press the EDIT/ENTER button to accept the new selection. The charger ID may now be changed. Press the ESC button to return to the previous screen. If a port setting was changed, the ATevo will prompt to RESET. Select YES to RESET the ATevo. The new port settings will not become active until after the ATevo is RESET.

To configure ATevo Load Share Charger ID:

MENU > COMMUNICATION > Port 'X' setup > Charger ID > select (A, B, C, or D)

- Typically assign Primary charger as 'A' and Secondary chargers as 'B', 'C', and 'D'
- Example below shows Secondary charger that's assigned ID 'B'.



Press the EDIT/ENTER button to accept the new selection. Press the ESC button to return to the previous screen. If a port setting was changes, the ATevo will prompt to RESET. Select YES to RESET the ATevo. The new port settings will not become active until after the ATevo is RESET.

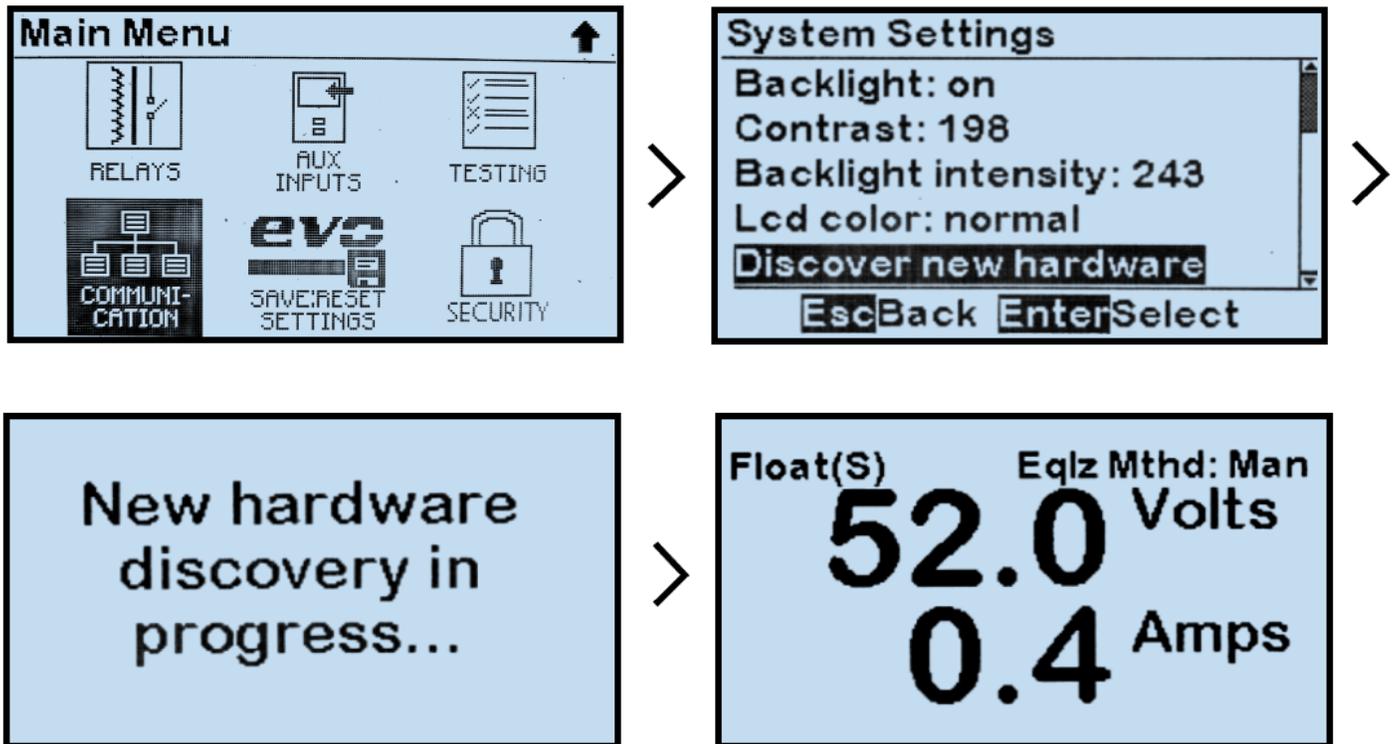
Last modified: 22 September 2023

13.5. Forced Load Sharing Operation

The Primary ATEvo runs a discovery poll each time it is reset or power-cycled. For discovery poll to work, Secondary ATEvo(s) need to be powered before the Primary.

During a discovery poll, the Primary ATEvo queries ATEvos with Charger IDs A, B, C, and D. The Primary ATEvo records the Charger ID of a responding ATEvo in its database, and immediately attempts to start sharing load with that ATEvo. Once a Primary ATEvo discovers a Secondary ATEvo, it expects it to be present the next time it is reset or power-cycled. As such, the Primary will continuously poll any previously discovered Secondary whether it is present or not. It will no longer matter which ATEvo starts up first, following a power cycle or reset.

A user can also initiate, on demand, a discovery poll on the Primary ATEvo as follows:
MENU > SYSTEM SETTINGS > discover new hardware



- As shown above, once load sharing has become active, Secondary ATEvos will show '(S)' after the charger mode. In similar manner, the Primary ATEvo will show '(P)' with the load-share indicator.
- Secondary ATEvos display the same charger mode as the Primary controlling them.

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13.5.1. Requirements to Maintain Forced Load Sharing

Several events can cause ATevos to break from Forced Load Sharing and resume independent output control:

- Communication failure between ATevos
- An ATevo is shut down
- An ATevo reports that it is not ready – which may be because of:
 - ac input failure or low ac line
 - open DC Output Circuit Breaker (CB2)
 - HLD or HVDC present

When the issue is corrected the ATevos resume load sharing and again display the load-share indicator next to charger mode.

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13.5.2. Virtual Independent Mode

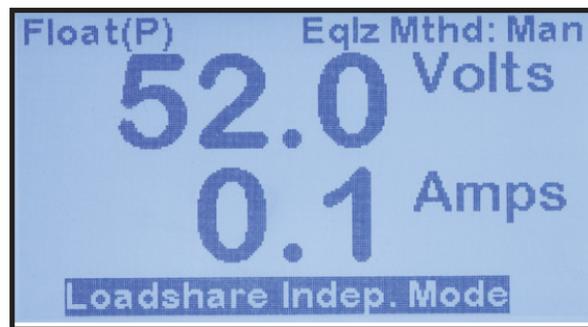
Virtual Independent Mode detects when an external dc branch breaker is opened while ATEvos are in Forced Load Sharing. ATEvos not connected to the same dc bus cannot share load.

If either of these two (2) conditions persist for more than 25 seconds, Forced Load Sharing ATEvos will go into Virtual Independent mode:

- when total load shared between ATEvos is less than 1.0 Amperes
- when output voltage of any Secondary ATEvo, that is actively sharing load, sags 1.5% under the Primary ATEvo's output voltage

This condition is cleared when the Primary ATEvo detects the total current supplied by all chargers is greater than 1.0 Ampere, and the Primary ATEvo itself is supplying at least 0.4 Amperes.

While in Virtual Independent mode, the ATEvo will display 'Loadshare Indep. Mode' on the last line of the display.



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13.5.3. Forced Load Sharing Alarms

The following alarms related to Forced Load Sharing are logged and can be configured to trigger the common alarm:

- 'Loadshare Not Ready' – displays on ATevo that is not ready to share load for reasons including no ac power, low ac power, HVDC shutdown, HLD shutdown, or open DC Breaker (CB2)
- 'Loadshare Comm Failure' – displays when an ATevo configured for Forced Load Sharing is not receiving any load share messages
- 'Loadshare Indep Mode' – indicates virtual independence between Forced Load Sharing ATevos, only reported on the Primary ATevo

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13.6. Temperature Compensation with Forced Load Sharing

The recommended practice for an ATevo Forced Load Sharing application, which uses temperature compensation, is for each ATevo to have a battery temperature probe (A10) and have temperature compensation initiated.

Last modified: 2 August 2023

13.7. Battery Open Alarm for Forced Load Sharing

The recommended practice for Forced Load Sharing which employs periodic Open Battery Testing is to only enable the test on the Primary ATevo. During load sharing, the Primary ATevo will dictate the battery open test voltage setting to all Secondary chargers when a scheduled test runs. It is always possible to manually start a Battery Open Test from a Primary or Secondary when load sharing is active.

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13.8. Timed Equalize with Forced Load Sharing

If a timed equalize is in progress, all ATEvos sharing load will depict the Equalize Time Remaining, alternating with the Volt/Ammeter display. If the ATEvos go independent while timed equalize is active, they will continue timed equalize. If a Primary ATEvo goes offline, the Secondary ATEvo will continue in equalize mode until the Primary ATEvo come back on-line. The Primary ATEvo and all Secondary ATEvos will switch back to float mode after the Primary ATEvo resets.

Last modified: 2 August 2023

13.9. Auto-Equalize with Forced Load Sharing

If desired, Auto-Equalize mode only needs to be configured on the Primary ATevo. Secondary ATevos can also enable Auto-Equalize mode, but it will only matter if the Primary ATevo is offline.

Last modified: 2 August 2023

13.10. Firmware Updates with Forced Load Sharing

The recommended order to update firmware on ATEvos sharing load is to update Secondary chargers first, and Primary chargers last. If a communications issue occurs after the upgrade, reset the Primary ATEvo or rerun discover mode on the Primary ATEvo.

Last modified: 2 August 2023

13.11. Troubleshooting Forced Load Sharing ATevos

- Ensure that at least one ATevo is configured as Primary on Port 2 or 3, and a Serial Communication Adapter (A13) is plugged into that port.
- Ensure that at least one ATevo is configured as Secondary on Port 2 or 3, and a Serial Communication Adapter (A13) is plugged into that port.
- Ensure that each Serial Communication Adapter board (A13x) used for Forced Load Sharing is configured for RS-485, and is wired correctly.
- Verify that all ATevos are communicating. The Serial Communication Adapters (A13) have a **YELLOW** and **GREEN** LED that light briefly when the ATevo is sending or receiving data respectively. These LEDs can be used to identify the problem source.
- Verify the voltage calibration of all ATevos connected in Forced Load Sharing.

Last modified: 2 August 2023

14. Maintenance

SECTION TOPICS
Performing Routine Maintenance
Ordering Replacement Parts
Replacing Defective Components

Last modified: 2 August 2023

14.1. Performing Routine Maintenance



High voltages appear at several points inside the ATevo. Use extreme caution when working inside the enclosure. Do not attempt to work inside ATevo unless you are a qualified technician or electrician.



Disconnect and lock out all power from ATevo before starting to remove or replace any components. Turn OFF ac power at the distribution panel upstream from the ATevo. Disconnect the battery from the DC Output Circuit Breaker (CB2+/-). Wait several minutes to allow voltages in dc filter electrolytic capacitors (C1x/C2) to bleed off.

14.1.1 Keeping ATevo Clean

If it should become necessary to clean this equipment, disconnect ATevo from its power sources first. Do not use liquid cleaners, aerosols, abrasive pads, scouring powders, or solvents such as benzene or alcohol. Use a soft cloth, lightly-moistened with a mild detergent solution. Let surface dry fully before reconnecting power.

At least once a year, vacuum all vented surfaces of the enclosure to ensure an adequate supply of cooling air. ATevo chargers are cooled by natural convection.

In an extremely dusty environment (especially if airborne dust is conductive), carefully vacuum out the interior. Clean the surfaces of circuit boards, and clean around electrical terminals.

ATevo is rated for operation up to 122 °F / 50 °C. If the installation is in a warmer environment, or at an elevation over 3000ft / 914m, contact your sales representative for operating information.

14.1.2 Checking Power & Signal Connections

Check the tightness of all field connections inside the ATevo, and connections to the battery. A loose or corroded connection at the battery terminals can be a fire or explosion hazard, and may cause erroneous operation of ATevo.

14.1.3 Checking Remote Sense Wiring – optional

If you wired ATevo for remote sense, check the signal connections to the battery or load, making sure insulation is in satisfactory condition. If there is a failure of the remote sense signal wiring, ATevo will generate an alarm.

14.1.4 Checking Temperature Compensation Probe – optional

If you are using the optional Temperature Compensation Probe (A10), confirm the probe is securely installed. Make sure the connectors and the wiring from the probe to ATevo are in satisfactory condition. If there is a failure of the temperature compensation probe, or the wiring, ATevo will generate an alarm.

14.1.5 Measuring Output Ripple Voltage

Measure ac ripple at the battery terminals at least once a year, using an rms responding ac voltmeter. If the battery Ampere-hour capacity is at least four (4) times the output current rating of ATevo, the ripple voltage should be no higher than the value featured in the specifications in Appendix A.

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14.2. Ordering Replacement Parts

All ATevo Series battery chargers ship with a supplemental Parts Data Package Report, itemizing all components within the unit.

Contact your sales representative to place an order for spare or replacement parts.

Please provide the following information for each component:

- model number and serial number of the ATevo battery charger
- reference designator, factory part number & description
- quantity required

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14.3. Replacing Defective Components

⚠ WARNING

High voltages appear at several points inside ATevo. Use extreme caution when working inside enclosure. Do not attempt to work inside ATevo unless you are a qualified technician or electrician.

⚠ WARNING

Disconnect and lock out all power from ATevo before starting to remove or replace any components. Turn OFF ac power at distribution panel upstream from ATevo. Disconnect battery from DC Output Circuit Breaker (CB2+/-). Wait several minutes to allow voltages in dc filter electrolytic capacitors (C1x/C2) to bleed off.

NOTICE

Printed circuit boards are sensitive to damage from static discharges. Leave replacement pc boards in anti-static bags until you are ready to install them. Ground yourself before handling board, by touching ground stud on back of door. Always handle printed circuit boards by their edges.

Each topic in this section provides instructions for replacing a different component if defective.

- [Removing Safety Shield](#)
- [Replacing Main Control Board](#)
- [Replacing Serial Communications Adapter](#)
- [Replacing Ethernet Adapter](#)
- [Replacing Rectifier / Heat Sink Assembly](#)
- [Replacing Power Board](#)
- [Replacing Auxiliary I/O Board](#)
- [Replacing Filter Capacitor Board Assembly](#)
- [Replacing Eliminator Filter Capacitor \(C2\) - optional](#)
- [Replacing Circuit Breakers](#)
- [Replacing Power Isolation Transformer](#)
- [Replacing Filter Inductors](#)
- [Replacing DC Power Supply](#)
- [Replacing MOV Surge Suppressor Board](#)

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14.3.1. Removing Safety Shield

Refer to [Section 2.2](#)

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14.3.2. Replacing Main Control Board (A1)

- See also Service Instructions ([JD5012-50](#) & [JD5077-00](#)).

Preparation:

- Shut down and lock out all power to ATevo.
- Remove optional user wiring from various printed circuit board (A1, A2, A4, etc.) terminals (TB#).

Removal of Existing Main Control Board:

- Remove ribbon cable lower-right edge of Main Control Board (A1). Board is mounted on four (4) plastic standoffs and one (1) metal ground stud.
- Remove nut from grounding stud on lower-left corner of board.
- Compress tab on each standoff, and pull board toward you until it clears all standoffs.

* If any optional serial communications boards are present (these would be located along left side of Main Control Board), they must be removed along with Main Control Board as a complete assembly. To do so, compress standoffs on each board and pull board toward you until it clears standoffs.

Installation of New Main Control Board:

- Insert replacement board onto instrument panel with same orientation, and push it onto standoffs. Confirm board is fully seated on all four (4) standoffs.
- Install nut onto grounding stud at lower-left corner of board.
- Reconnect ribbon cable at lower-right edge.
- Replace user wiring to various Main Control Board terminals.
- Restart the ATevo.

* Replacement Main Control Boards (A1) must be recalibrated. Run Hindle Health Test to check dc voltmeter accuracy. If installation's parameters (float voltage, etc.) are different from ATevo factory preset values, these values will need to be re-entered or restored via SD memory card.

Last modified: 2 August 2023

14.3.3. Replacing Serial Communications Adapter (A1#)

To replace any Serial Communications Adapters (A12 or A13), refer to [Section 14.3.2](#) for Replacing the Main Board (A1). The Main Control Board (A1) must be removed to replace a Serial Communications Adapter board.

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14.3.4. Replacing Ethernet Adapter (A22)

To replace the Ethernet Communications Adapter (A22). Refer to [Section 14.3.2](#) for Replacing the Main Control Board (A1). The Main Control Board (A1) must be removed to replace the Ethernet Communications Adapter board.

Last modified: 2 August 2023

14.3.5. Replacing Rectifier / Heat Sink Assembly (A6)

- See also Service Instructions ([JD5076-00](#) & [JD5076-01](#))

Preparation:

- Shut down and lock out all power to ATevo.
- Remove safety shield.
- Disconnect the battery and dc load(s) from the DC Output Circuit Breaker (CB2 +/-).
- Check with a voltmeter before proceeding.
- Make sure rectifier/heat sink assembly (A6) has cooled.

Removal of Existing Rectifier:

- Disconnect wires and ribbon cable from Power Board rectifier assembly.
- Remove two (2) bolts securing rectifier assembly at top and bottom of heat sink extrusion.
- Pull rectifier assembly straight out toward front of assembly.
- Remove four (4) screws that attach Power Board to assembly.
- Remove screw that attaches Filter Board to assembly.
- If an Auxiliary I/O Board is present, remove four (4) screws that attach it to assembly.
- Lift and remove all boards from heat sink assembly and rectifier assembly.

Installation of New Rectifier:

- Plug removed boards onto new heat sink and rectifier assembly.
- Make sure all spade connections on bottom of Power Board (A2) are correctly seated on new rectifier.
- Replace all board mounting screws.
- Insert new (replacement) rectifier assembly into enclosure.
- Install mounting bolts on top and bottom of heat sink extrusion.
- Reconnect wires to rectifier and Power Board (A2).
- Replace safety shield and close front panel door.
- Restart ATevo.

Last modified: 12 September 2023

14.3.6. Replacing Power Board (A2)

To replace the Power Board (A2), refer to [Section 14.3.5](#) for Replacing Rectifier / Heat Sink Assembly. The Heat Sink Assembly (A6) must be removed in order to replace the Power Board.

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14.3.7. Replacing Auxiliary I/O Board (A4)

Preparation:

- Shut down and lock out all power to ATevo.
- Remove safety shield.
- Disconnect the battery and dc load(s) from the DC Output Circuit Breaker (CB2 +/-).
- Check with a voltmeter before proceeding.



Wires connected to the Relay Outputs (A4-TB4), Binary Inputs (A4-TB1), and Analog Inputs (A4-TB3) may still have wetting voltages or signal voltages present.

Removal of Existing Auxiliary I/O Board:

- Analog Inputs terminals (A4-TB3) and Binary Inputs terminals (A4-TB1) are removable. If any wires are present on these terminals, pull the terminal blocks out of their sockets.
- Remove wires connected to Relay Output terminal block (A4-TB4).
- Remove (4) screws that connect Auxiliary I/O Board (A2) to Heat Sink Assembly (A6).
- Remove Auxiliary I/O Board (A4) from Rectifier / Heat Sink Assembly (A6) by pulling it forward, toward front of ATevo.

Installation of New Auxiliary I/O Board:

- Align header socket at top right of Auxiliary I/O Board (A4) with header pins on Power Board (A2).
- Push Auxiliary I/O Board onto header pins of Power Board and align (4) mounting holes with standoffs on Heat Sink Assembly.
- Install (4) mounting screws through board and into standoffs.
- Replace safety shield, close front panel door.
- Restart ATevo.

Last modified: 2 August 2023

14.3.8. Replacing Filter Capacitor Board Assembly (A7 or C1x)

For ATevo models rated 16-50 Adc, the Filtering Assembly (A7) consists of a capacitor bank (C1x) and bleed resistors (R9x), mounted on a printed circuit board. Models rated 75-100 Adc, feature discrete blue electrolytic filter capacitor 'cans' (C1x).

Preparation:

- Shut down and lock out all power to ATevo.
- Wait several minutes to allow internal voltage potentials in capacitors to bleed off.
- Remove safety shield, and check with a voltmeter.

For ATevo models rated 16-50 Adc:

- See also Service Instruction ([JD5078-00](#)).
- Along left side of ATevo, locate the Filter Capacitor Board (A7) assembly on top of heatsink, above power board and rectifier.

Removal of Existing Board:

- Remove two (2) nuts from studs connecting Power Board (A2) to capacitor board.
- Remove one (1) screw at top-center of Filter Board.
- Remove existing capacitor board assembly.

Installation of Replacement Board:

- Place new Filter Board (A7) onto studs of Power Board, and replace two (2) nuts and one (1) screw.
- Replace safety shield, and close front panel door.
- Restart ATevo.

For ATevo models rated 75-100 Adc:

- See also Service Instruction ([JD5078-01](#)).
- Locate the C1 discrete capacitor can(s) near the top-left of the enclosure.

Removal of Existing Capacitor (C1x) Assembly:

- Remove the screws attaching the capacitor to connection wires and/or bus bar.
- Loosen the screw on the capacitor bracket at the bottom of the capacitor mounting.
- Make note of polarization \pm of the capacitor screw terminals.
- Remove capacitor(s) from bracket(s).

Installation of New C1 Capacitor Assembly:

- Place new capacitor(s) into brackets maintaining the same polarity as the one(s) removed.
- Tighten the screw(s) on the capacitor bracket(s).
- Reconnect the connection wires and/or bus bars in the same location using the capacitor terminal screws.
- Replace safety shield, and close front panel door.
- Restart ATevo.

Last modified: 12 September 2023

14.3.9. Replacing Eliminator Filter Capacitor (C2) – optional

Preparation:

- Shut down and lock out all power to ATevo.
- Wait several minutes to allow internal voltage potentials in capacitors to bleed off.
- Remove safety shield and check with a voltmeter.

For ATevo models rated 16-50 Adc:

The eliminator filter (C2) consists of a single electrolytic capacitor, with two (2) wires connected directly to the Power Board (A2).

- See also Service Instruction ([JD5078-02](#)).
- Locate the 'blue can' capacitor (C2) at back-left of ATevo:
 - Style-5054: secured to bottom base with two (2) nylon zip ties
 - Style-5070: mounted to top base with a clamping bracket

Removal of Existing Capacitor (C2x) Assembly:

- Clip nylon zip tie, or loosen screw on clamping bracket.
- Disconnect wires (attached to C2 eliminator capacitor) from Power Board (A2). Replacement C2 capacitor assembly will have new wires with pre-crimped terminals.
- Remove existing wired eliminator capacitor.

 The pos(+) and neg(-) wires have different terminals to eliminate the possibility of connecting in reverse polarity.

Installation of NEW C2 Capacitor Assembly:

- Connect wires of new C2 capacitor assembly to Power Board.
- Secure new (replacement) C2 capacitor to ATevo base in same location and manner as one removed above.
- Replace safety shield, and close front panel door.
- Restart ATevo.

For ATevo models rated 75-100 Adc:

The C2 filter is mounted next to the C1 filter capacitor(s), and connects to the C1 capacitor with a bus bar.

- See also Service Instruction ([JD5078-03](#)).

Follow instructions in [Section 14.3.8](#), for replacing both C1 and C2 caps together.

Last modified: 12 September 2023

14.3.10. Replacing Circuit Breakers (CB1/CB2)

- * Procedure is the same for both AC Input Circuit Breaker (CB1) and DC Output Circuit Breaker (CB2).

Preparation:

- Shut down and lock out all power to ATevo.
- Remove safety shield.
- Check with a voltmeter before proceeding.
- Remove wires on both sides of circuit breaker, noting polarity.

For Standard kAIC Breakers:

- Remove four (4) screws on front of breaker bracket and remove breaker.
- Place new breaker in same orientation and replace four mounting screws.
- Reconnect wires with same polarity as removed breaker.

For Medium or High kAIC Breakers:

- Breakers are mounted to a breaker bracket via (2) screws and nuts. Screws are along centerline of breaker between lugs on left and right side of breaker. Nuts are on back of breaker bracket.
- Remove nuts from back of breaker bracket and pull breaker toward you, off of breaker bracket.
- Remove screws from breaker and insert them into new breaker.
- Position new breaker onto breaker bracket and install nuts on back of breaker bracket.
- Reconnect wires with same polarity as removed breaker.
- Replace safety shield and close front panel door.
- Restart ATevo.

Last modified: 12 September 2023

14.3.11. Replacing Power Isolation Transformer (T1)

Preparation & Existing Transformer Removal for All ATevos:

- Shut down and lock out all power to ATevo.
- Allow internal voltage potentials (and **heat**) to dissipate.
- Remove safety shield.
- Disconnect battery from DC Output Circuit Breaker (CB2+/-).
- Check with a voltmeter before proceeding, including any installed remote sense wires.

Transformer Removal

- Remove enclosure shroud.
- Disconnect Transformer (T1) wires at Power Board lugs (A2-X1 and A2-X4).
- Disconnect T1-Y1 and T1-Y2 transformer wires at Power Board (A2) terminal block.
- Disconnect MOV Board (A9) from H1 and H5 primary leads, by removing two (2) screws that connect H1 and H5 lugs to MOV Board (A9).
- Disconnect H1 and H5 primary wires from AC Input Breaker (CB1).



Transformer (T1) is extremely heavy. Be prepared to support its weight before proceeding.

- Remove hardware at corners of transformer mounting plate.
- Carefully lift transformer off and out of enclosure.

New Transformer Installation:

- Position new transformer in same orientation existing, making sure mounting holes in plate align with holes in enclosure.
- Reinstall hardware in corners of transformer mounting plate.
- Route H1 and H5 primary wires to AC Circuit Breaker (CB1), making sure lugs for MOV connection align with bolt holes in MOV board (A9).
- Install two (2) screws through lugs that connect MOV Board (A9) to primary wires, and tighten nuts.
- Insert ends of H1 and H5 primary wires into AC Input Breaker (CB1), and tighten compression lugs.
- Route X1 and X4 secondary wires from transformer to X1 and X4 lugs on Power Board.
- Insert wires into lugs and tighten lugs.
- Route Y1 and Y2 wires from transformer to terminal block on Power Board (A2).
- Install wires into terminal block and tighten screws.
- Replace safety shield, and close front panel door.
- Restart ATevo.

Last modified: 12 September 2023

14.3.12. Replacing DC Power Supply (P/S-A2)

Steps:

- Shut down and lock out all power to ATevo.
- Remove safety shield.
- The 9V DC Power Supply Board (P/S-A2) is plugged onto the bottom-center of Power Board (A2), directly below the L2-2 lug.
- Gently pull the DC Power Supply Board off of the Power Board.
- Align the two (2) header sockets (on bottom of the replacement DC Power Supply Board) with the J101 and J102 header pin strips on the existing Power Board.
- Gently press the new DC Power Supply Board (P/S-A2) onto Power Board (A2) until it mates.
- Replace safety shield, and close the front panel door.
- Restart ATevo.

Last modified: 12 September 2023

14.3.13. Replacing MOV Surge Suppressor Board (A9)

- For Style-5054, see also Service Instruction ([JD5079-00](#))
- For Style-5070, see also Service Instruction ([JD5079-01](#)).

Steps:

- Shut down and lock out all power to ATevo.
- Remove safety shield, and check with a voltmeter.
- Locate the MOV Board (A9):
 - Style-5054: bolted to top-left side of circuit breaker bracket
 - Style-5070: mounted to center I/O panel
- Remove the two (2) screws that connect the Transformer (T1) primary wire lugs to the MOV Board (A9).
- Loosen mounting hardware, and remove old MOV Board.
- Install new (replacement) MOV Board (A9) onto breaker bracket.
- Reinstall mounting hardware to secure MOV Board to bracket.
- Reconnect Transformer (T1) primary wires to MOV Board (A9).
- Reinstall two (2) screws through lugs, and tighten nuts.
- Replace safety shield, and close front panel door.
- Restart ATevo.

Last modified: 12 September 2023

15. Appendices & Drawings

APPENDICES
Appendix A - Specifications
Appendix B - Documentation & Drawings
Appendix C - Document Control Information

Last modified: 3 August 2023

15.1. Appendix A – Specifications

 Except as noted, all specifications apply at 77 °F / 25 °C, nominal ac line voltage & nominal float voltage.

Table 1 – Specifications

Specification	Conditions	24 Vdc	48 Vdc	130 Vdc	260 Vdc
Industry Standards (designed to)	standard applications	IEEE 2405-2022 NEMA PE-5			
Agency Listings (labeled)	standard features & options	CSA C22.2 UL 1012 UL 1564			
Output Voltage Regulation	Vac +10%, -12% 0 to 100% load frequency 60 ± 3 Hz (0 to 122 °F / -18 to 50 °C)	± 0.25% (see product literature for specific data)			
Transient Response	10-90% load change, with battery connected	(per NEMA PE-5)			
Output Ripple Voltage	Filtered (with battery, at battery terminals)	30 mV	30 mV	100 mV	200 mV
	Filtered (without battery)	1% rms		2% rms	
	Eliminator (without battery)	30 mV	30 mV	100 mV	200 mV
	Special 30mV Eliminator Filter (with 130V battery)	n/a	n/a	30 mV	n/a
Current Limit	Adjustable	50-110% of rated output current			
Soft Start	0 to 100% Load	4 seconds			
Surge Withstand Capability	test per ANSI C37.90.1-1989	no erroneous outputs			
Reverse Current from Battery	ac input power failure	(tbd)			
Audible Noise	average for four (4) sides, 5 ft / 1.5m	less than 65 dBA			

	from enclosure	
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Table 2 – Specifications, Continued

Specification	Conditions	24 Vdc	48 Vdc	130 Vdc	260 Vdc
Environment	cooling	natural convection for (6-25Adc) & (15-100Adc)			
	ambient temperature	operating 0 to 122 °F / -18 to 50 °C			
	elevation	3000 ft / 1000m without de-rating			
	relative humidity	0 to 95% non-condensing			
	pollution degree	PD2			
	installation category	Category III			
	ingress	NEMA Type 1 (standard)			
Alarm Relay Contact Rating	120 Vac	0.5 A resistive			
AC Input Voltage	(value on nameplate)	+10%, -12% (of nominal)			
Efficiency	16-25 Adc rating, full load (%)	n/a	n/a	n/a	92.3%
	30-50 Adc rating, full load (%)	82.2%	88.7%	92.7%	n/a
	75 Adc rating, full load (%)	74.7%	82.5%	92.7%	n/a
	100 Adc rating, full load (%)	74.7%	82.5%	n/a	n/a

Last modified: 12 September 2023

15.2. Appendix B – Documentation & Drawings

The manufacturer of ATevo Series Microprocessor-controlled float battery chargers maintains a brand-agnostic web site to support this product.

<http://www.atseries.net/ATevo/>

It stores in Adobe Acrobat (*.pdf) format, the latest revisions of user documentation, including:

- [Manuals & Technical Documents](#)
- [Complete Standard Drawings Binders](#)

Last modified: 3 August 2023

15.2.1. Manuals & Technical Documents

Manufacturer's Technical Documents

- [JF5061-00](#) ATevo Battery Charge Product Sample Specification
- [JF5054-00](#) ATevo Battery Charger Sales Brochure / Cut Sheet
- [JF5072-01](#) ATevo 1PH AC Input Current / Circuit Breaker Values
- [JF5001-00](#) ATevo Battery Charger Standard Product Warranty

Operating & Service Instruction Manuals

- [JA0102-52](#) ATevo 1PH Group II (16-100 Adc) - this document
- [JA5124-01](#) ATevo Firmware (latest) Addendum
- [JA0102-51](#) ATevo 1PH Group I (6-25 Adc)
- [JA0102-53](#) ATevo 3PH (16-1000 Adc)

Supplemental / Option Instructions

- [JA0102-54](#) ATevo Communications (for SCADA systems)
- [JA5015-51](#) ATevo Temperature Compensation
- [JA5054-50](#) ATevo Forced Load Sharing (parallel operation)
- [JA5124-03](#) ATevo AC Input Metering Module
- [JA5124-07](#) ATevo Battery Shunt (charge / discharge meter & alarm)
- [JA5124-08](#) ATevo Dynamic Current Limit
- [JA5124-09](#) ATevo Everything To Know About Grounding
- [JA5136-00](#) ATevo HindleHealth+ (smart battery shunt)

Service Instructions / Application Notes (more online)

- [JC5020-51](#) ATevo Quick Setup Sheet
- [JD0064-51](#) ATevo Startup Procedure
- [JD5011-00](#) AT External Relay Free-Wheeling Diode Application Note
- [JD5026-52](#) ATevo 1PH G2 Transformer Re-Tapping
- [JD5032-00](#) Ground Fault Detection In The Real World

Last modified: 12 September 2023

15.2.2. Complete Standard Drawings Binders

To simplify access to ATevo standard drawings, multi-sheet PDF binders have been compiled for 1PH Group II models - each of which begins with **JH00##-##..**

For Style-5054 enclosure	JH0011-22	JH0011-26	
For Style-5070 enclosure	JH0011-23	JH0011-24	JH0011-25

They can be accessed via hyperlinks in the table below.

Links to Standard Drawing Binders – By Output Voltage, Ampere Rating, and Enclosure Style

Output Voltage	Ampere Rating				
	30 ADC	40 ADC	50 ADC	75 ADC	100 ADC
24 VDC	JH0011-22	JH0011-22	JH0011-22	JH0011-24	JH0011-24
48 VDC	JH0011-22	JH0011-22	JH0011-22	JH0011-24	JH0011-24
130 VDC	JH0011-26	JH0011-23	JH0011-23	JH0011-24	N/A
	16 ADC	25 ADC	30 ADC	50 ADC	100 ADC
260 VDC	JH0011-25	JH0011-25	N/A	N/A	N/A

The individual drawings featured in these binders include:

- Enclosure Outline Drawings
- Internal Component Layout Drawings
- Control Panel / PC Board Detail Drawings
- Electrical Schematics
- Connection (Wiring) Diagrams

 To supplement the following ‘standard’ drawings, a customized record drawing package is available for every 1PH Group II ATevo battery charger. This set of documents features a unit-specific drawing list / data nameplate detail, enclosure outline, itemized internal component layout, electrical schematic with component ratings, and a full connection diagram. Contact your Sales Representative for drawing availability from the battery charger manufacturer.

Last modified: 18 September 2023

15.3. Appendix C – Document Control Information

Revision Numbers: Document and Page

Document revisions are controlled by the application which was used to produce this online manual which is found at <https://www.manula.com>. The revision number for this site is displayed in the header for all pages.

Each page of the manual may be revised by the manufacturer on a regular basis in order to provide customers updated information in a timely manner. The revision date of each page is shown in the footer of each page.

Parts Data Package

A job-specific customized Parts Data Package report is supplied with every shipped ATevo battery charger. The data listed in this report supercedes any information featured in product literature, standard documentation, and/or quote documents. The parts and quantities listed are applicable only to the battery charger featuring the same serial number listed on the Parts Data Package report.

Drawings

A customized record drawing package is available for any ATevo, featuring a unit-specific drawing list / data nameplate detail, outline drawing, itemized internal component layout, electrical schematic with component ratings, and a full connection diagram. If the standard drawings featured in this manual are not sufficient, please contact your sales representative for drawing availability from the battery charger manufacturer.

Any job-specific custom drawings supplied with an ATevo supercede the standard drawings featured in the manual. The standard drawings featured in the manual may not be included with custom printed manuals, when job-specific custom drawings are supplied.

Online Availability of Related Information

Other related product operating manuals, feature and accessory special instructions, standard drawings (including the ones listed in this manual), field service instructions, and product application notes for the AT Series microprocessor- controlled battery chargers and battery charger products are available online at <http://www.ATSeries.net/>. Saved in Adobe Acrobat Portable Document Format (PDF), they are readily available for downloading and printing.

If revision levels differ between the drawings embedded in this manual and the full online PDF drawings, refer to document with the higher revision level. For document availability of private-

labeled manuals and/or standard drawings, please contact your sales representative.

Last modified: 3 August 2023

16. Firmware v2.7.0 Enhancements

Firmware v2.7.0 for ATevo brings enhanced new features. Click on each of the links below to learn more:

- [Alarm Triggers](#)
- [Disable Equalize](#)
- [Menu Changes](#)

For more information about how to upgrade firmware, see either [Section 6.5.4](#) or [6.5.5](#), depending on the ATevo product you purchased:

- [Originally supplied with firmware v2.6.6 or earlier](#)
- [Originally supplied with firmware v2.7.0 or later](#)

Last modified: 3 August 2023

16.1. Alarm Triggers

The Evo charger always had the user configurable “Common Alarm”. New alarms named “High Priority Alarm” and “Low Priority Alarm” are now available to a user who wishes to further customize alarm priority. These alarms can be configured to close a relay on an AUX I/O and are also readable over SCADA. Configuration is enhanced to accommodate selecting the triggers for these new alarms in the same menu that the common alarm is configured.

V2.6.6



Common Alarm Faults

High DC Voltage

Low DC Voltage

AC Input Failure

Pos gnd fault warning

Neg gnd fault warning

EscBack EnterToggle

V2.7.0



Alarm Trigger Configuration

Common Alarm

High Priority Alarm

Low Priority Alarm

EscBack EnterSelect

Common Alarm Triggers

AC input failure

Ambient temp probe fail

Current limit

DC output failure

DC short circuit

EscBack EnterToggle

Firmware prior to v2.7.0 navigated directly to common alarm configuration. Firmware v2.7.0 now navigates to a menu that allows a user to select one of the three “aggregate” alarms to configure. The lower right display shown is typical when “Common Alarm” has been selected. “High Priority Alarm” and “Low Priority Alarm” displays are similar. Also new in v2.7.0 is that alarms are listed in alphabetical order. In addition, alarm types that depend on optional hardware are only displayed if

the respective option is installed. Examples are “Battery overtemp” and “Battery temp probe fail”; these are visible only if a battery temperature probe is installed and enabled.

For more information about how to upgrade firmware, see either [Section 6.5.4](#) or [6.5.5](#), depending on the ATevo product you purchased:

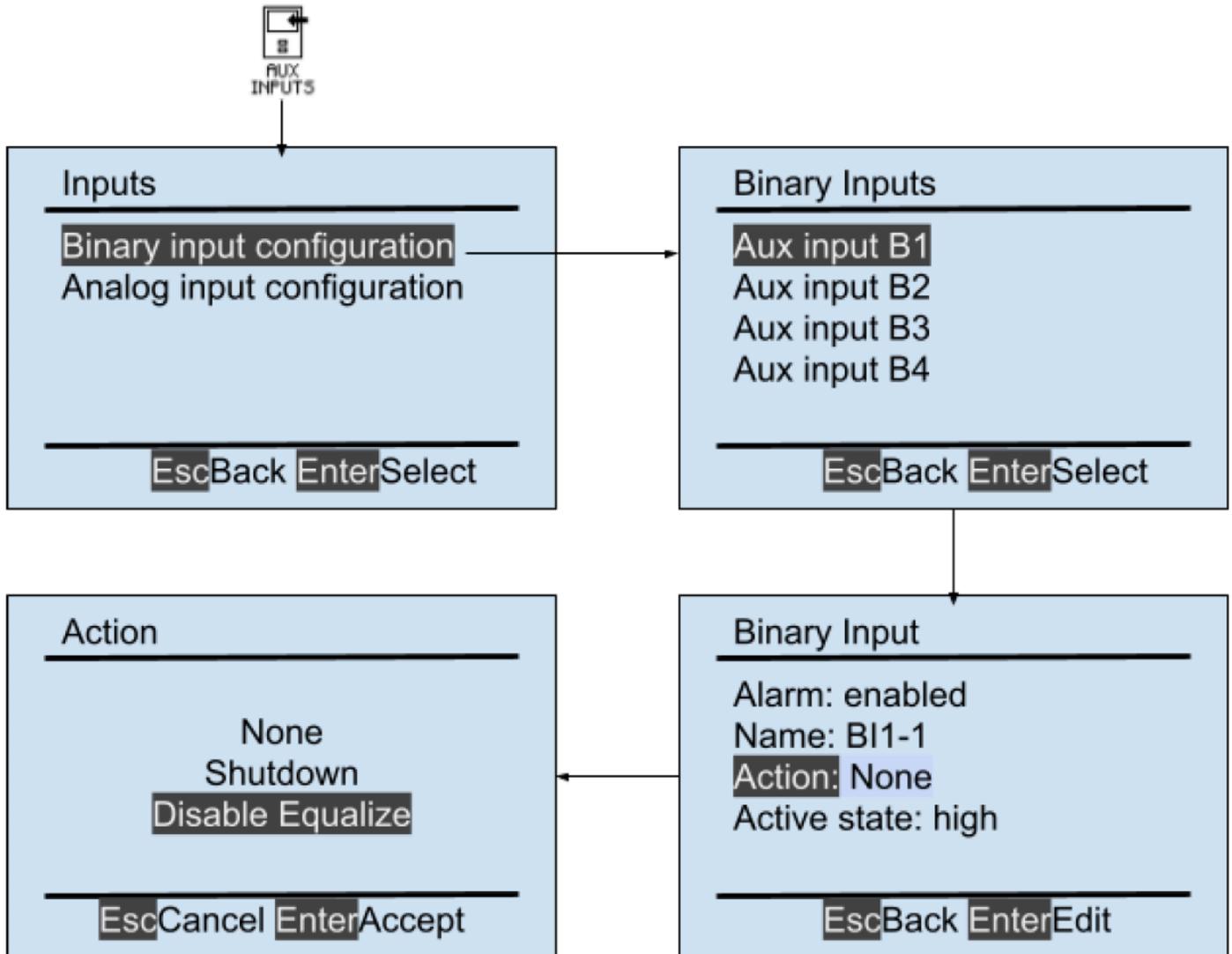
- [Originally supplied with firmware v2.6.6 or earlier](#)
- [Originally supplied with firmware v2.7.0 or later](#)

Last modified: 3 August 2023

16.2. Disable Equalize

Disables the EQUALIZE output voltage mode which attempts to equalize the voltage among battery cells. This action can be triggered by either a binary or analog input. An example use-case for this feature would be when an aux input connected to a hydrogen sensor fires a 1% Hydrogen Alarm, this input can disable the EQUALIZE charging.

This is presented as a new selection under the AUX INPUTS menu as an “Action” for either a [binary input](#) or an [analog input](#), as seen in the figure below.

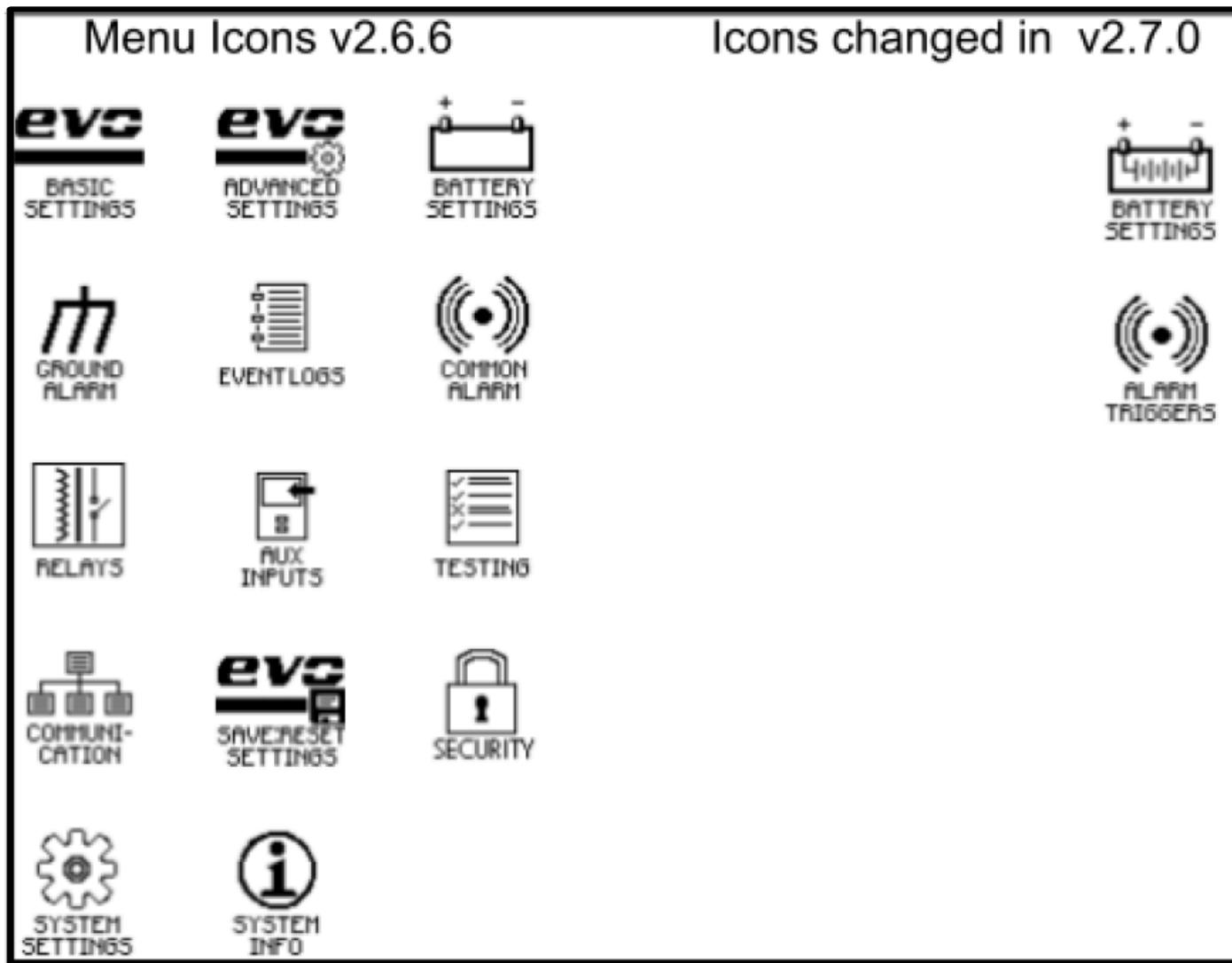


For more information about how to upgrade firmware, see either [Section 6.5.4](#) or [6.5.5](#), depending on the ATevo product you purchased:

- [Originally supplied with firmware v2.6.6 or earlier](#)
- [Originally supplied with firmware v2.7.0 or later](#)

16.3. Menu Changes

For clarification and to accommodate the new features mentioned above.



For more information about how to upgrade firmware, see either [Section 6.5.4](#) or [6.5.5](#), depending on the ATevo product you purchased:

- [Originally supplied with firmware v2.6.6 or earlier](#)
- [Originally supplied with firmware v2.7.0 or later](#)

Last modified: 3 August 2023

17. Safety Instructions

Please read and follow all Safety Instructions to avoid equipment damage, serious injury, or accidental death.

	SECTION TOPICS
	Safety Symbols
	Equipment Misuse
	DANGER
	WARNING
	CAUTION

Last modified: 10 May 2023

17.1. Safety Symbols

! SAFETY INSTRUCTIONS - PLEASE READ AND FOLLOW TO AVOID SERIOUS INJURY OR DEATH

SYMBOL	MEANING
	<p>Imminently hazardous situation, which if not avoided, WILL result in death or serious injury.</p>
	<p>Potentially hazardous situation, which if not avoided, could result in death or serious injury.</p>
	<p>Potentially hazardous situation, which if not avoided, could result in minor or moderate injury (e.g. minor burns, bruising from pinch points, minor chemical irritation). May also be used to alert against unsafe practices.</p>
	<p>Important information not related to personal injury (e.g. messages related to equipment or property damage).</p>
	<p>LOCKOUT TAGOUT is required before servicing.</p>
	<p>VENTILATION MANDATORY. Maintain at least 6in / 152mm of free air on all vented surfaces for cooling. Allow sufficient clearance to open front panel for servicing.</p>
	<p>Refer to manual.</p>
	<p>SAFETY ALERT. Indicates that a hazardous situation exists. TO REDUCE RISK OF INJURY OR DEATH, refer to accompanying documents, and follow all steps or procedures as instructed.</p>
	<p>DANGEROUS HIGH VOLTAGE inside product enclosure. TO REDUCE RISK OF FIRE OR ELECTRIC SHOCK, do not attempt to open enclosure or gain access to areas where you are not instructed to do so. SERVICING IS TO BE DONE ONLY BY QUALIFIED SERVICE PERSONNEL.</p>
	<p>Allow at least 3 minutes for internal components to discharge to a safe level after performing lockout tagout to prevent exposure to DANGEROUS HIGH VOLTAGE.</p>

	DANGER! Risk of Arc Flash (only for ATevo units with input voltage over 416 Vac)
	EXPLOSIVE GAS can be produced from batteries during normal operation. Never smoke, use an open flame, or create arcs in the vicinity of the ATevo or the battery.
	Do not operate equipment without all guards and/or covers in place.

Last modified: 10 May 2023

17.2. Equipment Misuse

! Use of equipment in a manner not specified by manufacturer may impair protection provided by the ATevo and result in **SERIOUS INJURY OR DEATH**

SYMBOL	EXAMPLE
	Do not use the equipment for any purpose not described in this manual.
	Do not operate this equipment without all guards and covers in place.
	Do not operate this equipment from any power source that does not match voltage rating stamped on equipment. Refer to Manufacturer's Identification Label for operational requirements.

Last modified: 10 May 2023

17.3. DANGER

⚠ DANGER

! Imminently hazardous situation, which if not avoided, WILL result in death or serious injury.

SYMBOL	INSTRUCTION
	Do not touch any uninsulated parts of ATevo, especially the input and output connections, as there is the possibility of electrical shock.
 	During normal operation, batteries may produce EXPLOSIVE GAS! Never smoke, use an open flame, or create arcs in the vicinity of ATevo, or the battery.

Last modified: 10 May 2023

17.4. WARNING



! Potentially hazardous situation, which if not avoided, could result in death or serious injury.

SYMBOL	INSTRUCTION
	Do not install ATevo outdoors, or in wet or damp locations, unless specifically equipped for that environment.
	Remove all jewelry, watches, rings, etc. before proceeding with installation or servicing to avoid electrical shock hazards.
	Do not operate ATevo with any power source that does not match the specified ac and dc voltage ratings. Refer to the data nameplate decal affixed to the outside panel for operational requirements.
	Do not operate ATevo with the safety shield or any other supplied guards removed or improperly installed.
	Do not operate ATevo if it has been damaged in any way. Refer to qualified service personnel.
	Before using ATevo, read all instructions and cautionary markings on: a) this equipment, b) battery, and c) any other equipment to be used in conjunction with ATevo
	Do not use ATevo for ANY purpose not described in this manual.
	Turn OFF ATevo before connecting or disconnecting the battery to avoid electrical shock hazards, arcing, burning, and/or equipment damage.
	De-energize and lock out all ac and dc power sources to ATevo before servicing.



Do not disassemble ATevo. Only qualified service personnel should attempt repairs. Incorrect reassembly could result in explosion, electrical shock or fire.

Last modified: 10 May 2023

17.5. CAUTION



! Potentially hazardous situation, which if not avoided, could result in minor or moderate injury (e.g. minor burns, bruising from pinch points, minor chemical irritation). May also be used to alert against unsafe practices.

SYMBOL	INSTRUCTION
	Maintain at least 6in / 152mm of free air on all vented surfaces for cooling. Allow sufficient clearance to open the front panel for servicing.
	This manual contains important safety and operating instructions, and therefore should be filed for easy access.

Last modified: 10 May 2023

18. Warranty

JF5001-00

Access the hyperlink above for a portable document format (PDF) of the ATevo manufacturer’s standard 5-Year Warranty.

FIVE-YEAR WARRANTY



[applies only to product(s) delivered within United States and Canada]

Product Details:

Battery Charger Model:
 Factory Ordering Code:
 Battery Charger Serial Number:
 Date Shipped:
 Date Energized:

Standard Warranty

This product is warranted to be free from defects in material and workmanship for a period of five (5) years from date of manufacture.

During the term of the warranty period: parts, assemblies, or components deemed to be defective will be repaired or replaced at the manufacturer’s option, free of charge. All costs related to removal, reinstallation and transportation will be paid by the purchaser/ customer and/or operator of the product. Evaluation, repair and/or replacement of any defective part(s) are FOB manufacturer’s factory.

This warranty does not cover products or parts that are damaged from improper use or abuse, as determined by the manufacturer. Accessory items or additional items carry only their respective manufacturer's warranty. Consumable items (such as fuses and electrolytic capacitors), which wear out under normal use are specifically not covered by this standard warranty. Any consequential damage due to diagnosis or repair by any party other than the manufacturer's authorized personnel is not covered under this warranty.

❑ **Extended Spare Parts Warranty**

The manufacturer's extended warranty includes all items as mentioned in the 'Standard Warranty' as previously listed, plus reasonable in/ out freight costs related to a warranty claim for parts. Said freight cost is based on either standard UPS rates or common carrier only, as appropriate. Contact your sales representative for more information & pricing regarding the extended spare parts warranty.

❑ **Magnetic Parts 25-Year Extended Warranty (equal to 5% of the original purchase price)**

Lifetime warranty (limited to 25 years from date of shipment) covers battery charger major electromagnetic components (T1 transformer, L1 inductor & L2 inductor) as applicable. Coverage is for 100% replacement of any covered magnetic component that fails during normal use. Abuse, neglect, and damage from outside sources or improper application will make this warranty null and void. The manufacturer reserves the right to make final determination regarding the application of this warranty. The manufacturer will be responsible for costs related to inbound and outbound freight of warranted magnetic components (T1, L1 & L2).

Freight cost is based on standard UPS rates or common carrier only, as appropriate. Costs related to removal and/or reinstallation of warranted magnetic components will be the responsibility of the purchaser/customer and/or operator of the product. Contact your sales representative for more information & pricing regarding the magnetic parts extended warranty.

NOTICE - *Requests for returns or warranty claims must be made via manufacturer's Return Material Authorization (RMA) instructions and assignment. Contact your sales representative for more information & pricing regarding returns or warranty claims. Returns that do not follow this procedure will not be honored.*

Election to any of the above offered extended warranties must be done within the terms of the initial standard warranty.

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