HINDLEPOWER

ATevo SERIES BATTERY CHARGER

ATevo

HINDLE HEAL+H SYSTEM
PRODUCT

OPERATING & SERVICE INSTRUCTIONS

Microprocessor-Controlled Float Battery Charger
SINGLE PHASE INPUT
GROUP I - 6-25 Adc OUTPUT

JA5011-51

User Notes

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).

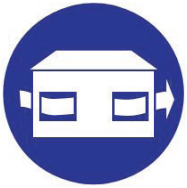
Freight cost is based on standard UPS rates or common carrier only, as appropriate. Costs related to removal and/or reinstallation of warranted magnetic components will be the responsibility of the purchaser/customer and/or operator of the product. Contact your sales representative for more information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

SAFETY INSTRUCTIONS

PLEASE READ AND FOLLOW TO AVOID SERIOUS INJURY OR DEATH

EQUIPMENT/MANUAL SAFETY WARNINGS	
WARNING	**MEANING**
⚠ DANGER	Imminently hazardous situation, which if not avoided, WILL result in death or serious injury.
⚠ WARNING	Potentially hazardous situation, which if not avoided, could result in death or serious injury.
⚠ 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.
NOTICE	Important information not related to personal injury (e.g. messages related to equipment or property damage).
	LOCKOUT TAGOUT is required before servicing.
	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.

SAFETY INSTRUCTIONS

PLEASE READ AND FOLLOW TO AVOID SERIOUS INJURY OR DEATH

EQUIPMENT/MANUAL SAFETY WARNINGS	
WARNING	**MEANING**
	Refer to manual.
	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.
	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.
	Allow at least three (3) minutes for internal components to discharge to a safe level after performing lockout tagout to prevent exposure to DANGEROUS HIGH VOLTAGE.

SAFETY INSTRUCTIONS

PLEASE READ AND FOLLOW TO AVOID SERIOUS INJURY OR DEATH

EQUIPMENT/MANUAL SAFETY WARNINGS	
WARNING	**MEANING**
	**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.

SAFETY INSTRUCTIONS

PLEASE READ AND FOLLOW TO AVOID SERIOUS INJURY OR DEATH

Use of equipment in a manner not specified by manufacturer may impair protection provided by ATevo.

EXAMPLES OF EQUIPMENT MISUSE	
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.

⚠ DANGER

1. Do not touch any uninsulated parts of ATevo, especially the input and output connections, as there is the possibility of electrical shock.
2. 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.

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

⚠WARNING

1. 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
2. Do not use ATevo for ANY purpose not described in this manual.
3. Do not install ATevo outdoors, or in wet or damp locations, unless specifically equipped for that environment.
4. 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.
5. Turn OFF ATevo before connecting or disconnecting the battery to avoid electrical shock hazards, arcing, burning, and/or equipment damage.
6. Do not operate ATevo with the safety shield or any other supplied guards removed or improperly installed.
7. Do not operate ATevo if it has been damaged in any way. Refer to qualified service personnel.
8. De-energize and lock out all ac and dc power sources to ATevo before servicing.
9. Do not disassemble ATevo. Only qualified service personnel should attempt repairs. Incorrect reassembly could result in explosion, electrical shock or fire.
10. Remove all jewelry, watches, rings, etc. before proceeding with installation or servicing to avoid electrical shock hazards.

⚠CAUTION

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

TABLE OF CONTENTS (1PH 6-25 Adc - Group I)

* **NOTICE** To supplement the 'standard' drawings in Appendix B, a ***customized*** record drawing package is available for ***every*** ATevo 1PH Group 1 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.

1.1 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.

1.2 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 (per Section 1.3), and report issues found (per Section 1.4).

1.3 Unpacking and Inspecting ATevo

Carefully remove all shipping materials, but save until you are sure ATevo is undamaged. Remove ATevo from shipping pallet. Inspect unit for possible damage, using checklist below. If damage found, refer to Section 1.4 for proper reporting.

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.

1.4 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. Should the products require an inspection by (or return to) the manufacturer, please contact your sales representative for further instructions.

1.5 Returning Damaged Equipment

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

1.6 Moving ATevo

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

- for Style-5054 enclosure, refer to outline drawing (JE5251-00)

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

ATevo Weight by Model					
Output Voltage	Ampere Rating				
	6 Adc	12 Adc	16 Adc	20 Adc	25 Adc
24 Vdc	121 lb	121 lb	132 lb	138 lb	138 lb
	55 kg	55 kg	60 kg	62 kg	62 kg
48 Vdc	121 lb	135 lb	157 lb	175 lb	175 lb
	55 kg	61 kg	71 kg	79 kg	79 kg
130 Vdc	146 lb	186 lb	211 lb	235 lb	235 lb
	67 kg	84 kg	96 kg	107 kg	107 kg
260 Vdc	199 lb	227 lb	n/a	n/a	n/a
	90 kg	103 kg	n/a	n/a	n/a

The ATevo Style-5054 enclosure (JE5251-00) does not feature top-lifting eyes for moving.

- Move ATevo with a forklift, using the supplied shipping pallet.
- Lift the ATevo Style-5054 enclosure into its final location, using a heavy-duty sling or a scissor lift.
- For standard wall-mounting, refer to Section 1.7.1
- For optional floor-mounting, refer to Section 1.7.2.
- For optional rack-mounting, refer to Section 1.7.3.

1.7 Mounting ATevo

Mount the ATevo Style-5054 enclosure to easily access the front panel AC Input (CB1) and DC Output (CB2) Circuit Breakers. Choose from the following mounting methods:

1.7.1 Wall-Mounting

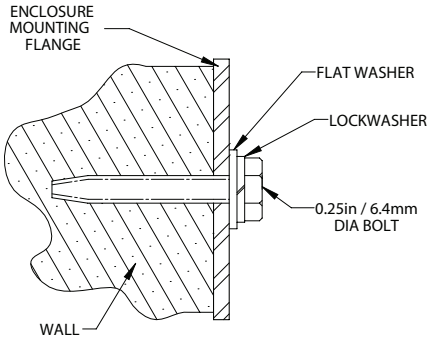
Wall-mounting is the standard method. Refer to the Style-5054 enclosure outline drawing (JE5251-00) in Appendix B. When wall-mounting ATevo, consider the following:

1. The wall must be strong enough to properly support ATevo's weight, plus a safety factor. Refer to Weight Table in Section 1.6.1. The weight of 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 cabinet shroud can be removed for internal servicing without removing ATevo from the wall.
3. Location requirements:
   - » Free of drips and splatter. If falling particles and liquids are a problem, install a NEMA Type 2 drip shield accessory.
   - » Between 0 and 122 °F / -18 and 50 °C, with relative humidity between 0% and 95% non-condensing.
   - » 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.

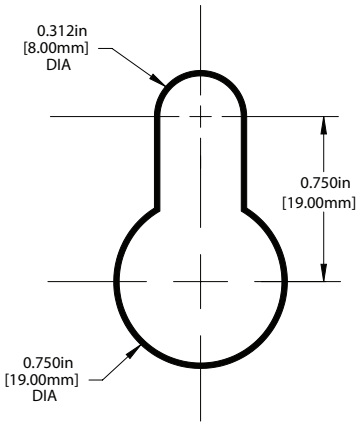
PROCEDURE

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 wall-mounting pattern and specification.

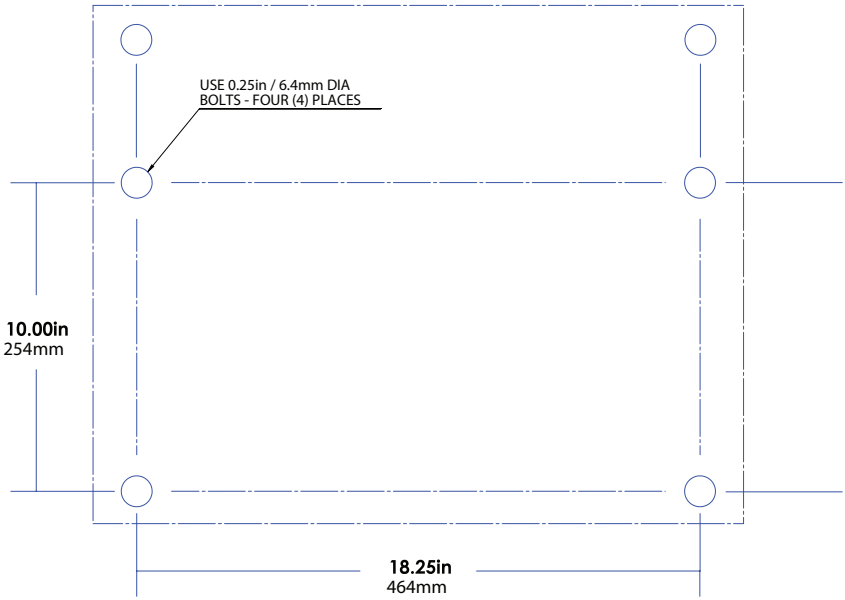
GRAPHICS



RECOMMENDED MOUNTING HARDWARE LOADING



KEYHOLE SLOT USED ON STYLE-5054 MOUNTING FLANGE



ATevo STYLE-5054 ENCLOSURE WALL-MOUNTING PATTERN

1.7.2 Floor-Mounting

To install ATevo onto a horizontal surface, the standard enclosure does not need to be modified, but a special floor mounting accessory (p/n EI0192-50) 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:
   - » Free of drips and splatter. If falling particles and liquids are a problem, install a NEMA Type 2 drip shield accessory.
   - » Between 0 and 122 °F / -18 and 50 °C, with relative humidity between 0% and 95% non-condensing.
   - » 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.

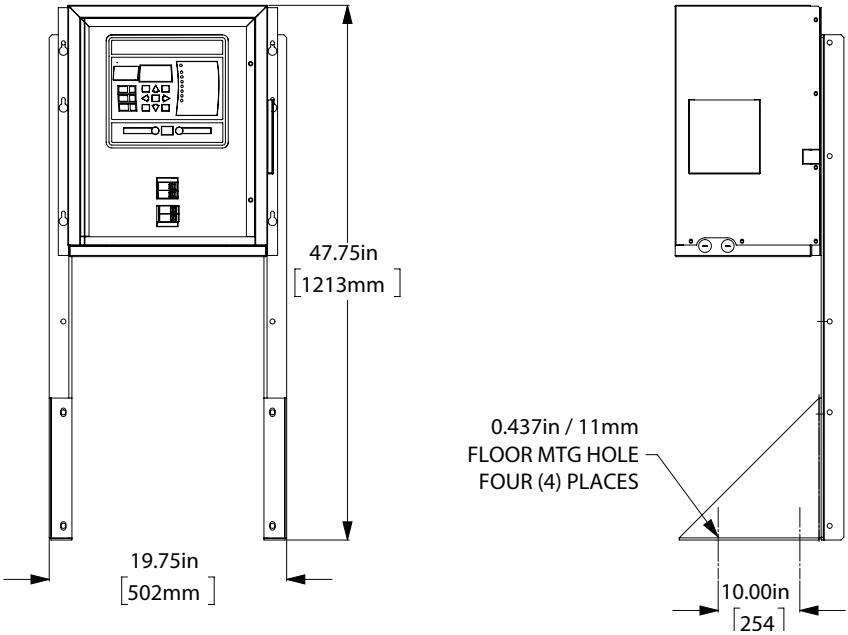
PROCEDURE

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.

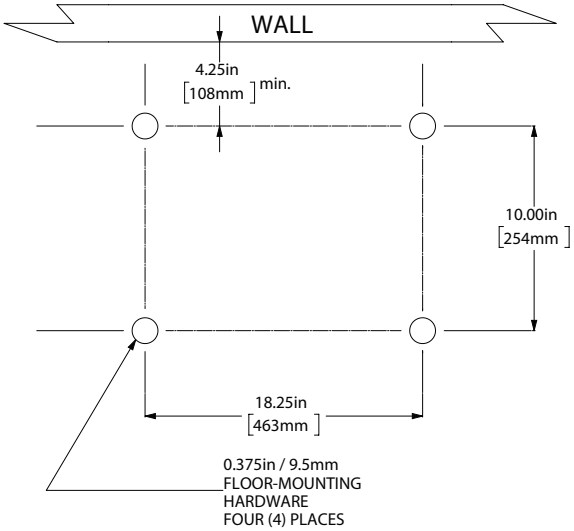
Assemble the floor-mounting accessory on to the anchor bolts as shown to right. Place ATevo onto vertical posts, add appropriate mounting hardware, and tighten.

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

GRAPHICS



ATevo STYLE-5054 ENCLOSURE FLOOR-MOUNTING PATTERN



1.7.3 Rack-Mounting

The ATevo can be installed into most 23in/584mm and 24in/610mm relay racks with standard EIA hole spacing. The Style-5054 enclosure does not need to be modified, but a special rack-mounting accessory (p/n EI0193-50) is required.

The kit includes two (2) mounting brackets, appropriate hardware, and Installation Instructions (JA0091-50) for the rack-mounting procedure.

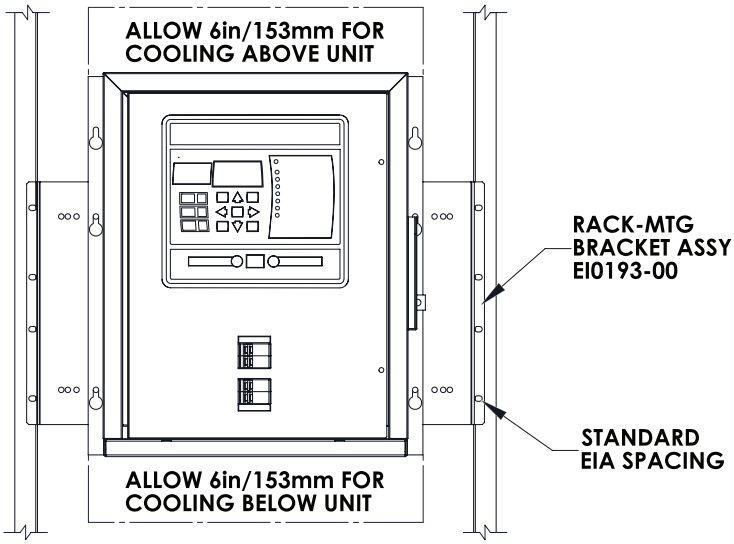
When rack-mounting ATevo, consider the following:

1. Rack must be strong enough to properly support the unit's weight. Refer to Weight Table in Section 1.6.1.
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:
   - » Free of drips and splatter. If falling particles and liquids are a problem, install a NEMA Type 2 drip shield accessory.
   - » Between 0 and 122 °F / -18 and 50 °C, with relative humidity between 0% and 95% non-condensing.
   - » 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.

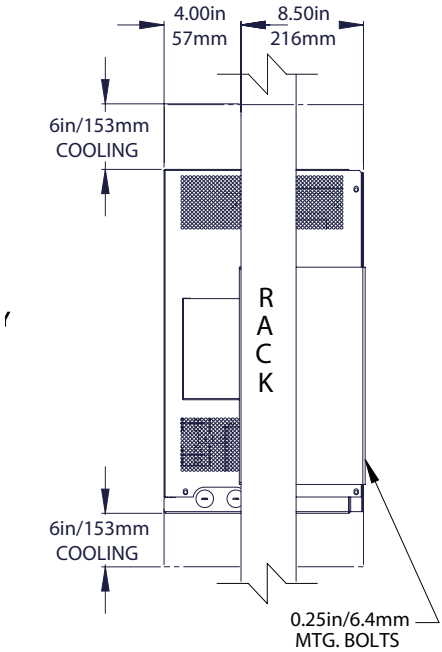
PROCEDURE

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.

GRAPHICS



ATevo STYLE-5054 RACK-MOUNTING



2.1 Mechanical Diagram and Component Location

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

ATevo consists of the following components and subsections:

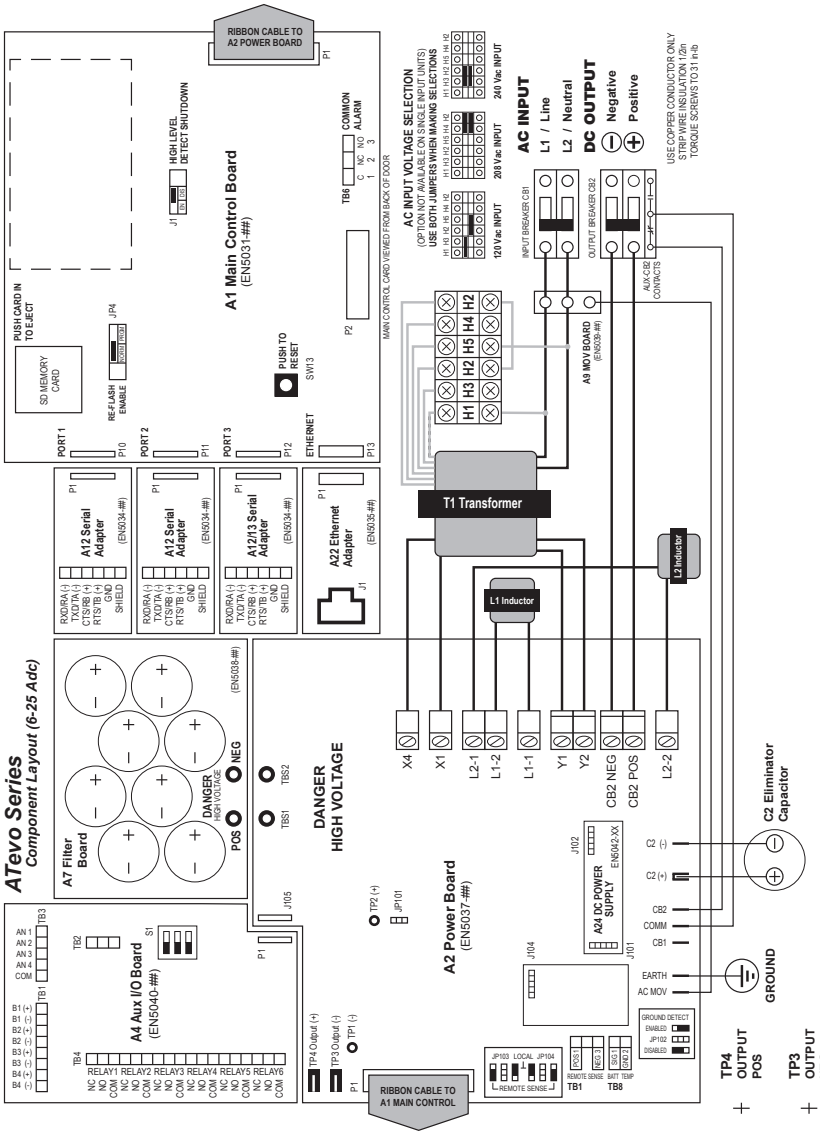
- **Rectifier Assembly** (A6)
- **A1 - Main Control PC Board**
- **A2 - Power Board**
  with 9V Power Supply (P/S-A2)
- **A4 - Auxiliary I/O Board** - *optional*
- **A7 - Filter Capacitor** (C1x/R9x) **Board**
- **A9 - AC MOV** (surge suppressor) **Board**
- **A10 - Remote Temperature Probe** - *optional*
- **A12 - Serial Communications Adapter(s)** - *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 L1/L2)*
- **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 Internal Component Layout Drawings (JE5252-01 & JE5252-21) 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.

ATevo Silkscreen (1PH 6-25 Adc)



2.1.1 Main Control Board (A1)

Shown on top-right of silkscreen, and mounted on the inside of the front panel door. It contains the ATevo front display, push buttons, and alarm LEDs. It is responsible for battery charger controls.

2.1.2 Power Board (A2)

Shown on bottom-left of silkscreen, and mounted on heat sink along left side of ATevo. It contains most power electronic connections, and terminal blocks for remote sense / optional TempCo wiring.

2.1.3 Auxiliary I/O Board (A4) - *optional*

Shown at top-left of silkscreen, and bolted to heat sink on the left side, above the Power Board. It plugs directly into 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

2.1.4 Filter Capacitor Board (A7)

Shown near top-left of silkscreen, and bolted to top of the Power Board (A2). The capacitors (C1x) filter 'ripple' from the dc output.

2.1.5 AC MOV Board (A9)

Shown to left of AC Circuit Breaker (CB1) on silkscreen, and mounted to top-left side of breaker bracket. 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.

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

2.1.7 Forced Load Sharing Comm Adapter (A13) - *optional*

Mounted similarly to Serial Communications Adapter (A12).

2.1.8 Ethernet Communications Adapter (A22) - *optional*

Shown directly to bottom-left of Main Control Board (A1) on silkscreen. It plugs into the Main Board at P13, and supports DNP3 or Modbus protocols via 10/100 copper Ethernet connection.

2.1.9 Eliminator Filter Capacitor (C2) - *optional*

Shown below Power Board on silkscreen, and mounted on bottom-left under Power Board. It provides the additional ripple filtering, required for the filtered 'eliminator' option.

2.1.10 AC Input Circuit Breaker (CB1)

Located in center of ATevo, about one-third from bottom. It protects ATevo ac wiring, and can be used to disconnect from ac source.

2.1.11 DC Output Circuit Breaker (CB2)

Located at bottom-center of ATevo. It protects ATevo dc wiring, and can be used to disconnect ATevo from battery and system dc load(s).

2.1.12 Main Filter Inductor (L1)

Shown in center of silkscreen, and located on bottom-left of back wall. It is part of the dc filter, lowering ripple.

2.1.13 Secondary Filter Inductor (L2)

Shown bottom-center of silkscreen, and located on bottom of base to right of Filter Inductor (L1). It is the second stage of the dc filter.

2.1.14 Power Isolation Transformer (T1)

Shown at center of silkscreen. The largest and heaviest component in ATevo is mounted on the back base, above the filter inductors (L1/L2). It provides isolation, and converts ac input voltage to appropriate levels prior to rectification.

NOTICE ATevo 1PH Group I models with the multi-tap ac input option (smart part code 'MT1'), feature a terminal block (TB-H#) mounted above the AC Input Circuit Breaker (CB1) for voltage selection. Jumper positions are depicted on silkscreen, to right of Power Isolation Transformer (T1). Refer to Section 2.3 for details.

2.2 Removing Protective Safety Shield

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

STEPS

- Standard flat blade screwdriver is required.
- Open ATevo front panel door to access the safety shield.
- Remove the two (2) screws that attach the safety shield to the ATevo. One (1) is above the AC Input Breaker (CB1), the other is 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 Breakers.
- Reverse procedure for reinstalling the safety shield.

2.3 ATevo with Selectable Input Voltage - *optional*

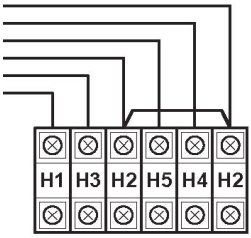
ATevo may be equipped with a multi-tap ac input voltage feature for field configuration. These units accept 120, 208 or 240 Vac 60Hz, and feature '**MTI**' in the smart part number.

2.3.1 Determining if Multi-Tap Option is Present

Check the ATevo nameplate. If the ac input voltage is listed as **120/208/240,** the ATevo is equipped with the multi-tap option. If the nameplate is not visible:

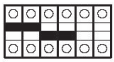
- Open the ATevo front panel door.
- Behind the safety shield, look for a gray terminal block directly above the AC Input Circuit Breaker (CB1).
  - » Reference the input voltage selection silk-screened on the center-right of the safety shield.
  - » If this terminal block is present, the ATevo is equipped with the multi-tap ac input voltage option.

2.3.2 Verifying Multi-Tap AC Input Voltage Setting

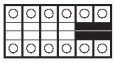


INPUT VOLTAGE SELECTION
(USE BOTH JUMPERS)
SELECIONE VOLTAJE DE ENTRADA
(UTILIZE LOS DOS CONECTORES)

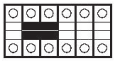
120 VOLTS AC
120 VOLTAJE CA



208 VOLTS AC
208 VOLTAJE CA



240 VOLTS AC
240 VOLTAJE CA



Before you connect ac power to ATevo, inspect the present ac input voltage setting, and confirm the correct jumper positions for the desired ac input supply voltage. The multi-tap ac input voltage setting can be verified without removing the safety shield.

- Open ATevo's front door and locate the multi-tap terminal block above the AC Input Breaker (CB1).
- Observe the relative locations of the **RED** jumpers in the multi-tap terminal block (TB-H#).
- Refer to the adjacent diagram to confirm the present ac input voltage setting is correct.

2.3.3 Modifying Multi-Tap AC Input Voltage Setting

⚠ WARNING *Before changing the voltage selection jumper, shut down ATevo and lock out both ac and dc power supplies. Turning off (opening) the ATevo internal circuit breakers does not eliminate live voltages inside the enclosure.*

- Standard flat blade screwdriver is required.
- Remove the ATevo safety shield per Section 2.2.
- Locate the multi-tap terminal block.
- Set locations of **RED** jumpers for desired ac input voltage, per Section 2.3.2.
  - » Carefully pry out jumpers in existing locations.
  - » Re-install jumpers into new (correct) locations.
- Re-check jumper locations and confirm jumpers are properly seated.

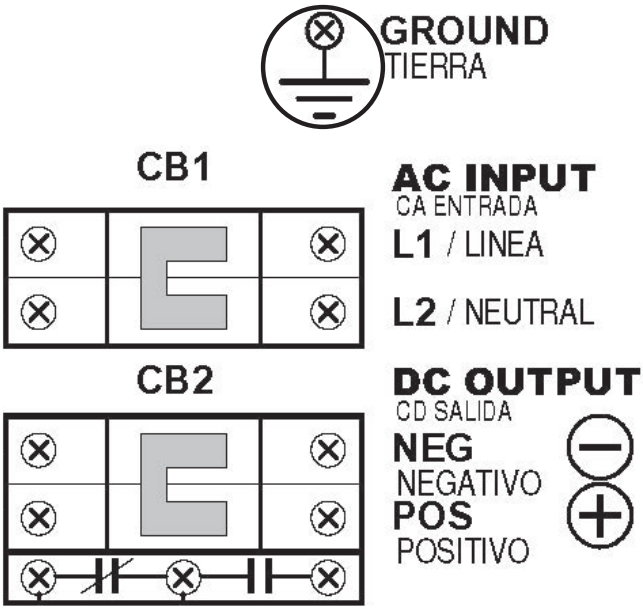
2.4 Making AC Input Connections

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.

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. If ATevo has the Multi-Tap ac input voltage option, make sure the setting matches the ac input supply voltage per Section 2.3.2.
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 de-energized for unit maintenance. A time-delay circuit breaker or slow-blow fuse is recommended.
3. Size branch circuit breaker or fused disconnect switch per ATevo 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. Do not run external ac input power wiring through the same conduit as external dc wiring.
6. All site requirements of the facility take precedence over these instructions.



NOTES

- Conduit must be properly grounded, and in compliance with the national wiring rules of the country where installed.
- Use copper or aluminum conductors only.
- For 120 Vac, connect the **neutral** leg to input terminal (CB1-L2).

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.
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.

2.5 Making DC Output Connections

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

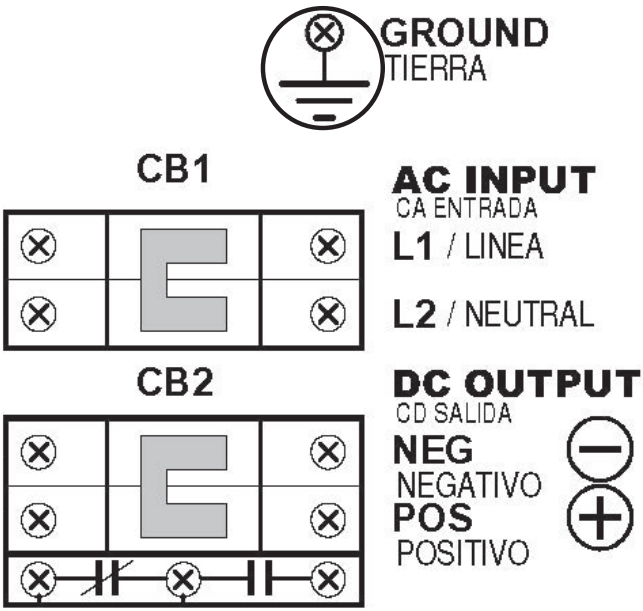
Follow these steps to connect the battery to ATevo:

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)				
	6	12	16	20	25
#16	2.5V	5.0V	6.7V	8.2V	10.5V
#14	1.6V	3.2V	4.2V	5.3V	6.6V
#12	1.0V	2.0V	2.6V	3.3V	4.2V
#10	0.63V	1.3V	1.7V	2.1V	2.6V
#8	0.40V	0.80V	1.1V	1.3V	1.7V
#6	0.25V	0.50V	0.66V	0.83V	1.1V
#4	0.16V	0.32V	0.42V	0.52V	0.65V

EXAMPLE: *100ft / 30.5m of #8 AWG wire at 16A has a 1.1V 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.



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.**

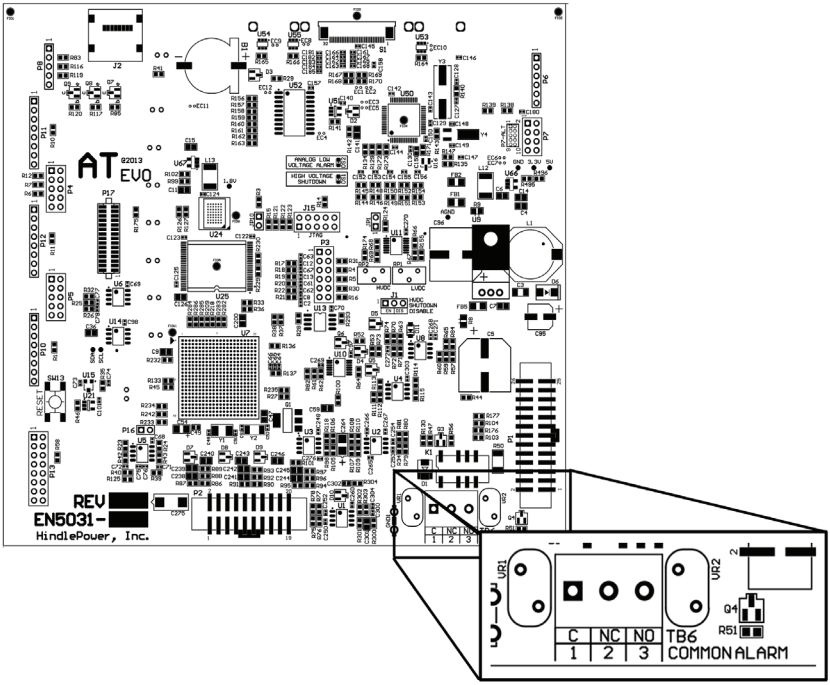
   NOTICE *To prevent equipment damage, confirm polarity of pos(+) and neg(-) wiring.*
5. **Using a flat-blade screwdriver, securely tighten compression screws on DC Output Breaker Terminals (CB2+/-).**
6. **Reinstall safety shield after you have made and checked all connections.**

2.6 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+/-). Refer to Section 11 for information and wiring instructions.

2.7 Wiring ATevo Common Alarm

The ATevo Main Control Board (A1) is equipped with a **SUMMARY** alarm, referred to in this manual as the 'Common Alarm Relay'. This relay contact transfers when any one (1) or more of the standard ATevo alarm(s) is triggered. One (1) set of form-C alarm contacts is provided, which are accessible via terminal block (A1-TB6) on the Main Control Board. Refer to the figure below.



PROCEDURE

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

NOTES

- Alarm contacts are rated for 0.5A @ 125 Vac/Vdc.
- Common Alarm Relay terminal block (A1-TB6) is compression screw type, accepting #22-14 AWG wire.
- Terminals are labeled in the **non-alarm** condition, with ATevo operating 'normally' and relays energized.
  NOTICE **not** 'shelf state'
- 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).

2.8 Wiring Relays on Auxiliary I/O Board

The optional Auxiliary I/O Board (A4) provides multiple discrete alarm relay contacts. When supplied, the board(s) is mounted to the rectifier heat sink, above the Power Board (A2), on the left side of ATevo. Refer to Section 12 for more information and wiring instructions.

2.9 Wiring Temperature Compensation Probe

The optional battery temperature compensation (or **TempCo**) probe contains a temperature-dependent resistor, encased in an epoxy module. When supplied, this probe is installed on or near the battery. Refer to Section 10 for more TempCo information and wiring instructions.

2.10 Wiring Serial Communications Adapters

ATevo will support up to three (3) optional Serial Communications Adapter pc boards (A12 or A13). They are mounted on the inside surface of the front panel door. Communication adapters plug directly into the left side of the Main Control Board (A1) via connection ports P10, P11, and P12.

For further details, see **below**.

2.11 Wiring Ethernet Adapter Board

ATevo will support an optional Ethernet Adapter pc board (A22). It is mounted on the inside surface of the front panel door. The Ethernet adapter plugs directly into the left side of the Main Control Board (A1) via connection port P13.

For further details, see **below**.

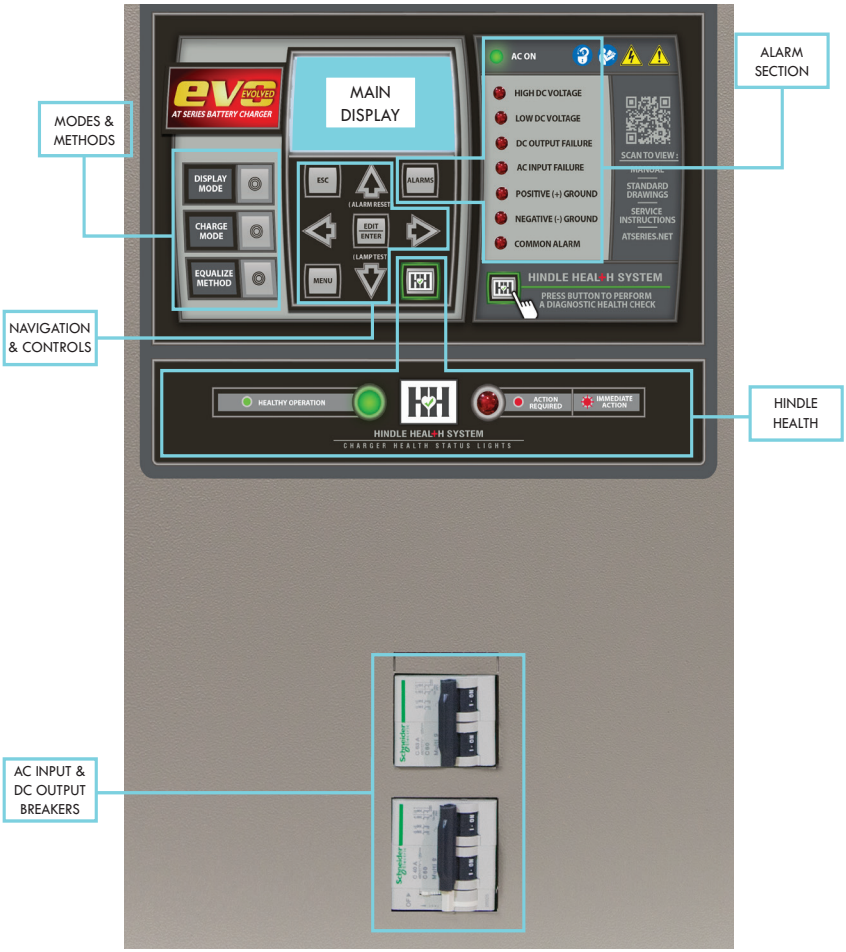
NOTICE

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 communications front panel configuration. Finally, it catalogs DNP3 and Modbus communication registers.

3.1 Front Panel Controls and 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 top) and dc output (CB2 bottom) circuit breakers are accessible via front panel door cut-outs. See Enclosure Outline Drawing (JE5251-00) for location and arrangement of these internally-mounted protection devices.

3.1.1 ATevo Main Display

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

3.1.2 Navigation and Control Button Group

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

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 covered 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 covered 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. When opened, this device disconnects ATevo output from the dc bus (battery) voltage.

⚠ WARNING *There still may be live dc power connected to some internal boards, including any relays wetted by battery voltage.*

3.2 Display

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

ATevo screens can be grouped, by function, into four (4) basic types:

- HOME screen
- Configuration Screens
- Status Screens
- Hindle Health Screens (HHS)

3.2.1 Home Screen

The ATevo HOME Screen is the **primary** display, and is active most of the time the charger is energized. The only time other screens are displayed is during configuration changes, during testing, when more detailed status is requested, or when the user wishes to utilize the advanced ATevo features.

- The ATevo HOME Screen displays charger output voltage (Vdc) and output current (Adc) in a **LARGE FONT** for easy viewing.
- '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 is installed and enabled, the present battery temperature and normalized voltage set point will also appear on the display. Refer to Section 10 for more details on the TempCo option and display.
- If an alarm or status indication occurs, text indicating such will be displayed along the bottom row of the HOME Screen.

3.2.2 Configuration Screens

These screens are used for changing ATevo configuration and set points. Many of these screens are covered in Section 4, 'Startup and Configuration'. Other configuration screens (for installed options) are covered in their respective sections.

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.

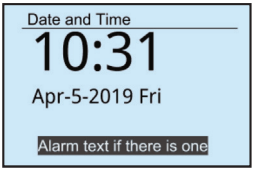
3.2.4 Hindle Health System Screens

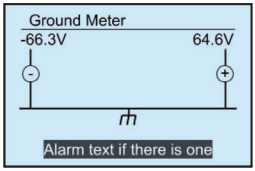
Hindle Health System screens are associated with the Hindle Health button (HH). When (HH) is pressed, ATevo enters a user-assisted self-diagnostic mode. Screens prompt the user to participate in a series of tests that confirm that ATevo is operating correctly. For more information on the Hindle Health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

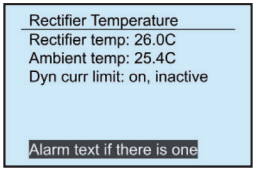
3.2.5 Other Screens

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

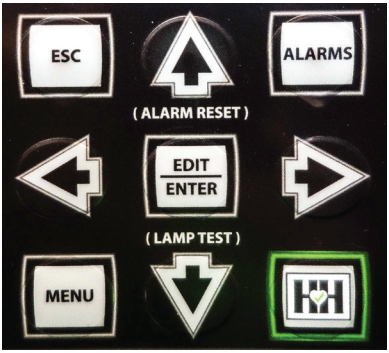






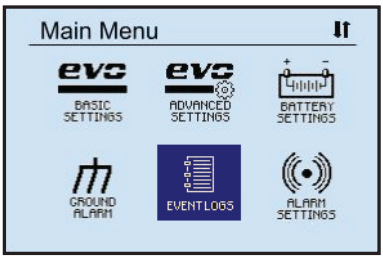
3.3 Main Menu and Navigation

The navigation control buttons (MENU, ESC, EDIT/ENTER, UP, DOWN, LEFT, and RIGHT) 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.



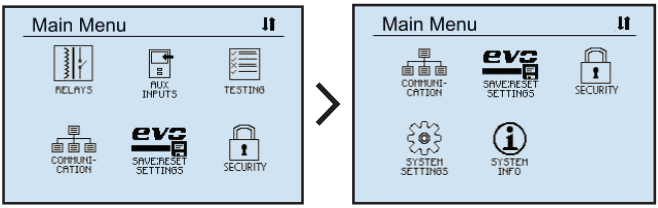
3.3.1 MENU and ARROW Buttons

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 screen shot below, the user has already pressed the DOWN arrow to select 'Event Logs'.



The top-left of the screen indicates the **Main Menu** 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 screen shot 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.

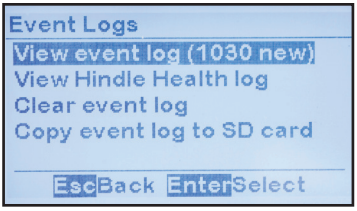
FURTHER DISPLAYED MAIN MENU ICONS



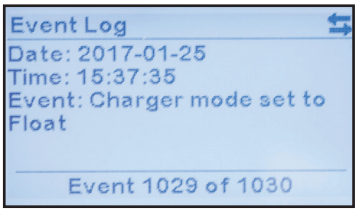
Refer to Section 6.1 for descriptions of each.

3.3.2 EDIT/ENTER Button

Pressing the EDIT/ENTER button will activate the feature or function selected on screen. As an example, in the prior screen shot, '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 shown below.



The screen shot 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.

3.3.3 Navigation Conventions in this Manual

In the previous two (2) pages, a sequence of commands was executed that caused a sequence of screens to display. 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 listed 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 used by most television remote controls. It is not necessary to list the navigation button pushes of UP, DOWN, LEFT, RIGHT, 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.

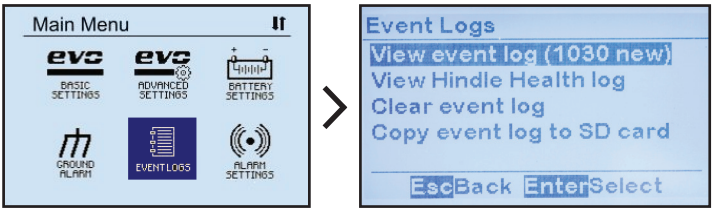
Navigation Convention: Command > Command > Command

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.



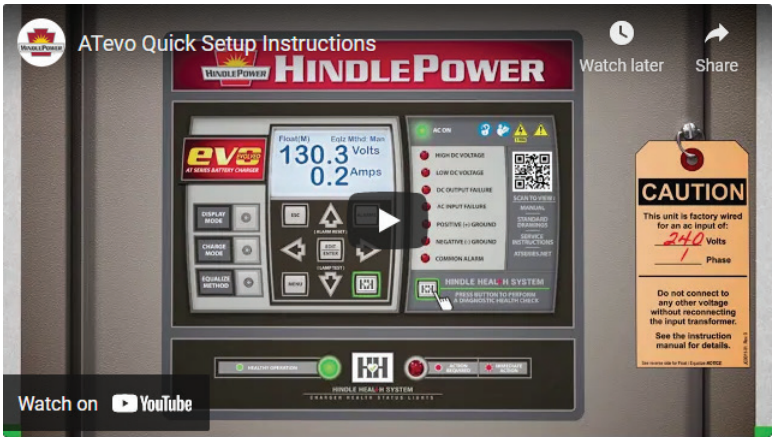
3.3.4 Escape (ESC) Button

In general, pressing ESC returns back one (1) menu level. The examples below illustrate its use:

- When **Main Menu** is displayed, pressing 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.

4.1 Startup

A video of the ATevo Quick Setup Instructions is available online. Follow the hyperlink below, or scan the QR code to the right to view this informative tool.



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 battery charger will:

- Use the FACTORY SETTINGS (float voltage, equalize voltage, etc) listed in the following tables. 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 dc current increase gradually to rated values.

4.1.2 Factory Settings Tables

Factory settings for each ATevo are summarized in the tables on the following four (4) pages. These values may be revised following an ATevo firmware update. To access the latest revision of these settings, see online resource (JA5124-02).

24 Vdc 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 (1)	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
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	24.0	21.00	Volts
Ripple Alarm	50	500	500	milli-Volts
Ground Fault POS (+)	1	50	10	kOhms
Ground Fault NEG (-)	1	50	10	kOhms

(1) 32.00 Vdc High Range Set Point considered "***extended*** equalize". Unit may not meet +/-0.25% regulation, beyond 31.00 Vdc.

48 Vdc 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 (2)	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
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
Ripple Alarm	50	500	500	milli-Volts
Ground Fault POS (+)	1	50	10	kOhms
Ground Fault NEG (-)	1	50	10	kOhms

(2) 61.00 Vdc High Range Set Point considered "***extended*** equalize". Unit may not meet +/-0.25% regulation, beyond 59.00 Vdc.

130 Vdc ATevo Set Points & Defaults

Parameter	Low Range Set Point	High Range Set Point	Nominal (default)	Units
Float Voltage	110.0	141.0	131.0	Volts
Equalize Voltage	117.0	149.0 (3)	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
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
Ripple Alarm	50	500	500	milli-Volts
Ground Fault POS (+)	1	50	10	kOhms
Ground Fault NEG (-)	1	50	10	kOhms

(3) 149.0 Vdc High Range Set Point considered "***extended*** equalize". Unit may not meet +/-0.25% regulation, beyond 145.0 Vdc.

260 Vdc 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	234.0	298.0 (4)	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
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
Ripple Alarm	50	500	500	milli-Volts
Ground Fault POS (+)	1	50	10	kOhms
Ground Fault NEG (-)	1	50	10	kOhms

(4) 298.0 Vdc High Range Set Point considered "***extended*** equalize". Unit may not meet +/-0.25% regulation, beyond 290.0 Vdc.

4.1.3 Checking Installation

Two (2) additional resources are available for download and printing, to aid users with ATevo start-up:

- Quick Setup Sheet (JC5020-51)
- Startup Procedure Checklist (JD0064-51)

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 front panel door.

- If ATevo features the Multi-Tap option, verify the ac input jumpers on INPUT VOLTAGE SELECTION terminal block are correct for the ac supply voltage. Refer to Section 2.3.2.
- Check battery polarity at the DC Output Breaker (CB2+/-).

4.1.4 Starting Up

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

- Turn ON (close) the AC Input Circuit Breaker (CB1) **first**.
- You should hear a soft hum from ATevo, as output increases.
- ATevo LCD should start up, and indicate output voltage (Vdc).
- If the display does not light, do **not** proceed. Turn OFF (open) the AC Breaker (CB1), and recheck all connections.

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

- Turn ON (close) the DC Output Circuit Breaker (CB2) **second**.
- If any error codes appears on the ATevo Display:
  - refer to Section 7 before proceeding
  - interpret the origin and resolution of the indication
- If **any** Alarm Indicator LEDs light (and stay lit):
  - refer to Section 7 before proceeding
  - interpret the origin and resolution of the indication

4.1.5 Home Screen

The default HOME screen appears after power up. It displays:

- bus voltage **(Vdc)**
- charger current **(Adc)**

On the top line (in smaller text) it also lists status of CHARGER MODE, and EQUALIZE METHOD. These are covered in Section 5.1.

HOME SCREEN

ATevo will automatically switch back to the HOME screen if no buttons are pushed for then (10) minutes, or by pressing ESC one (1) or more times. Each press of ESC returns one (1) level, until HOME is reached.

4.2 Configuring Basic Set Points and Alarms

The **ATevo** is the second generation of AT Series microprocessor-controlled float battery chargers. Because its configuration button sequence is identical, users of legacy AT10.1 chargers will easily adapt to the ATevo. This section details how to configure basic ATevo set points, and alarms found also on legacy AT10.1 chargers:

- Float Voltage
- Equalize Voltage
- Equalize Timer
- High DC Voltage Alarm
- Low DC Voltage Alarm
- Current Limit Level

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, ATevo prompts you to set the first parameter in the list (Float Voltage).

To set parameters, do the following:

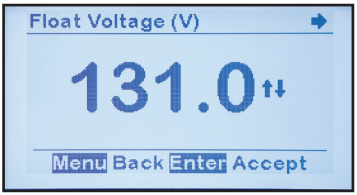
- Press UP or DOWN (or hold down to scroll) until desired value displays. Each parameter has a minimum and maximum limit as listed in the tables in Section 4.1.2.
- Press EDIT/ENTER to save setting. ATevo prompts you to set the second parameter.
- Continue in the same manner to set all six (6) parameters in the bulleted 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.

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

While adjusting settings, if the user does not press a front panel key for ten (10) minutes, Edit Mode ends **automatically**. In this case, ATevo does **not** save the adjustments made to any setting, not previously saved with the EDIT/ENTER key.

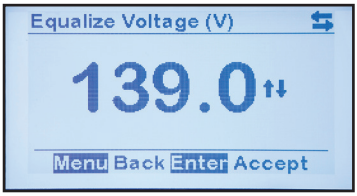
4.2.2 Setting Float Voltage

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.



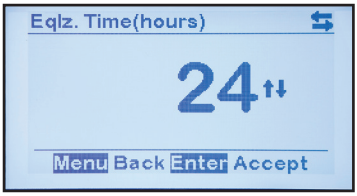
4.2.3 Setting Equalize Voltage

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.



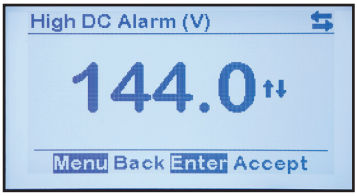
4.2.4 Setting Equalize Timer

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.



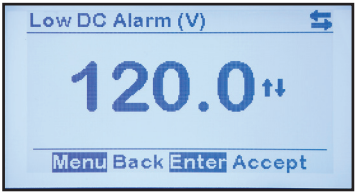
4.2.5 Setting High DC Alarm Voltage

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.



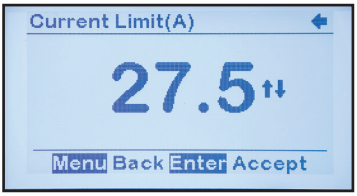
4.2.6 Setting Low DC Alarm Voltage

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.



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. The display returns to the HOME screen.

4.3 Configuring Advanced Set Points and Alarms

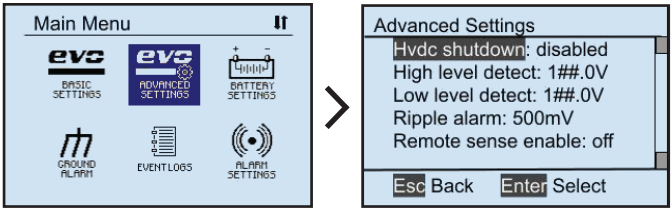
This section details the configuration of **new**, more advanced features available in ATevo. It also details features that may have been present in legacy AT10.1 Series battery chargers, where the configuration process has been changed or simplified.

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.

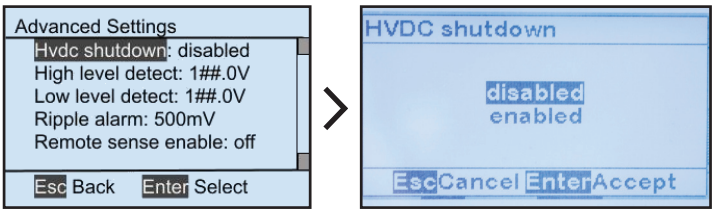


To change a parameter, do the following:

- Navigate to it, using UP and DOWN.
- 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.

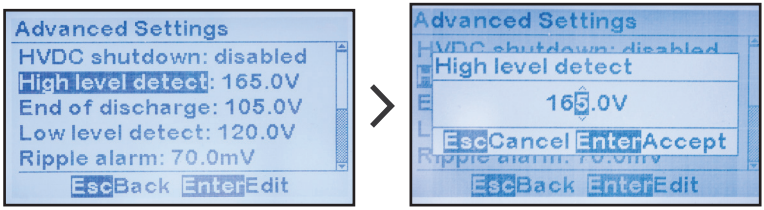
4.3.2 Setting High Voltage Shutdown

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.



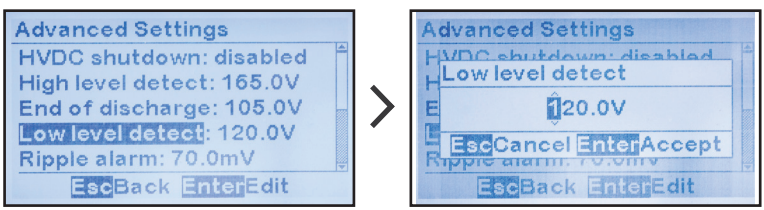
4.3.3 Setting High Level Detect

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.



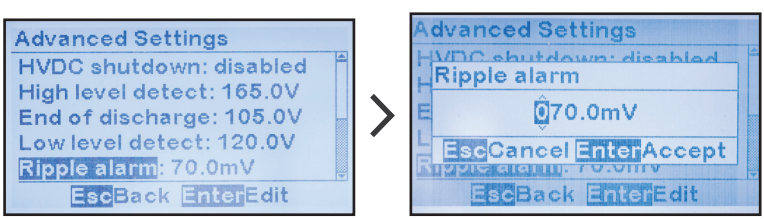
4.3.4 Setting Low Voltage Level Detect

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.



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.



4.4 Configuring System Settings

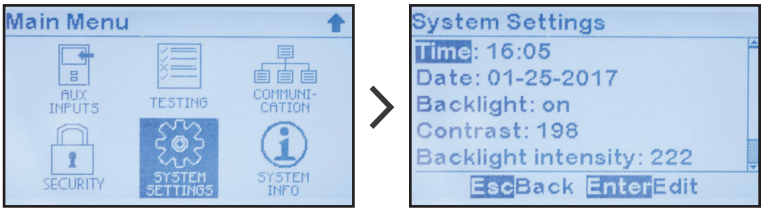
This section details configuration of the ATevo system parameters, including date, time, and LCD controls (brightness, contrast, etc.).

4.4.1 How to Configure System Settings

To enter the System Settings mode, select:

MENU > SYSTEM SETTINGS

ATevo will display a scrollable screen of parameters.

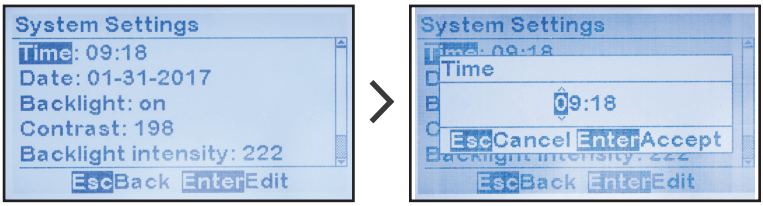


To change a parameter, do the following:

- Navigate to it, using UP and DOWN.
- 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.

4.4.2 Setting System Time

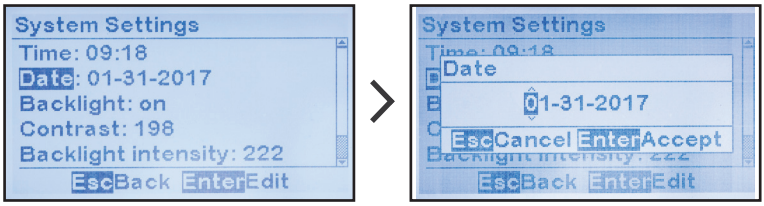
To access and change the System Time, follow the steps in Section 4.4.1.



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

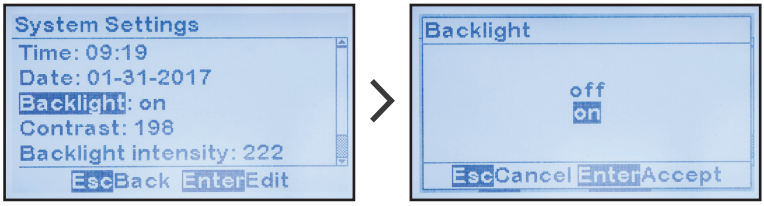
4.4.3 Setting System Date

To change the System Date, follow the steps in Section 4.4.1.



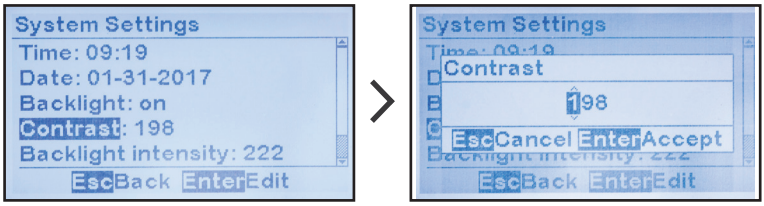
4.4.4 Setting Display Backlight Control

To change the LCD Backlight setting (ON/OFF), follow the steps in Section 4.4.1.



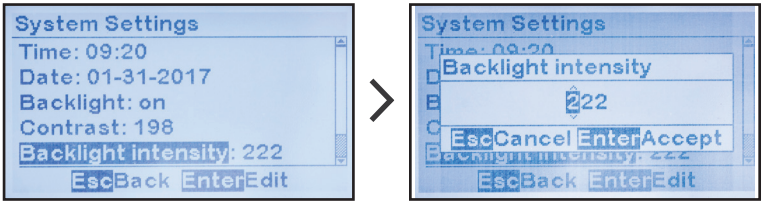
4.4.5 Setting Display Contrast

To change the LCD Display Contrast, follow the steps in Section 4.4.1.



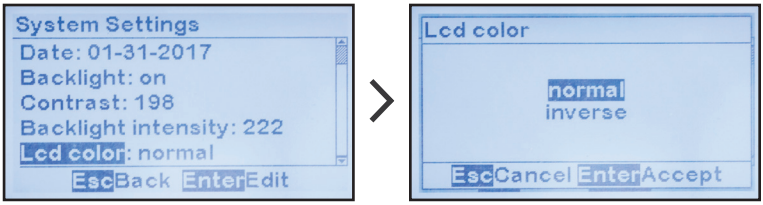
4.4.6 Setting Display Backlight Intensity

To change the LCD Display Backlight Intensity, follow the steps in Section 4.4.1.



4.4.7 Setting Display Reverse Image Control

To change the LCD Display Image preference, follow the steps in Section 4.4.1.



4.5 Configuring Relays

ATevo is equipped with a 'summary', or **COMMON** Alarm Relay, on the Main Control Board (A1-TB6). Optional Auxiliary I/O boards are also available, each supplying six (6) additional relays. ATevo will support up to four (4) optional Auxiliary I/O boards (24 relays total).

4.5.1 Configuring Common Alarm Relay

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

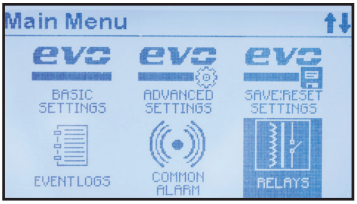
- to be assigned to a fault condition or status point
- to be assigned a delay period for activation / state change (after the alarm or status condition is initially detected)
- to operate in a latching or non-latching mode

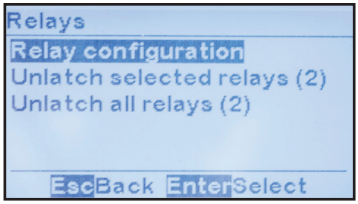
By default, the Main Board Relay is configured to indicate the status of the Common Alarm, but this may be changed to indicate the status of any ATevo alarm or status state.

If this relay is configured to be 'latching', it will change to the active state after 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. Refer to Section 7.6 for instructions on how to clear (or reset) latched relays.

To change the Common Alarm Relay configuration:

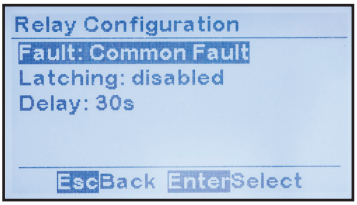
MENU > RELAYS > 'Main board relay'

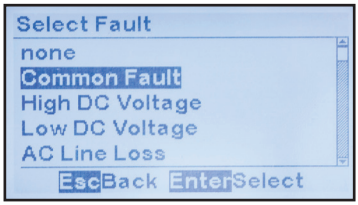




To change the relay's assigned fault condition:

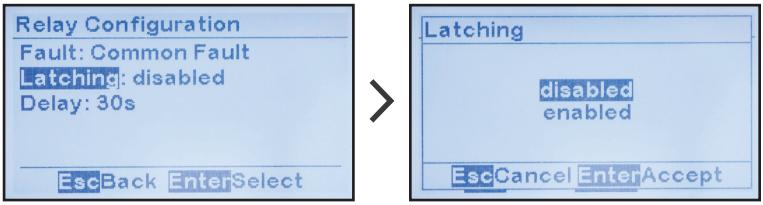
'Fault:' > select desired condition





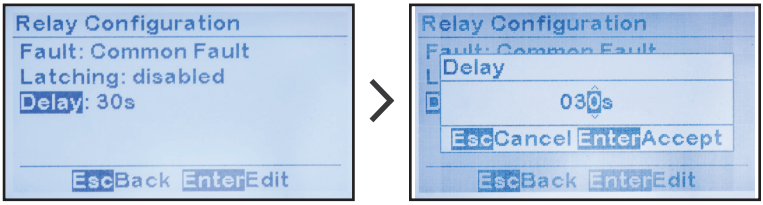
To change the relay's latching status:

'Latching:' > select desired status



To change the relay time delay:

'Delay:' > increment/decrement to set point value



4.5.2 Configuring Auxiliary I/O Board Relays

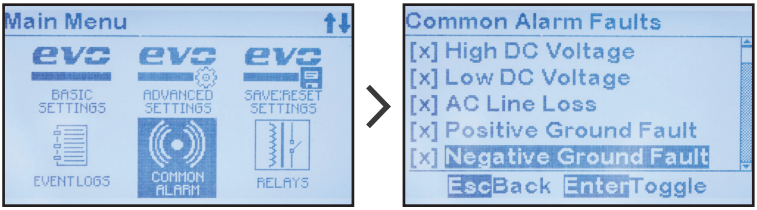
Configuration of the relays on the optional Auxiliary I/O Board (A4) is similar to the Common Alarm Relay configuration on the Main Control Board (A1). This is because the Auxiliary I/O Board Relays have the same three (3) configuration parameters. Refer to Section 12.4 for configuration instructions.

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 > 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.

4.7 Configuring Serial Communications Adapter

ATevo can support up to three (3) optional Serial Adapters.

Each Serial Adapter 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)

4.8 Configuring Ethernet Adapter

ATevo can support an optional Ethernet Adapter (A22), which:

- 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*)

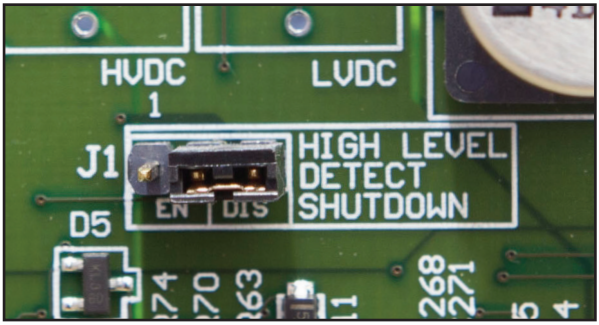
NOTICE

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.

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:

- Turn OFF (open) AC Input Circuit Breaker (CB1).
- Turn OFF (open) DC Output Circuit Breaker (CB2).
- Open ATevo front panel door.
- Locate Main Control Board (A1), installed on back of front door.
- Locate jumper (J1) labeled 'High Level Detect Shutdown', at center-right of the Main Control Board (A1).
- Move jumper shorting block as follows:
  - » 'EN' to enable the High Level Detect Shutdown
  - » 'DIS' to disable the High Level Detect Shutdown
- Close ATevo front panel door.
- Turn ON (close) AC Input Circuit Breaker (CB1) first.
- Turn ON (close) DC Output Circuit Breaker (CB2) second.

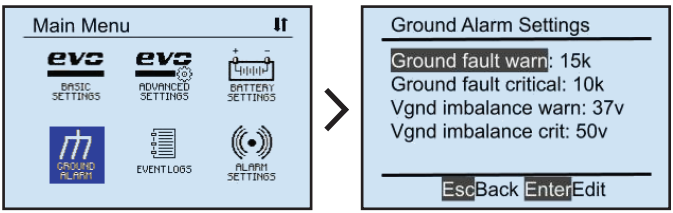
Refer to Section 5.4 for more information on the High Level Detect feature.

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**').



4.10.1 Setting Up Ground Fault Alarm Sensitivity

To change the resistance values (measured in kOhm) of the ground fault alarm sensitivities, press MENU, then select GROUND ALARM.

- Navigate to **Ground Fault Warning** using UP and DOWN.
- Select it with EDIT/ENTER.
- Press UP and DOWN to change setting value.
- Once desired setting is displayed, press EDIT/ENTER to store it.
- Repeat process for **Ground Fault Critical**.

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

4.10.2 Setting Up Ground Imbalance Alarm

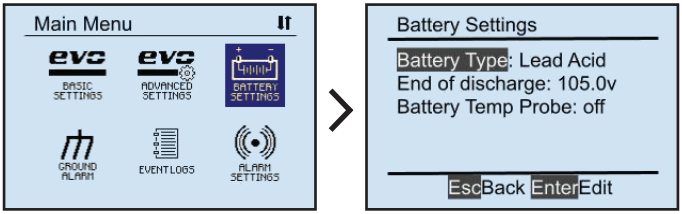
To change the imbalance alarm (measured in Vdc), press MENU, then select GROUND ALARM:

- Navigate to **Vgnd Imbalance Warning** using UP and DOWN.
- Select it with EDIT/ENTER.
- Press UP and DOWN to change setting value.
- Once desired setting is displayed, press EDIT/ENTER to store it.
- Repeat process for **Vgnd Imbalance Critical**.

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

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.



4.11.1 Selecting Battery Type

To select battery type, press MENU, then select BATTERY SETTINGS:

- Navigate to **Battery type** using UP and DOWN.
- Select it with EDIT/ENTER.
- Press UP and DOWN to change type (**Lead Acid** / **NiCd**).
- Once desired setting is displayed, press EDIT/ENTER to store it.

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), press MENU, then select BATTERY SETTINGS:

- Navigate to **End of discharge** using UP and DOWN.
- 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.

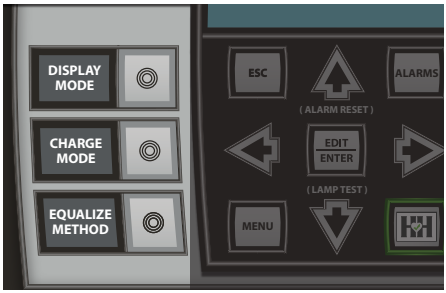
4.11.3 Setting Up the Battery Temperature Probe

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.

5.1 ATevo Operating Modes

ATevo operating mode and method selections are primarily controlled by three (3) buttons (DISPLAY MODE, CHARGE MODE, and EQUALIZE METHOD) at the far left of the control panel.



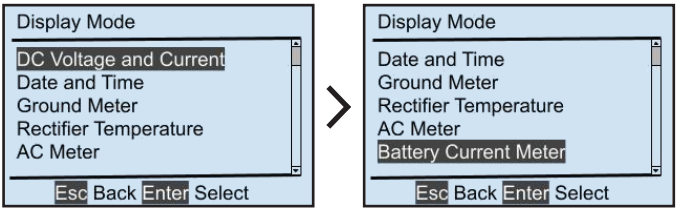
5.1.1 Changing Display Mode

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 (1) of six (6) displayed choices



NOTICE *The DISPLAY MODE button is in the same relative location as the METER MODE button on legacy AT10.1 Series battery chargers. Its functionality is equivalent, in that it determines which measurements are displayed on the HOME screen.*

5.1.2 Changing Charge Mode

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

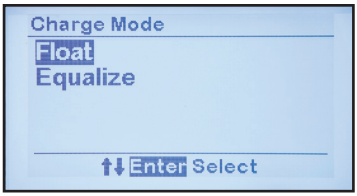
- FLOAT - for **normal** battery charging
- EQUALIZE - to **balance** voltage among battery cells
  Before using, consult battery manufacturer's data sheets.

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

- *'Float'* is displayed when ATevo is in FLOAT mode
- *'Equalize'* is displayed when ATevo is in EQUALIZE mode

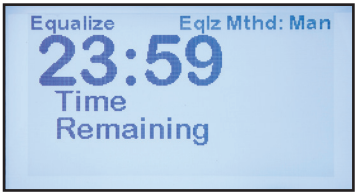
To change Charge Mode:

CHARGE MODE > other displayed choice



When ATevo is in EQUALIZE mode, the battery 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.

NOTICE *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.*

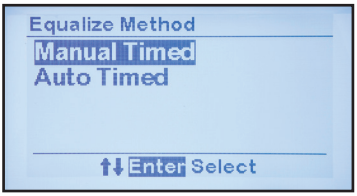
5.1.3 Changing Equalize Method

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 twelve (12) seconds
- start EQUALIZE TIMER
- remain in EQUALIZE mode until either the EQUALIZE TIMER expires, or 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.

NOTICE *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.*

5.1.4 Lamp Test, Alarm Relays & Display of Firmware

ATevo features a Lamp Test mode, which 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.

To test Alarm Relays, press and **hold** the DOWN key. After four (4) seconds, the form-C alarm contacts will change state on:

- Common Alarm Relay (A1-TB6)
- any optional Auxiliary I/O Board relays (A4x-TB4)

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

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

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.

NOTICE *ATevo Reset Latched Alarms function is identical to the Reset Latched Alarms on legacy AT10.1 Series battery chargers.*

To select between clearing individual relays (or all relays), use the RELAYS menu icon, as covered in Section 7.6.

5.2 High Voltage Shutdown

ATevo has a High Voltage Shutdown feature similar to the High Voltage Shutdown feature in legacy AT10.1 Series 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 thirty (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 circuit breakers, to clear the shutdown and turn ON the rectifier controls.

The High Voltage Shutdown feature can be enabled or disabled as covered in Section 4.3.2.

NOTICE *ATevo also has a* **hardware** *(analog) High Level Detect feature, which is covered in Section 5.4.*

5.3 Low Level Detect

ATevo features an **analog** Low Level Detect function, similar to the Low Level Detect in legacy AT10.1 Series battery 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 Voltage Alarm LED that illuminates if the Low Level Detect condition is triggered.

The Analog Low Voltage Alarm LED (DS2) is located on the **back** side of the Main Control Board (A1), as shown below. Open the ATevo 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.

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 thirty (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 alarm circuit latches until ATevo is restarted, by recycling both the AC Input (CB1) and DC Output (CB2) Circuit Breakers. The High Level Detect circuit also features a dedicated **analog** Shutdown alarm LED, which illuminates if the High Level Detect condition is triggered. This indicator (DS1) is located on the **back** side of the Main Control Board (A1). Open the ATevo front panel door to view the High Level Shutdown LED.

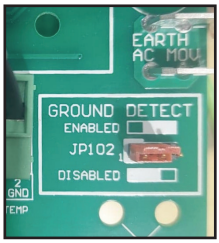
Refer to the following sections, for details on how to:

- Enable or Disable High Level Detect - Section 4.9
- Configure the High Level Detect threshold - Section 4.3.3

5.5 Disabling Ground Detection

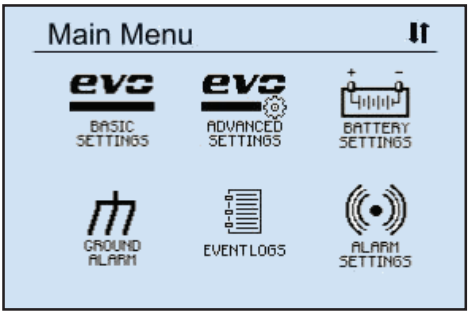
Depending on installation, users may wish to temporarily (or permanently) disable the ATevo ground detect feature. If so:

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



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 (3) 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.

6.1.1 Basic Settings Icon

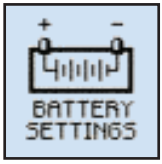
This icon opens Basic Set Points and Alarms screens beginning with the first parameter. These are the legacy AT10.1 settings. Refer to Section 4.2 for configuration instructions.

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 AT10.1 Series battery chargers.

6.1.2 Advanced Settings Icon

This icon opens configurable options for Advanced Settings. Refer to Section 4.3 for instructions.

6.1.3 Battery Settings Icon



This icon opens configurable options for Battery Settings. Refer to Section 4.11 for instructions.

6.1.4 Ground Alarm Icon

This icon opens configurable options for Ground Fault Alarm Settings. Refer to Section 4.10 for instructions.

6.1.5 Event Logs Icon

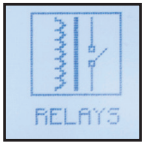
This icon opens a list of Event Log functions. You can view and clear logged events and copy logs to SD memory card. Refer to Section 9 for instructions.

6.1.6 Alarm Triggers Icon

This icon is used to exclude alarms from the Common Alarm activation list. By default, all alarms, when active, will annunciate the Common Alarm.

Refer to Section 4.6 for instructions.

6.1.7 Relays Icon

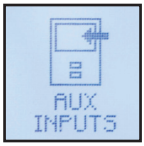


This icon shows relay configuration and control options. Use it to configure relays and reset or clear any latched alarm relays. To change a relay configuration, execute the 'Relay configuration' command then select the relay to configure.

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



This icon configures 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. Refer to Section 12.5 for binary inputs, and Section 12.6 for analog inputs.

6.1.9 Testing Icon

This icon displays the Battery Open Test configuration and controls. Refer to Section 7.7 for instructions on how to start, schedule, and set up parameters for the Battery Open Test.

6.1.10 Communication Icon

This icon configures ATevo for optional remote communications. The Main Control Board (A1) supports up to three (3) serial adapters, and one (1) Ethernet adapter. 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. One (1) of the serial ports is also used when the optional Forced Load Sharing feature is installed. Refer to the supplementary ATevo Communications Manual (JA0102-54) for port configuration instructions.

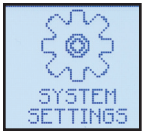
6.1.11 Save | Reset Configuration Icon

This 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. Refer to Section 6.5 for instructions.

6.1.12 Security Icon

This icon opens a list of user password and login functions. Refer to Section 6.4 for instructions.

6.1.13 System Settings Icon



This icon opens configurable options for System Settings such as time, date, and display backlight intensity. Refer to Section 4.4 for instructions.

6.1.14 System Information Icon

This icon allows the user 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

6.2 Alarms Button

The ALARMS button displays the ATevo Active Alarm List, four (4) alarms per page. If more than four (4) 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.

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 test can be aborted at any point by pressing the ESC button. Refer to Section 8 for instructions on how to run the Hindle Health System test.

6.4 Security and 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.

6.4.1 Three (3) Levels of Password Protection

ATevo features three (3) levels of password authorization:

- » READ
- » READ/WRITE
- » ADMINISTRATOR

Each requires a unique password to access functions and features.

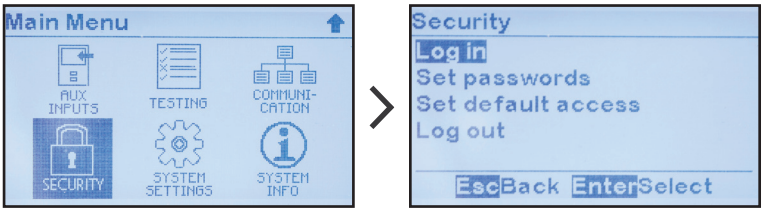
- READ is the lowest level, it permits:
  - » viewing charger's data and status,
  - » observing measurements and set points, but
  - » it does not permit configuration changes.
- READ/WRITE is the mid level, it permits:
  - » viewing charger's data and status as in READ level, and
  - » changing charger's 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.

6.4.2 How to Access Security Features and Password Configuration

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

To access the security features and password configuration:

MENU > SECURITY

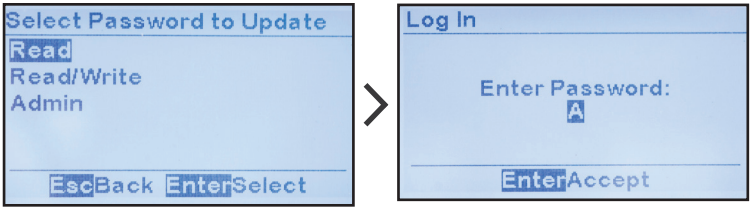


ATevo Security Screen prompts you to choose from one (1) of the security and password configuration selections.

6.4.3 Setting Passwords

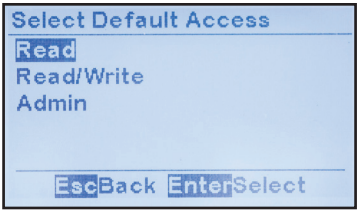
To change passwords, refer to Section 6.4.2 and ensure you have ADMINISTRATOR privilege. Then:

'Set passwords' > select from three (3) password authorization levels > set characters for that authorization level's password



6.4.4 Setting Default Access

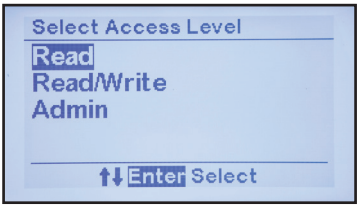
The DEFAULT ACCESS setting determines the authorization and password level when there is no log in. If you do not wish to implement password security, DEFAULT ACCESS should be set to ADMINISTRATOR, the default factory setting.



6.4.5 Logging In to a Password Authorization Level

If you attempt to access a feature or change a parameter that is configured at a higher privilege level than DEFAULT ACCESS (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.



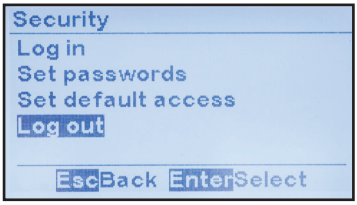
If the entry is correct, you will be able to access all features at the privilege level. However, if no buttons are pushed for more than 10 minutes, ATevo will switch back to DEFAULT ACCESS level.

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.

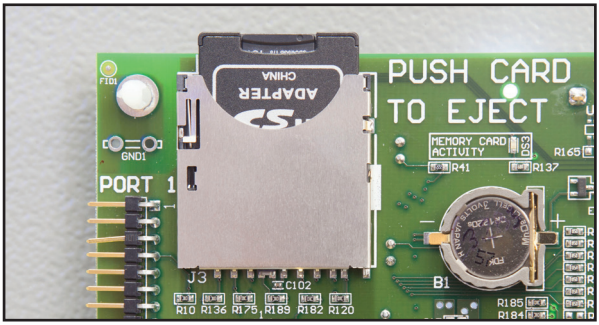
To LOG OUT of the present privilege level, select 'LOG OUT'. The user will receive a confirmation message and return to DEFAULT ACCESS.

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



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.



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 charger.

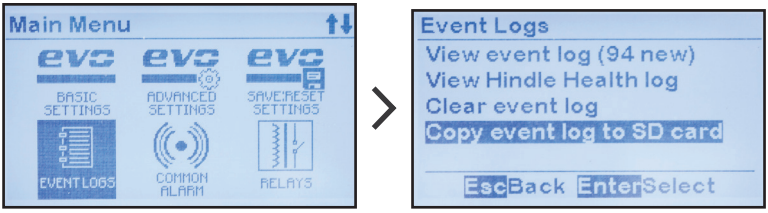
When installing the SD card, face the contacts down toward the Main Control Board (A1). Gently press the card into the socket until you feel the card locking mechanism 'click'. To remove, gently press the card further into the socket. Then allow it to 'snap' back, to disengage from the locking mechanism. Pull the SD card out.

6.5.2 Storing Event Log File to Memory 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 is written to a file named `ATgvaixx.LOG` where:

- 'g' specifies charger family:
  (1) 1Ø <= 25Adc, (2) 1Ø > 25Adc, (3) = 3Ø 16-1000Adc
- 'v' specifies dc output voltage:
  (A) = 12V, (B) = 24V, (C) = 48V, (D) = 130V, (E) = 260V
- 'a' specifies dc output current:
  (A) = 6A, (B) = 12 A, (C) = 16A, (D) = 20A, (E) = 25A
- 'i' specifies charger ID (A-Z): per SYSTEM INFO menu
- 'xx' is a sequential number

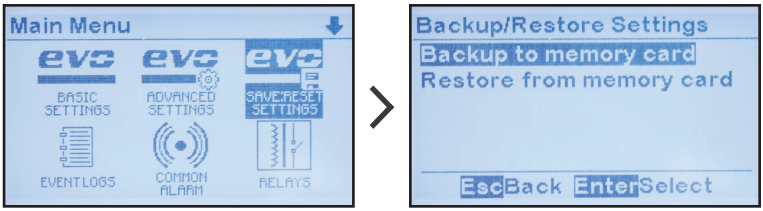
Each time the event log file is stored, it is written to a new file whereby 'xx' increments by one (1). This prevents previous event log files stored on the SD Memory Card from being overwritten.

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 is written to a file named `ATgvai00.EVO` where:

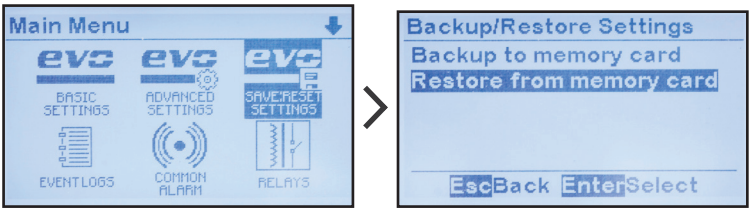
- 'g' specifies charger family:
  (1) 1Ø <= 25Adc, (2) 1Ø > 25Adc, (3) = 3Ø 16-1000Adc
- 'v' specifies dc output voltage:
  (A) = 12V, (B) = 24V, (C) = 48V, (D) = 130V, (E) = 260V
- 'a' specifies dc output current:
  (A) = 6A, (B) = 12 A, (C) = 16A, (D) = 20A, (E) = 25A
- 'i' specifies charger ID (A-Z): 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.

6.5.4 Upgrading Firmware via SD Memory Card

A powerful ATevo 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.

NOTICE An **expanded** (more detailed) version of the ATevo Firmware Upgrade Procedure is available online. Refer to Service Instruction (JD5012-60) for details. The following procedure applies to **older** ATevo models / firmware versions.

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

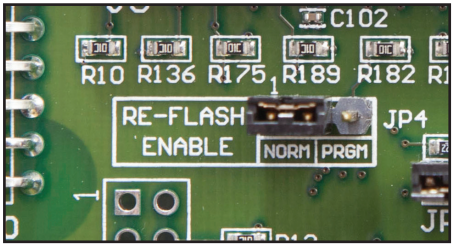
- `mainapp.bin` = Main Control Application program
- `bruno.bin` = Display Application program

These can be updated independently or at the same time.

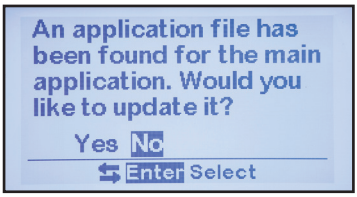
Next, copy these files onto an SD Memory Card, using either a Personal Computer (PC) with an SD Memory Card slot, or a USB to SD Memory Card adapter. When the files are on the SD Memory Card transfer them to ATevo.

- With ATevo operating normally, open the front panel door.
- Locate the SD Memory Card socket on the back of the Main Control Board (A1).
- Directly below the socket is a 'RE-FLASH ENABLE' jumper (JP4).

- Move shorting block on jumper to ‘PRGM’ position from ‘NORM’.



- Insert ATevo-compatible SD Card (with program files) into socket.
- Press RESET button (SW13) located 3in below RE-FLASH JUMPER.
- If file `mainapp.bin` is stored on the card, the message below will appear.



- Select ‘Yes’, if desired.
- A message will confirm the Main Application program update.
- If the SD Memory Card contains the `bruno.bin` file, you will be prompted to upgrade the Display Application program.

- Select ‘Yes’, if desired. A message will confirm the update.
- The ATevo will reset, and prompt you to upgrade the Main Application program again.
- Move the ‘RE-FLASH ENABLE’ jumper (JP4) back to the normal-operating position, marked ‘NORM’.
- Press RESET, and ATevo will re-boot.
- When it restarts, ATevo will run the newly installed program(s).

7.1 Legacy AT10.1 Alarms and 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 (2405-2022) 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 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 two-page table in Section 7.3, which identifies:

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

All Legacy Alarms will activate the Common Alarm Relay (as covered 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 features instructions on how to configure relays.

NOTICE To **TROUBLESHOOT** any active ATevo alarm, or identify status messages, refer to Service Instruction (JD5088-01). This supplemental document features a concise lookup table detailing:

- What's happening? (definition of alarm)
- Why did it happen? (probable cause or explanation)
- How do I fix it? (recommended action)

7.2 Common Alarm Indicator

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

The Common Alarm LED is used to indicate that one (1) or more of the advanced alarms (summarized in Section 7.3 table) are active.

When the Common Alarm is active, after a configured time delay, the Common Alarm Relay (A1-TB6) on the Main Control Board will change to the alarmed state. 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 features detailed instructions on how to configure alarm 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.

7.3 Alarm LED Summary Table

Refer to the following two (2) pages for a summary of all alarm LEDs.

ATevo Alarm LED Summary

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 (A1) 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 (A1) 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

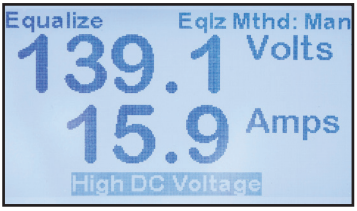
ATevo Alarm LED Summary

LED	Alarm Active	Condition Detected	Possible Cause(s)	Configurable Set Point	Relay Activated
AC Input Failure	AC Input Failure	ac input voltage (Vac) detected to be below **65%** 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 Legacy or Advanced Alarms	any one (1) legacy alarm in previous six (6) rows, or advanced alarms that do not have a dedicated LED	any of above	can set which Advanced Alarms activate Common	common alarm

7.4 Active Alarm Bar, Alarm View, and Alarm Log

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 (4) active alarms at once, but it is scrollable to view any additional alarms present.

7.4.3 Alarm Logs

Alarms are system events, stored in the ATevo event log with a time and date stamp. The same is true for alarm clearing (return to non-alarm state). Refer to Section 9 for information on event logs.

7.5 Advanced Alarms

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

- Legacy AT10.1 Alarms *(covered in Section 7.1)*
- Advanced Alarms

Covered in the following sections, the Advanced Alarms:

- do not have dedicated LEDs to indicate when they are active
- illuminate the COMMON ALARM LED and activate the Common Alarm Relay (A1-TB6)
- 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
- are further detailed in **Alarm Service Instruction** (JD5088-01)

7.5.1 High Voltage Shutdown Alarm

This alarm is activated when ATevo initiates a High Voltage Shutdown, provided that feature has been enabled. Refer to Section 4.3.2 for details.

High Voltage Shutdown is initiated by ATevo 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. Refer to Section 5.2 for details.

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 4.3.5 for details, and refer to the image (DS2) below.

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. Refer to Section 4.3.4 for details.

NOTICE *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. Refer to 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 TempCo 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 the SCR module is 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 can be powered by both ac and dc sources. ATevo primarily uses the ac power source when it is available, but diverts to a 9V dc source (P/S-A2) when there is no ac.

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

7.5.12 SCR Failure Alarm

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

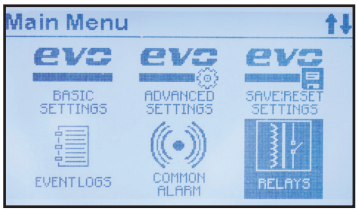
7.6 Resetting Latched Alarm Relays

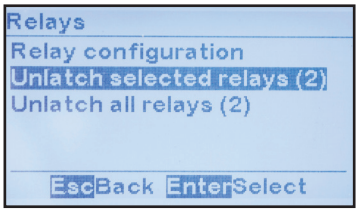
Latched alarm relays can be reset or cleared two (2) different ways.

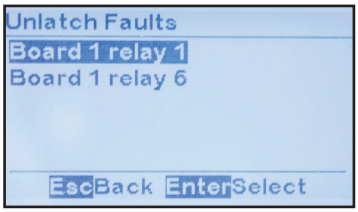
- The Legacy AT10.1 method may be used by pressing and holding the UP arrow button for a few seconds. This will reset or clear all latched alarm relays. A brief confirmation message will display.
- Individual latched alarm relays or all latched alarm relays may also be reset via the RELAYS icon from the Main Menu.

To reset an individual latched alarm relay:

MENU > RELAYS > ‘Unlatch selected relays’ > select latched relay from list

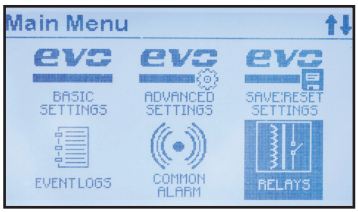


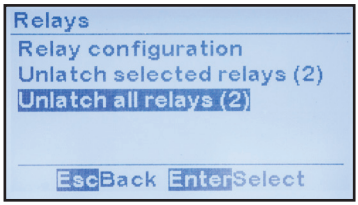




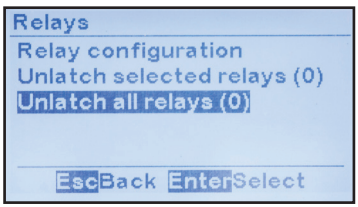
To reset all latched alarm relays:

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.



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.

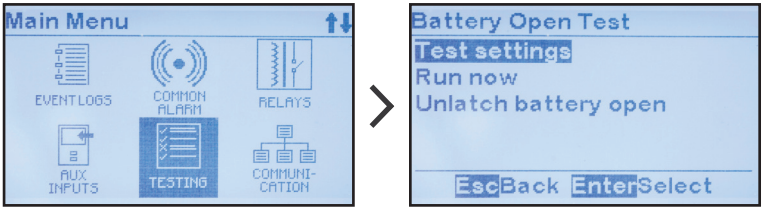
The Battery Open Test will fail if the dc bus drops below a configurable voltage set point. When such occurs the test aborts immediately and ATevo will raise output voltage back to the present Float or Equalize setting. Test duration is configurable, as shown below.

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

7.7.1 Battery Open Test Settings

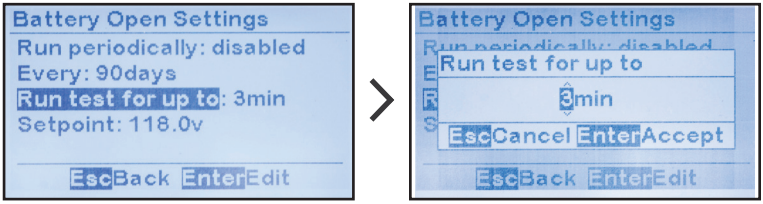
To access and configure Battery Open Test settings:

MENU > TESTING > 'Test Settings'



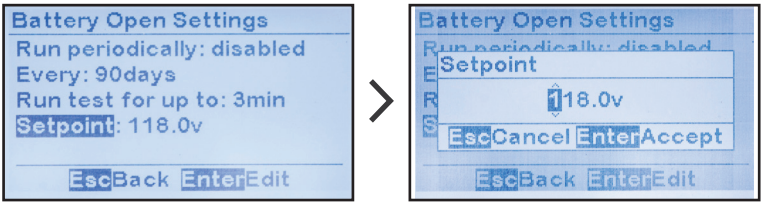
To configure test duration:

'Run test for up to:' > adjust duration



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

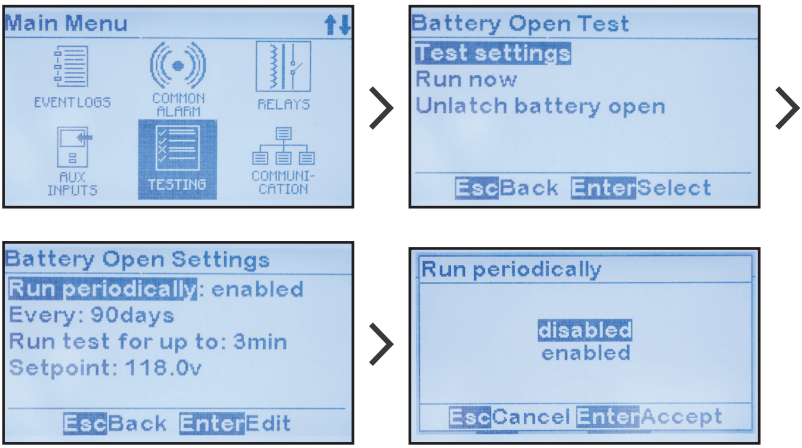
'Setpoint' > adjust voltage



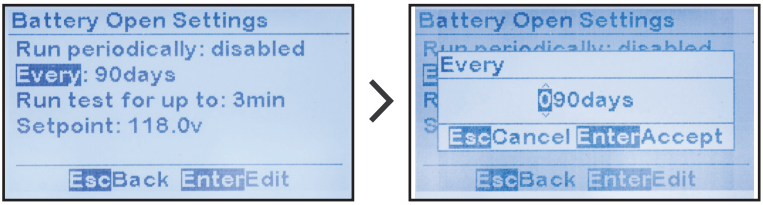
7.7.2 Running Battery Open Test Periodically

To schedule periodic Battery Open Tests:

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



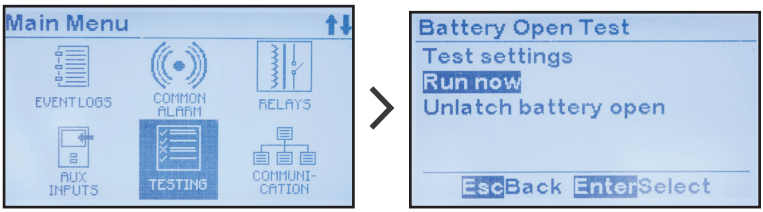
'Every:' > change desired digits



7.7.3 Running Battery Open Test Manually

To run the Battery Open Test manually on demand:

MENU > TESTING > 'Run now'

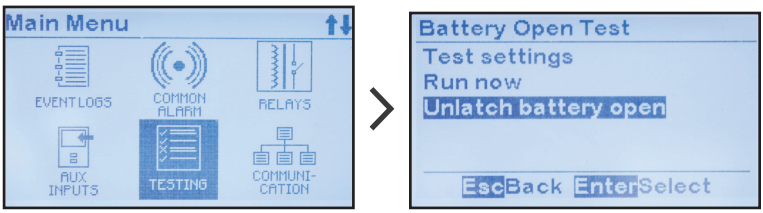


7.7.4 Resetting Battery Open Alarm

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'



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).

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).

8.1 Hindle Health System - Overview

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

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

ATevo microprocessors continuously run utilities that check hardware component operation. These include 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 located 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, which are covered in Section 8.3.

8.2.3 Hindle Health LED Indicators

Hindle Health LED Indicators are located 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 controls. The LCD may be blank, frozen, or depicting corrupted data. The core microprocessor responsible for charging the battery may **still** be operational.
  - » **Solid** - ATevo requires attention, but the condition is **not** critical. In most cases the LCD will operate, be able to report the issue, and display instructions on how to resolve it. The **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.

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.

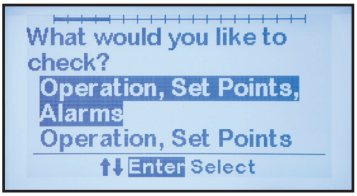
Step-by-step guidance is provided through the testing process. To start the Hindle Health System, press the **Hindle Health Button**. For a more detailed guide, see also Service Instruction (JD5072-00).

8.3.1 Introduction and 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:

- Operation, Set Points, Alarms
- Operation, Set Points *(will not test alarms or relays)*

8.3.3 Test Screens

The remaining screens are test displays. These prompt the user through an interactive process to verify proper ATevo 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, prompt the user to verify the alarms operate, and are confirmed by any connected SCADA devices
- explain how to **verify the ATevo dc voltmeter**, and automatically enter calibration mode if required

NOTICE For details see Service Instruction (JD5072-00).

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, such as verifying correct float voltage.

8.4 HindleHealth+ - *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 **HH**+ user instructions (JA5136-00).

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:

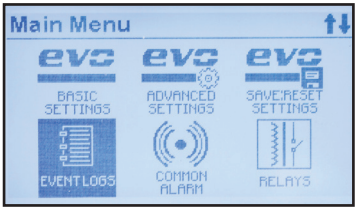
- clearing the event log
- saving the event log to SD memory card

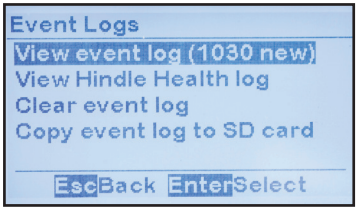
9.2 Viewing Event Log

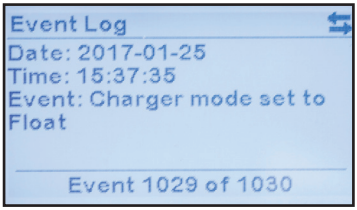
To view the event log:

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

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







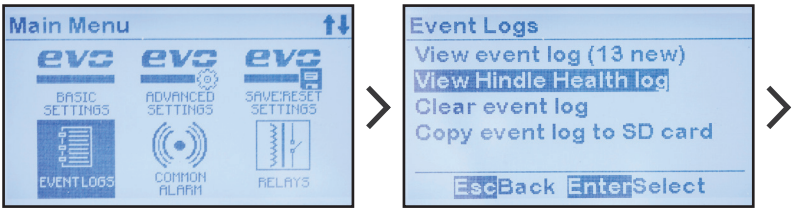
The most recent event stored will appear, but you can scroll through events with the RIGHT/LEFT arrows. Events include set point changes, and when an alarm becomes active and when the alarm is cleared. The log will show the date and time the event occurred, the event name, and the status change that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

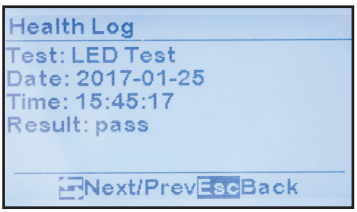
For more information on the alarms listed in the charger event log, refer to Section 7.

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.

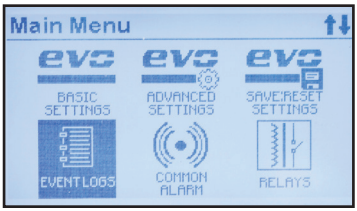
9.4 Clearing Event Logs

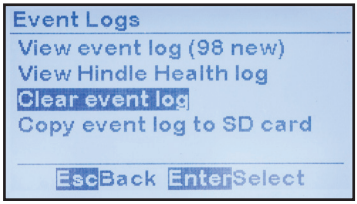
⚠ WARNING *All stored event history will be* **deleted**. *Prior to clearing the event logs, it is strongly recommended that you transfer a copy of the log files to the SD memory card. If not, all of the event history will be lost.*

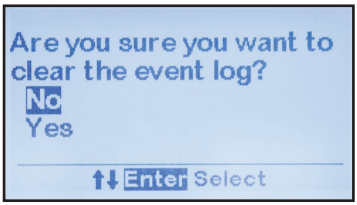
Event logs are stored in internal nonvolatile memory on the Main Control Board (A1). They can be erased by selecting 'Clear Event Log', which will clear both the Event Log and the Hindle Health Log.

To clear the logs:

MENU > EVENT LOGS > ‘Clear event log’ > ‘Yes’ to confirm





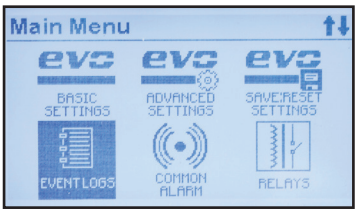


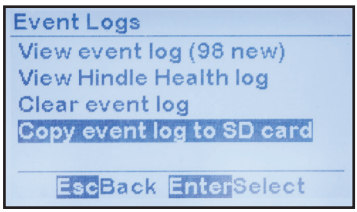
9.5 Copying Event Logs to SD Memory Card

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

10.1 ATevo Battery Temperature Compensation

Battery manufacturers specify recommended float and equalize voltages at 25 °C (77 °F) for their product. In order to prolong battery life and ensure reliable operation, temperatures above or below the nominal 25 °C require slightly lower or higher voltages (respectively). The Battery Temperature Compensation (or TempCo) feature for ATevo automatically adjusts the charger's dc output voltage, based upon the battery temperature. The external battery probe allows ATevo to provide:

- voltage compensation based on battery temperature
- battery temperature value (°C) monitoring
- a battery over-temp alarm.

The ATevo TempCo option (ordering p/n EJ5304-##) consists of a bagged kit, including:

- an external Battery Temperature Probe (A10)
- a signal cable to connect probe back to ATevo
- expanded user instructions (p/n JA5015-51)

An **abbreviated** version of this text is listed in the following sections.

The A10 probe contains a temperature-dependent resistor encased within an epoxy module. For mounting, the epoxy is housed within a tin-plated crimped ring lug. The probe is installed on (or near) the battery. The entire TempCo option can be purchased with ATevo, or easily field installed later.

10.2 Installing the TempCo Option

In overview, there are four (4) stages. The full detailed procedure is found in the next few pages:

- mount probe assembly (A10) on or near battery
- install interconnection cable from probe to ATevo
- wire charger-end of cable to ATevo Power Board (A2-TB8)
- configure ATevo to recognize TempCo option

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

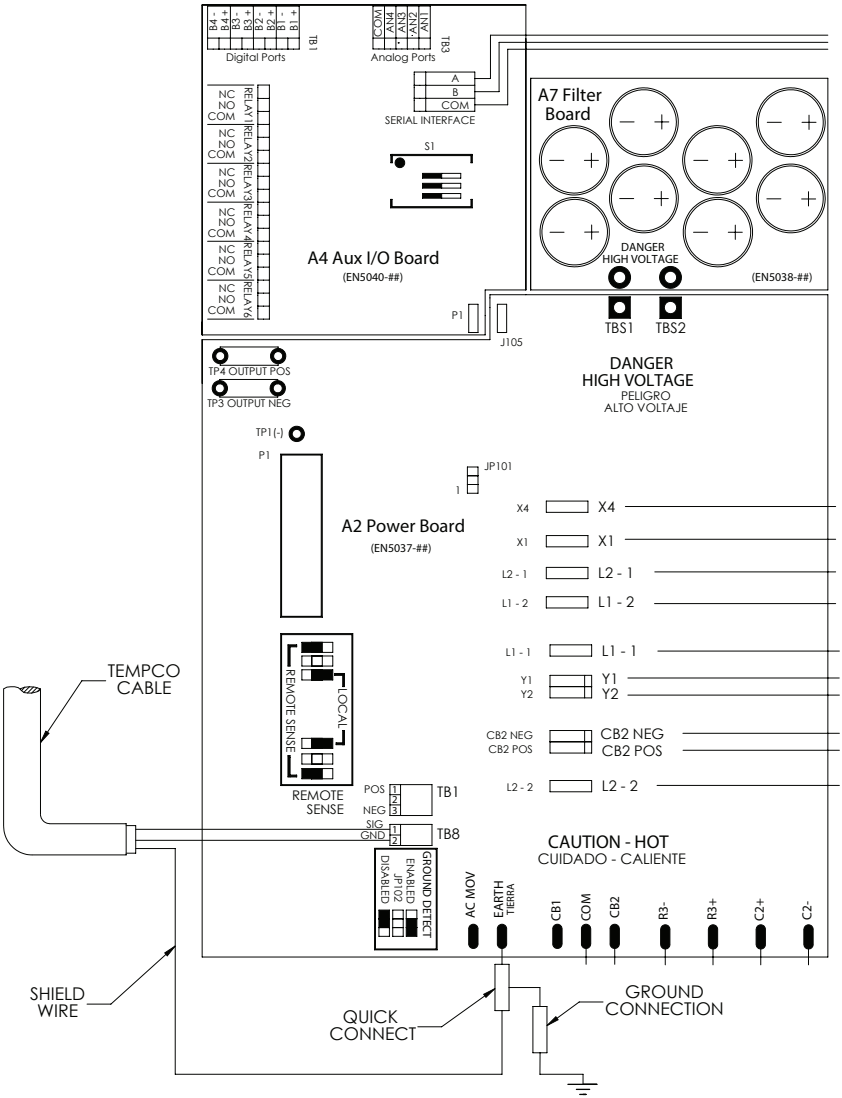
PROCEDURE

1. Turn off (open) both ATevo front panel breakers (CB1/CB2).
2. De-energize and lock out all external ac and dc voltages.
3. Allow internal voltage potentials to dissipate.

NOTICE *Consult battery manufacturer documentation for mounting restrictions and material compatibilities.*

4. Mount the probe on (or as close as possible to) the battery.
5. At the battery location, mount the TempCo probe (A10) on a clean & dry surface.
6. Use the 3/8in hole ring lug, and secure the probe with standard ZPS hardware.
7. Open ATevo front panel door, and remove safety shield.
8. Verify no hazardous voltages are present with a voltmeter.
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 TempCo 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 the lower end of the ATevo Power Board (A2). Locate signal terminal block (A2-TB8) and EARTH terminal as shown below:



11. Connect the TempCo cable to ATevo.
    - » 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 at the bottom of Power Board (A2).
    - » 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 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 zip 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 zip-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 ATevo.

10.2.1 Configuring the TempCo Option

ATevo will need to be configured to select the battery type, and enable the TempCo probe (A10). Refer to Sections 4.11.1 and 4.11.3 for instructions.

10.3 Using the TempCo Option

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

The probe senses battery temperature variation and adjusts output float/equalize voltages to compensate. If battery temperature increases, ATevo output voltage decreases. If you are experiencing any inconsistencies in ATevo when the probe is installed, temporarily disable the TempCo feature per Section 4.11.3.

NOTES

- Set Float and Equalize voltages 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 **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 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

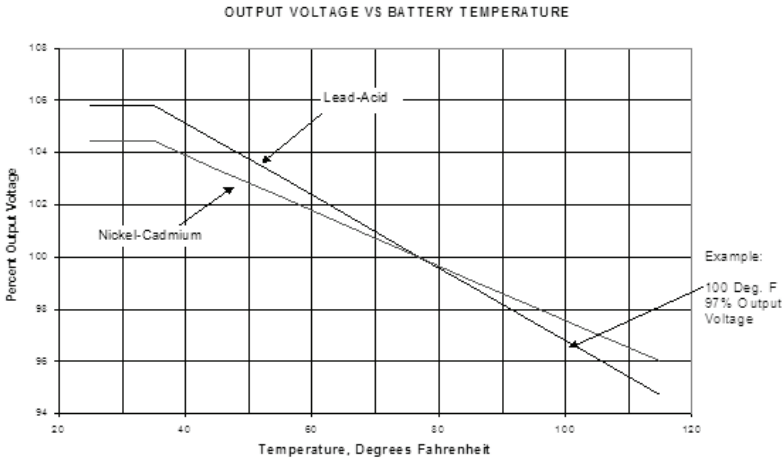
Additional parameters appear on the HOME SCREEN when the TempCo option is installed and enabled.

- 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.

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 in the graph above, 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 x 0.97 = 128 Vdc

11.1 ATevo Remote Voltage Sense

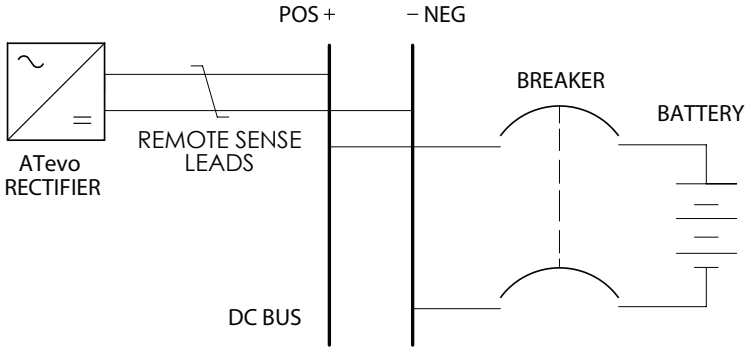
ATevo regulates dc output voltage as measured at the charger's output connection (CB2+/-). The Remote Voltage Sense feature permits ATevo to monitor and regulate the dc output voltage at the battery. This feature is useful when long battery cables, causing resistive voltage-drop, connect ATevo to the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

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.*

11.3 Wiring for Remote Sense

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

PREPARATION

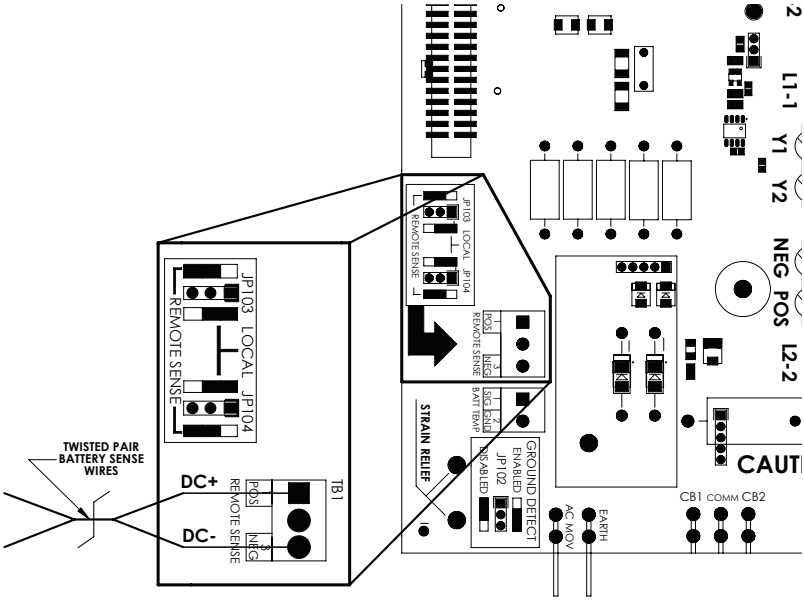
- Open both front panel circuit breakers (CB1/CB2).
- De-energize and lock out all external ac and dc voltages.
- Allow internal voltage potentials to dissipate.
- Use #16 AWG twisted-pair wire, of appropriate length to reach from the battery to ATevo.
- Designate, or **label**, one (1) wire of twisted 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 the BATTERY, at a desired voltage sense location.
- Open ATevo front panel door, and remove safety shield.
- Verify no hazardous voltages are present with a voltmeter.
- Identify the Power Board (A2) on the left side of ATevo.
- Refer to image on the following page.
- Locate the Remote Sense terminal block inside ATevo:
  - Style-5054: on bottom-front of Power Board (A2-TB1)
- Route the other end of twisted pair battery sense wiring to the 3-position REMOTE SENSE terminal block.

PROCEDURE

- Connect wire from twisted-pair designated '**DC(+)**' to **1-POS** on REMOTE SENSE terminal block.
- Connect wire designated '**DC(-)**' to **3-NEG** on REMOTE SENSE.
- 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.

  NOTICE **DO NOT** yet re-energize ATevo.

- Configure Remote Sense Jumpers per Section 11.4.
- Replace safety shield, and restart ATevo.



NOTES

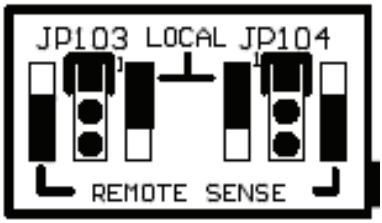
- Maximum current is 150mA.
- Run twisted-pair cable with sense leads in a dedicated conduit.
- Fuse each of the sense wires.

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 the ATevo 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 ATevo factory default configuration. Unless otherwise specified, units ship to use charger 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.

11.5 Disabling Remote Sense

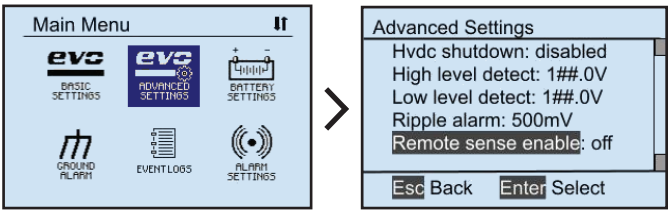
If you need to temporarily disable Remote Sense:

- De-energize and lock out all external ac and dc voltages.
- Open ATevo front panel door, and remove safety shield.
- Verify no hazardous voltages are present with a voltmeter.
- Move SHORTING BLOCKs to Local Sense configuration per Section 11.4.3.
- Replace safety shield, and close front panel door.
- Restart ATevo.

NOTICE *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 TB1 terminal block.*

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.

12.1 Auxiliary Input/Output (I/O) Board

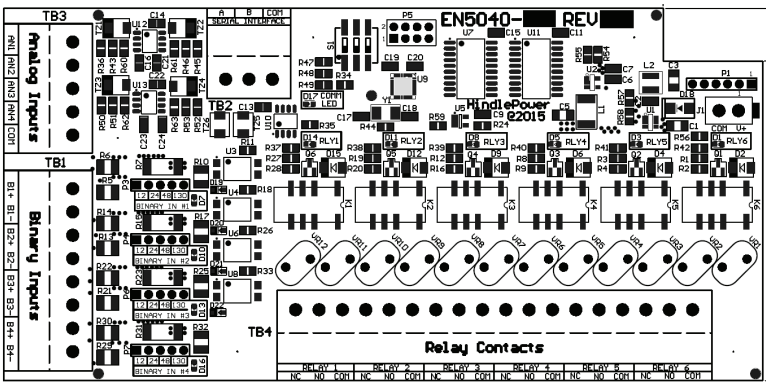
The Auxiliary I/O Board (A4) is an optional component, supplied when local communication to and from ATevo is required. Each board is equipped with:

- 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 Auxiliary 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 drawing:

- JE5253-21 (Style-5054, up to 25Adc, w/options)

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 the ATevo 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

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 (*factory default*). 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.

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, so that it is 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.

12.2 Connections to Auxiliary I/O Board

12.2.1 System Connections

The Auxiliary I/O Board header socket (A4-P1) plugs into header pins (A2-J105) on the Power Board. All system connections are factory installed when the Auxiliary I/O Board option is ordered with ATevo.

12.2.2 Wiring Relays 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

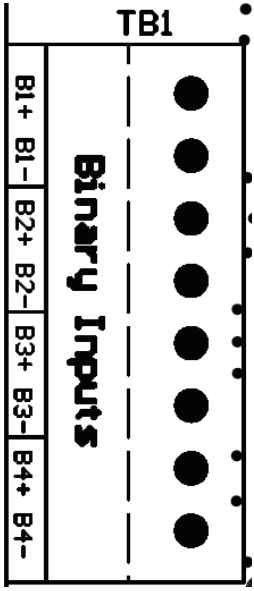
1. De-energize and lock out all external ac and dc voltages.
2. Allow internal voltage potentials to dissipate.
3. Open ATevo front panel door, and remove safety shield.
4. Verify no hazardous voltages are present with a voltmeter.
5. Route remote annunciator wiring to Auxiliary I/O Board (A4) through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

NOTES

- Alarm contacts are rated for 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.
  NOTICE **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).

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.

NOTICE *Before wiring the binary inputs, verify the binary input voltage selection jumpers are configured for correct input voltage. Refer to Section 12.3.2. Incorrect voltage configuration may damage the Auxiliary I/O Board (A4). Factory default is 130 Vdc.*

PROCEDURE

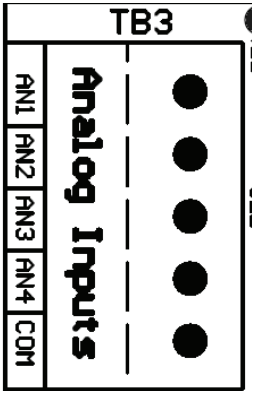
1. **De-energize and lock out all external ac and dc voltages.**
2. **Allow internal voltage potentials to dissipate.**
3. **Open ATevo front panel door, and remove safety shield.**
4. **Verify no hazardous voltages are present with a voltmeter.**
5. **Route binary input wiring to Auxiliary I/O Board (A4) through an unused enclosure knockout.**
6. **Strip 0.25in / 6.4mm of insulation from each wire.**
7. **Connect wiring (#22-14 AWG) to appropriate contacts on Auxiliary I/O Board (A4-TB1), and tighten terminal screws.**
8. **Replace safety shield, and close front panel door.**
9. **Restart ATevo.**

NOTES

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

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 external ac and dc voltages.
2. Allow internal voltage potentials to dissipate.
3. Open ATevo front panel door, and remove safety shield.
4. Verify no hazardous voltages are present with a voltmeter.
5. Route remote analog inputs to the Auxiliary I/O Board (A4) through an unused enclosure knockout.
6. Strip 0.25in / 6.4mm of insulation from each wire.
7. Connect wiring (#22-14 AWG) to appropriate contacts on Auxiliary I/O Board (A4-TB3), and tighten terminal screws.
8. Replace safety shield, and close front panel door.
9. Restart ATevo.

NOTES

- Analog inputs are rated at 0-10Vdc.
- Terminal block (A4-TB3) is compression screw type, accepting #22-14 AWG wire.
- All analog inputs (AN1, AN2, AN3, AN4) must be referenced to the ATevo negative (-) bus voltage (COM) terminal.

12.3 Hardware Configuration

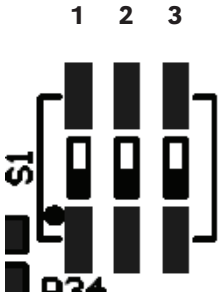
The Auxiliary I/O Board requires two (2) hardware configurations:

- 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 (A4x). Each Auxiliary I/O Board connected to ATevo must have a unique address setting to identify it to the system. The Auxiliary I/O DIP switch (S1) determines the Auxiliary I/O Board Address.

The Auxiliary I/O Board (A4) features a 3-position DIP switch (S1), located near the top-center of the board. Viewing the board with the '**S1**' silkscreen label to the left (as shown below), 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, 2-ON**
- Auxiliary I/O Board #2: **1-OFF, 2-ON, 2-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 DIP switch 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 binary input voltage, move the SHORTING BLOCK to connect the two (2) header pins directly above the voltage rating (12, 24, 48, or 130). Factory default jumper setting is 130. Repeat this process for the remaining three (3) binary inputs, using the associated configuration jumpers for Binary Input #2, #3, and #4.

12.4 Software Configuration for Relays

The Auxiliary I/O Board's inputs are generic and do not require any configuration. The Inputs (analog and binary) are defined by their associated number. Binary Input #1 through Binary Input #4 and Analog Input #1 through Analog Input #4 will reside on the Auxiliary I/O Board 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 (1-6) 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. Refer to 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.

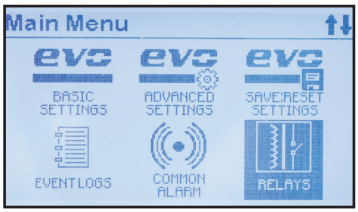
NOTICE **Software Configuration Naming**

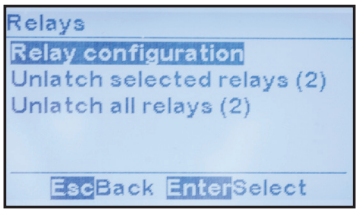
In the following subsections, Auxiliary I/O Board **relays** *are specified by 'A4x' board number (refer to Section 12.3.1) plus relay number on the associated board. For example, 'Aux 1 relay 3' specifies Relay #3 on Auxiliary I/O Board #1.*

12.4.1 Auxiliary I/O Board Relay Configuration

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

MENU > RELAYS > 'Relay Configuration' > select relay from options > select parameter (refer to Section 12.4.2 through 12.4.4)

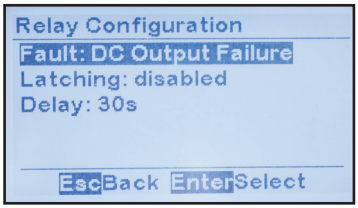


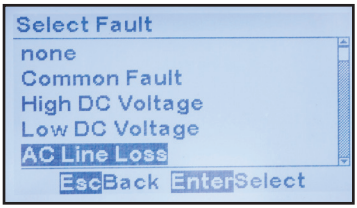


12.4.2 Auxiliary I/O Board Relay Alarm Configuration

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

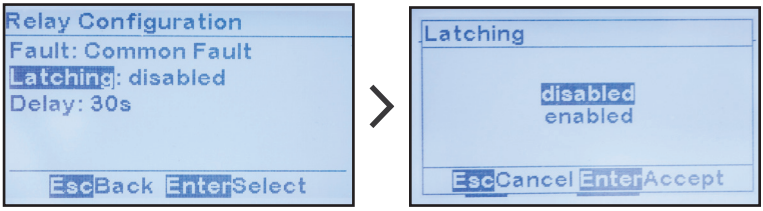




12.4.3 Auxiliary I/O Board Relay Latch Configuration

To change latching control configuration on an Auxiliary I/O Board:

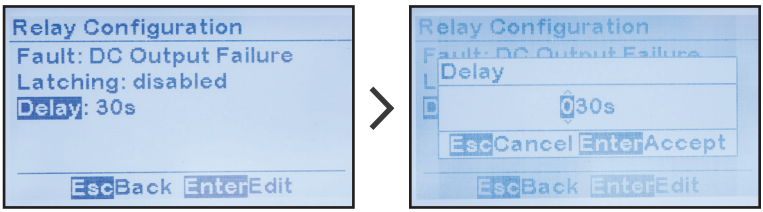
MENU > RELAYS > 'Relay Configuration' > select relay from options (refer to Section 12.4.1) > 'Latching:' > select from two (2) options



12.4.4 Auxiliary I/O Board Relay Time Delay Configuration

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

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



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 (<75% nom.)	disabled	30 seconds
#5	Positive (+) Ground Fault	disabled	30 seconds
#6	Negative (-) Ground Fault	disabled	30 seconds

12.5 Software Configuration for Binary Inputs

The Auxiliary I/O Board binary inputs are used to monitor, report, and/or alarm 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.

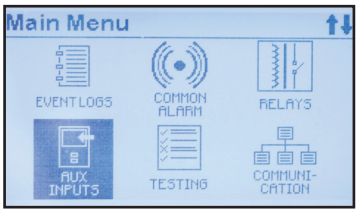
NOTICE **Software Configuration Naming**

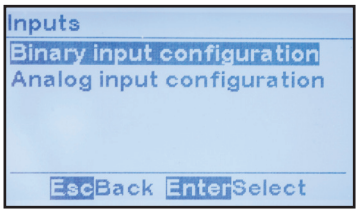
In the following subsections, Auxiliary I/O Board binary input **default** *names are specified by 'A4x' board number (refer to Section 12.3.1) plus binary input number on the associated board. For example, 'Aux 1 input B2' specifies binary input #2 on Auxiliary I/O Board #1.*

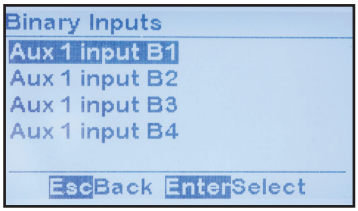
12.5.1 Binary Input Configuration

To make changes to parameters for any binary input on an 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)



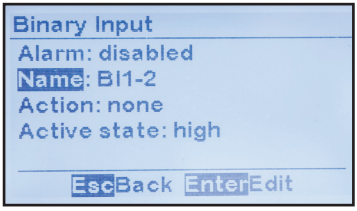


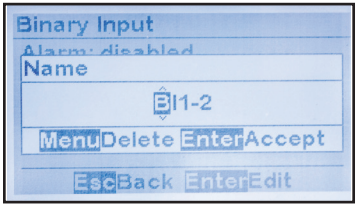


12.5.2 Binary Input Name Assignment

To change the name of a binary input on an 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



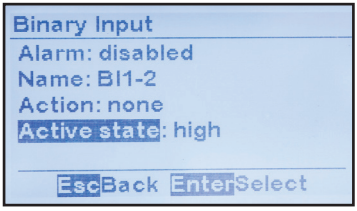


12.5.3 Binary Active State Assignment

The binary active state assignment determines the normal and alarm state of the input.

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

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

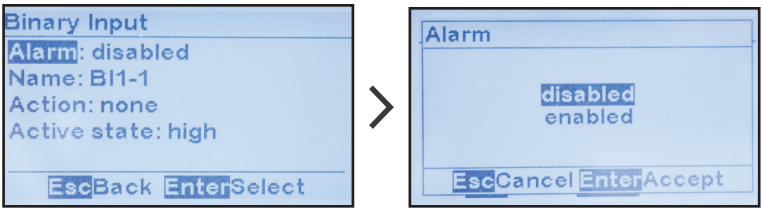


12.5.4 Binary Input Alarm Enable

The binary active 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 two (2) alarmed states

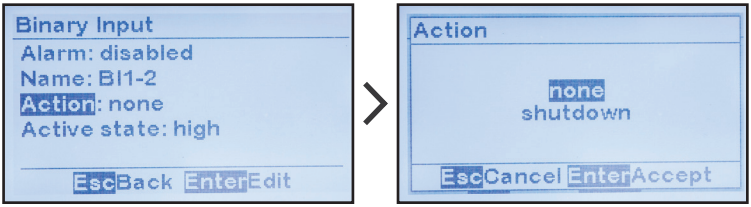


12.5.5 Binary Input Action Assignment

The binary input action assignment links the binary input to a changer 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 two (2) actions



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

In addition, the factory default voltage jumper setting for all binary inputs is 130Vdc.

12.6 Software Configuration for Analog Inputs

The Auxiliary I/O Board (A4) 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.).

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

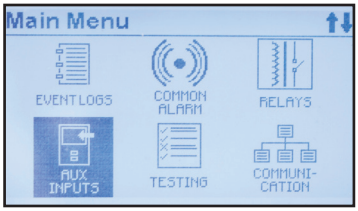
NOTICE **Software Configuration Naming**

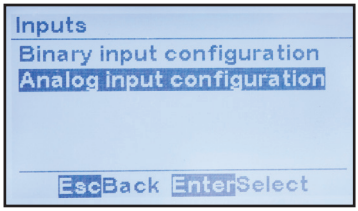
In the following subsections, Auxiliary I/O Board analog input **default** *names are specified by 'A4x' board number (refer to Section 12.3.1) plus analog input number on the associated board. For example, 'Aux 1 input AN2' specifies analog input #2 on Auxiliary I/O Board #1.*

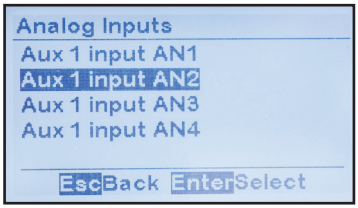
12.6.1 Analog Input Configuration

To make changes to parameters for any analog input on an Auxiliary I/O Board:

MENU > AUX INPUTS > 'Analog Input Configuration' > select input > select parameter (refer to Section 12.6.2 through 12.6.7)



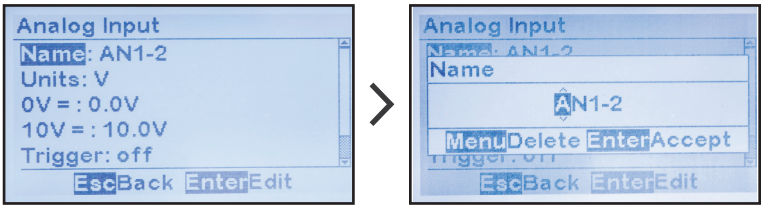




12.6.2 Analog Input Name Assignment

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

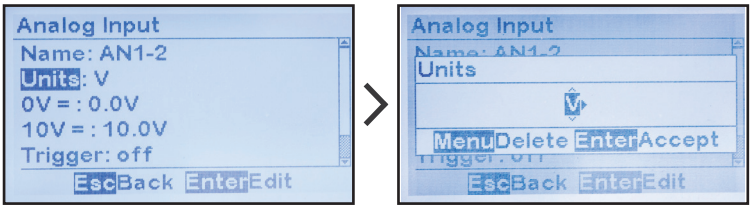


12.6.3 Analog Input Primary Unit Assignment

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 an Auxiliary I/O Board (A4):

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



12.6.4 Analog Input Scaling Assignment

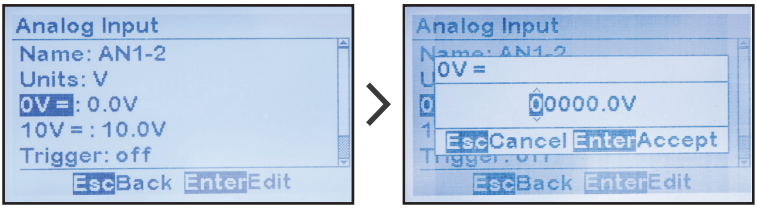
ATevo can scale the analog input values such that the measurement can be represented in primary units.

To adjust the scaling, enter the primary value when the analog input is at 0.0 Vdc, 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

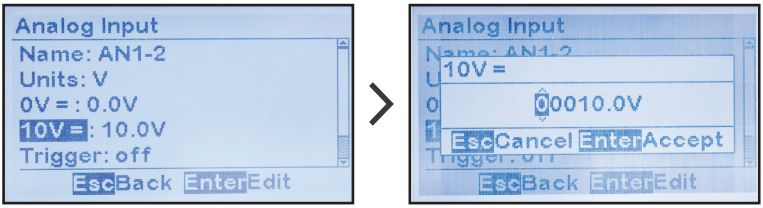
- This number must represent the primary value when the input value is 0 V. If no scaling is required, set 0.



To adjust 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.

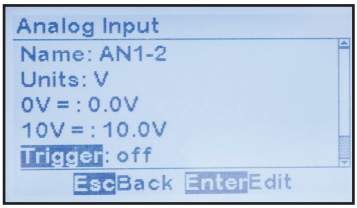


12.6.5 Analog Input Alarm and Trigger Assignment

The ATevo can generate various 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



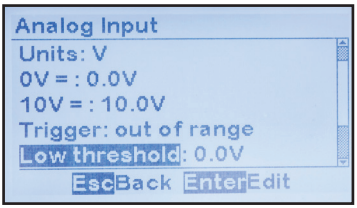
12.6.6 Analog Input Alarm Threshold Assignment

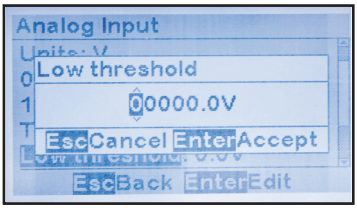
ATevo can generate alarms based on analog input values. Alarm thresholds are set points at which an alarm occurs. Each analog input can be assigned an alarm with a trigger. Some triggers only require one (1) threshold. The 'above a threshold' alarm trigger requires a 'high threshold' set point. The 'below 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 to trigger 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.

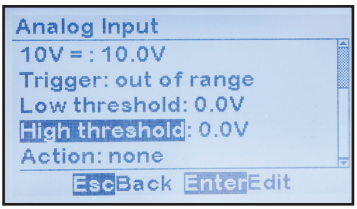


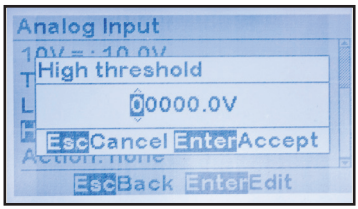


To adjust the high level threshold set point for a trigger for an analog input alarm:

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.



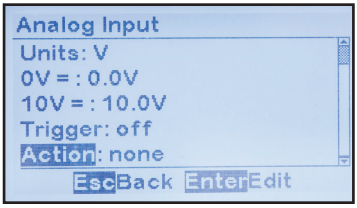


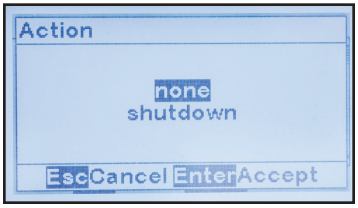
12.6.7 Analog Input Action Assignment

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





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

13.1 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 (1) 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.

The ATevo 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.

13.2 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).

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.

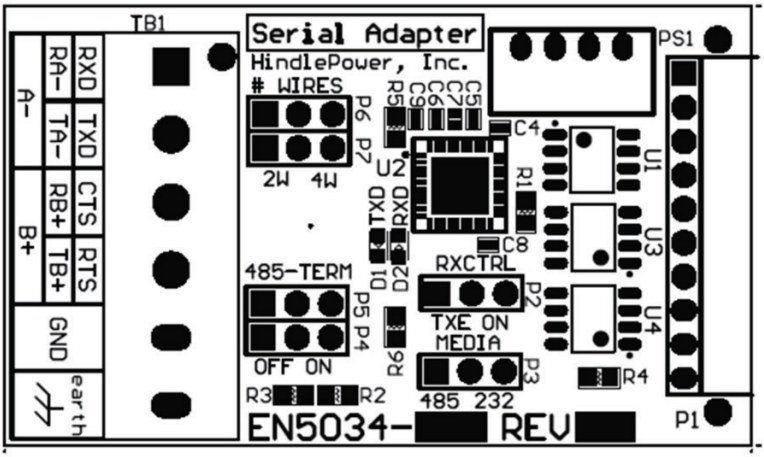
If forced load sharing is added to the ATevo in the field, the following three (3) hardware and software configurations will be required.

13.3.1 Installing Serial Communications Adapter (A13)

Refer to the supplementary ATevo Communications Manual (JA0102-54) for more information and how to install and wire the Serial Communications Adapter.

13.3.2 Configuring Serial Communications Hardware

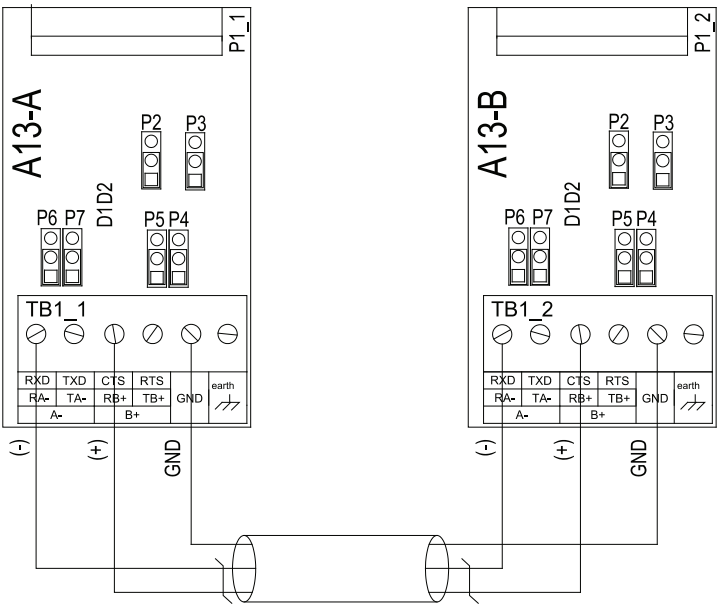
The jumpers on the Serial Communications Adapter (A13) must be configured to operate in 2-WIRE RS-485 mode.



2-Wire RS-485 Settings		
Jumper(s)	**Label**	**Setting**
P2	RXCTRL	TXE
P3	MEDIA	485
P4, P5	485-TERM	OFF
P6, P7	#WIRES	2W

13.4 Wiring ATevo Chrgrs 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

13.4.1 Configuring ATevo for Forced Load Sharing

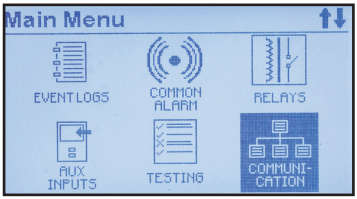
Each ATevo connected in forced load sharing must be assigned a charger ID. Configure one (1) as the Primary charger, and configure the other as the Secondary charger.

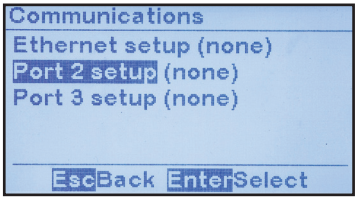
To configure ATevo for Forced Load Sharing:

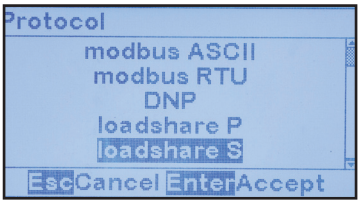
MENU > COMMUNICATION > Port '**X**' setup

- where '**X**' is either '**2**' or '**3**', depending on which numbered port the FLS Serial Communications Adapter (A13) is plugged into
- select either '**loadshare P**' for the Primary ATevo
- or select '**loadshare S**' for the Secondary ATevo

NOTICE *In the following images, sample ATevo displays depict Port 2 used for Forced Load Sharing. If it is open, it is* **recommended** *(although not necessary) to use* **Port 3** *for FLS. The factory-installed default for Forced Load Sharing is Port 3, leaving Port 2 open for other serial communications adapters.*





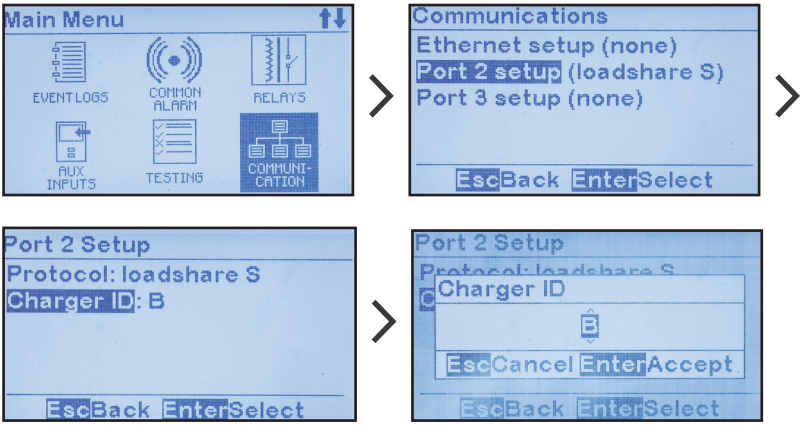


Press the EDIT/ENTER button to accept the new selection. The charger ID may now be changed. Press the ESC button to return to the previous screen. If a port setting was changed, the ATevo will prompt to RESET. Select YES to RESET the ATevo. The new port settings will not become active until after the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

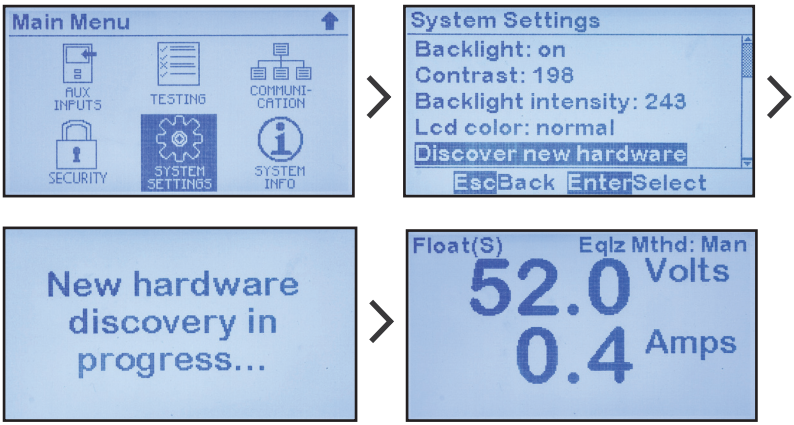
13.5 Forced Load Sharing Operation

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.

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** (<65%) or **low** ac supply (<75%)
  - » 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.

13.5.2 Virtual Independent Mode

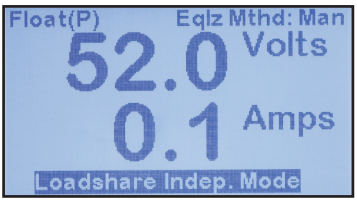
Virtual Independent Mode detects when an external dc branch breaker is opened while ATevos are in Forced Load Sharing. ATevos not connected to the same dc bus cannot share load.

If either of these two (2) conditions persist for more than twenty-five (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 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.



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

13.6 Temperature Comp. 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.

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.

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.

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.

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.

13.11 Troubleshooting Load Sharing ATevos

- Ensure that at least one (1) 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 (1) 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** LED and a **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.

14.1 Performing Routine Maintenance

⚠ WARNING *High voltages appear at several points inside the ATevo. Use extreme caution when working inside the enclosure. Do not attempt to work inside 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 power at the ac distribution panel, upstream from ATevo. Disconnect the battery from the DC Output Circuit Breaker (CB2+/-). **NOTICE** *Wait several minutes to allow voltage potentials in dc filter electrolytic capacitors (A7/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. Single-Phase input ATevo models (rated 6-25 Adc) 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 and 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.

14.2 Ordering Replacement Parts

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

14.3 Replacing Defective Components

⚠ WARNING *High voltages exist at several points inside the ATevo. Use extreme caution when working inside the enclosure. Do not attempt to work inside 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 input power at the ac distribution panel, upstream from ATevo. Disconnect the battery from the ATevo DC Output Circuit Breaker (CB2+/-). Wait several minutes to allow voltage potentials in dc filter electrolytic capacitors (A7/C1x/C2) to bleed off.

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

14.3.1 Removing Safety Shield

Refer to Section 2.2.

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 the ribbon cable from lower-right edge of the Main Control Board (A1). The 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 the tab on each standoff, and pull board toward you until it clears all standoffs.

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

Installation of New 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 pc board terminals.
- Close font panel door.
- Restart ATevo.

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

14.3.3 Replacing a 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.

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.

14.3.5 Replacing Rectifier / Heat Sink Assembly (A6)

- See also Service Instruction (JD5076-00).

Preparation:

- Shut down and lock out all power to ATevo.
- Open ATevo front panel door, and remove safety shield.
- Disconnect the battery from ATevo DC Output Breaker (CB2+/-).
- Verify no hazardous voltages are present with a voltmeter.
- Make sure the rectifier/heat sink assembly (A6) has **cooled**.

Removal of Existing Rectifier:

- Disconnect the ribbon cable and wires from Power Board (A2).
- Remove the two (2) bolts securing rectifier assembly on center of left side of enclosure, between top and bottom vent perforations.
- Pull rectifier assembly (A6) straight out toward front of ATevo.
- Remove the four (4) screws that attach Power Board to assembly.
- Remove the screw that attaches Filter Board (A7) to assembly.
- If an Auxiliary I/O Board (A4) is present, remove the four (4) screws that attach it to the assembly.
- Lift and remove all boards from the existing rectifier / heat sink assembly (A6).

Installation of New Rectifier:

- Plug removed boards onto new rectifier/heat sink assembly (A6).
- Make sure all spade connections on the bottom of Power Board (A2) are correctly seated on the new rectifier.
- Replace and tighten all board mounting screws.
- Insert new (replacement) assembly into enclosure, making sure protrusions on the heat sink drop into holes at back of enclosure.
- Install mounting bolts on left side of enclosure.
- Reconnect all wires to the Rectifier (A6) and Power Board (A2).
- Replace safety shield, and close front panel door.
- Restart ATevo.

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.

14.3.7 Replacing Auxiliary I/O Board (A4)

- See also Service Instructions (JD5025-50 & JD5025-51).

Preparation:

- Shut down and lock out all power to ATevo.
- Open ATevo front panel door, and remove safety shield.
- Disconnect the battery from ATevo DC Output Breaker (CB2+/-).
- Verify no hazardous voltages are present with a voltmeter.

⚠ WARNING *Any 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:

- The Analog Inputs terminal blocks (A4x-TB3) and Binary Inputs terminal blocks (A4x-TB1) are removable. If any wires are present on these, pull plug-in terminal blocks out of their sockets.
- Remove any alarm signal wires connected to the 18-position Relay Output terminal blocks (A4x-TB4).
- Remove four (4) screws mounting board (A4) to rectifier (A6).
- Pull forward old Auxiliary I/O Board from the Rectifier / Heat Sink Assembly, and remove board from ATevo.

Installation of New Auxiliary I/O Board:

- Align header socket (A4-P1) of Auxiliary I/O Board with header pins (A2-J105) on Power Board.
- Push Auxiliary I/O Board onto header pins of Power Board, and align four (4) mounting holes with standoffs on Heat Sink.
- Insert four (4) mounting screws through Auxiliary I/O Board (A4), and secure new (replacement) board onto standoffs.
- Reconnect any signal wiring previously removed.
- Replace safety shield, and close front panel door.
- Restart ATevo.

14.3.8 Replacing Filter Capacitor Board Assembly (A7)

- See also Service Instruction (JD5078-00).

The Filtering Board assembly (A7) consists of a capacitor bank (C1x) and bleed resistors (R9x), mounted on a printed circuit board.

Preparation:

- Shut down and lock out all power to ATevo.
- Wait several minutes to allow internal voltage potentials in capacitors to bleed off.
- Open ATevo front panel door, and remove safety shield.
- Verify no hazardous voltages are present with a voltmeter.
- Along left side of ATevo, locate the Filter Capacitor Board (A7) assembly on top of heatsink, above power board and rectifier.

Removal of Existing Capacitor Board Assembly:

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

Installation of New Capacitor Board Assembly:

- Place new Capacitor Board Assembly (A7) onto studs on Power Board (A2), and replace (2) nuts and (1) screw.
- Replace safety shield, and close the front panel door.
- Restart ATevo.

14.3.9 Replacing Eliminator Filter Capacitor (C2) - *optional*

- See also Service Instruction (JD5078-02).

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

Preparation:

- Shut down and lock out all power to ATevo.
- Open door, remove safety shield, and check with a voltmeter.
- Locate the 'blue can' capacitor (C2), at the bottom-left of ATevo, secured to the galvanized base with two (2) nylon zip ties.

Removal of Existing Capacitor:

- Clip nylon zip ties, and disconnect wires from Power Board (A2).
- Remove existing wired capacitor. Replacement capacitor (C2) is supplied with new wires and pre-crimped terminals.

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

Installation of Replacement Capacitor Assembly:

- Connect wires of new capacitor assembly (C2) to Power Board.
- Mount replacement cap to ATevo base with provided zip ties.
- Replace safety shield, and close front panel door.
- Restart ATevo.

14.3.10 Replacing AC and/or DC Circuit Breakers (CB1/CB2)

Preparation:

- Procedure is the same for both AC (CB1) and DC (CB2) breakers.
- Shut down and lock out all power to ATevo.
- Open door, remove safety shield, and check with a voltmeter.
- Verify no hazardous voltages are present with a voltmeter.
- Note **polarity**, and remove wires on both sides of circuit breaker.

For Standard kAIC Breakers:

- Standard breakers are mount to a DIN rail.
- Pull tab located on right side of breaker to release it from rail.
- Place new breaker in same orientation onto DIN rail.
- Push in the snap tab to lock it to the DIN rail.
- Reconnect wires with same polarity as removed breaker.

For Medium or High kAIC Breakers:

- These breakers are mounted to a breaker bracket via (2) screws and nuts. The screws are along centerline of breaker between the lugs on the left and right side of the breaker. The nuts are on the back of the 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 the front panel door.
- Restart ATevo.

14.3.11 Replacing Power Isolation Transformer (T1)

Preparation:

- Shut down and lock out all power to ATevo.
- Allow internal voltage potentials (and **heat**) to dissipate.
- Open ATevo front panel door, and remove safety shield.
- Disconnect the battery from ATevo DC Output Breaker (CB2+/-).
- Verify no hazardous voltages are present with a voltmeter.
- Remove enclosure shroud.
- Disconnect X1 and X4 wires from Transformer (T1) at Power Board lugs.
- Disconnect Y1 and Y2 wires from Transformer at Power Board terminal block (A2-TB11).

For ATevos with Standard Input Transformer (no multi-tap option):

- Disconnect MOV Board (A9) from H1 and H5 primary leads by removing two (2) screws that connect H1 and H5 lugs to board.
- Disconnect H1 and H5 primary wires from AC Input Circuit Breaker (CB1-L1/L2).

For ATevos with Multi-tap Transformers:

- Disconnect H1, H2, H3, H4, and H5 primary wires from Multi-Tap Terminal Block (TB-H#).

New Transformer Installation for All ATevos:

⚠ CAUTION *The Transformer (T1) is extremely* **heavy**. *Make sure equipment is available to properly support weight before proceeding.*

- **Remove four (4) screws at corners of the transformer mounting plate.**
- **Carefully lift the Transformer (T1) off of enclosure back wall.**
- **Position new Transformer (T1) with same orientation as existing, making sure mounting holes in plate align with holes in enclosure back wall.**
- **Install mounting screws in corners of transformer plate.**

For ATevos with Standard Input Transformer (no multi-tap option):

- **Route H1 and H5 primary wires to the AC Input Circuit Breaker (CB1-L1/L2), making sure that lugs for MOV board connection align with bolt holes in MOV board (A9).**
- **Install the two (2) screws through lugs that connect MOV Board to primary wires and tighten nuts.**
- **Insert ends of H1 and H5 primary wires into the AC Input Circuit Breaker (CB1-L1/L2) and tighten compression lugs.**

For ATevos with Multi-tap Transformers:

- **Route H1, H2, H3, H4, and H5 primary wires to associated terminals on Multi-Tap Terminal Block (TB-H#). Insert primary wires into labeled positions of terminal block and tighten screws.**

For All ATevos:

- **Route X1 and X4 secondary wires from Transformer (T1) to X1 and X4 lugs on Power Board (A2).**
- **Insert wires into lugs and tighten.**
- **Route Y1 and Y2 wires from Transformer (T1) to terminal block on Power Board (A2-TB11).**
- **Install wires into terminal block and tighten screws.**
- **Check your work.**
- **Replace safety shield, and close the front panel door.**
- **Restart ATevo.**

14.3.12 Replacing Filter Inductors (L1/L2)

Preparation:

- Shut down and lock out all power to ATevo.
- Open ATevo front panel door, and remove safety shield.
- Disconnect the battery from ATevo DC Output Breaker (CB2+/-).
- Verify no hazardous voltages are present with a voltmeter.
- Remove enclosure shroud.
- For Main Filter Inductor (L1), disconnect wires labeled 'L1-1' and 'L1-2' at Power Board lugs.
- For Secondary Inductor (L2), disconnect wires labeled 'L2-1' and 'L2-2' at Power Board lugs.

New Inductor Installation for All ATevos:

⚠ CAUTION *The Filtering Inductors (L1 & L2) are extremely* **heavy**. *Make sure equipment is available to properly support weight before proceeding.*

- Remove two (2) screws at top corners of the inductor mounting plate.
- Carefully lift the existing Inductor (L1 or L2) out of the bottom slots, and off of the enclosure back wall.
- Position new Inductor (L1/L2) with same orientation as existing.
- Slide inductor into bottom slots, making sure top mounting holes in plate align with holes on enclosure back wall.
- Install mounting screws into top corners of inductor plate.
- Route wires (natural leads) from inductor to corresponding lugs labeled on Power Board (A2).
- Insert wires into lugs and tighten.
- Check your work.
- Replace safety shield, and close the front panel door.
- Restart ATevo.

14.3.13 Replacing DC Power Supply (P/S-A2)

- See also Service Instruction (JD5085-00).

Steps:

- Shut down and lock out all power to ATevo.
- Open ATevo front panel door, and remove safety shield.
- Verify no hazardous voltages are present with a voltmeter.
- 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 Power Supply Board off of the Power Board (A2).
- 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.

14.3.14 Replacing MOV Surge Suppressor Board (A9)

- For Style-5054, see also Service Instruction (JD5079-00).

Steps:

- Shut down and lock out all power to ATevo.
- Open ATevo front panel door, and remove safety shield.
- Verify no hazardous voltages are present with a voltmeter.
- MOV Board (A9) is bolted to the top of the circuit breaker mounting bracket.
- 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.

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

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 (per NEMA PE5)	Filtered (with battery)	30 mV	30 mV	100 mV	200 mV
		at battery terminals			
	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 from enclosure	less than 65 dBA			

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

Specification	Conditions	24 Vdc	48 Vdc	130 Vdc	260 Vdc
Environment	cooling	natural convection			
	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			
Digital Meter Accuracy	Vdc / Adc	0.5%			
AC Input Voltage	(value on nameplate)	+10%, -12% (of nominal)			
Efficiency	6-12 Adc rating, full load (%)	87.9%	90.6%	93.7%	94.6%
	16-25 Adc rating, full load (%)	86.7%	89.8%	94.4%	n/a

Manufacturer's Technical Documents:

- JF5061-00 ATevo Battery Charger 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

www.ATSeries.net/ATevo/

The manufacturer of ATevo Series Microprocessor-controlled float battery chargers maintains a brand-agnostic web site to support this product. It stores in Adobe Acrobat (*.pdf) format, the latest revisions of user documentation, including:

- Manufacturer's Technical Documents
  - JF5061-00 ATevo Battery Charger 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
  - JA0102-51 ATevo 1PH Group I (6-25 Adc) *- this document*
  - JA5124-01 ATevo Firmware *(latest)* Addendum
  - JA0102-52 ATevo 1PH Group II (16-100 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 Checklist
  - JD5011-00 AT External Relay Free-Wheeling Diode Application Note
  - JD5032-00 Ground Fault Detection In The **Real World.**
  - JD5088-01 ATevo **Alarm Troubleshooting**
- Complete Standard Drawings Binders *(see opposite page)*
- Enclosure Outline Drawings *(see opposite page)*
- Internal Component Layout Drawings *(see following page)*
- Control Panel / PC Board Detail Drawings *(see following page)*
- Functional Electrical Schematics *(see following pages)*
- Connection (Wiring) Diagrams *(see following pages)*
- Electrical & Mechanical Option / Accessory Drawings *(online)*

* **NOTICE** To supplement the following 'standard' drawings, a ***customized*** record drawing package is available for ***every*** ATevo 1PH Group I 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.

DRAWING BINDERS

To simplify access to ATevo standard drawings, multi-sheet PDF binders have been compiled for 1PH Group I models. Select the following hyperlinks for online drawing binders.

- JH0011-01 - ATevo 1PH G1 (6-25Adc) battery charger (**standard w/o options**)

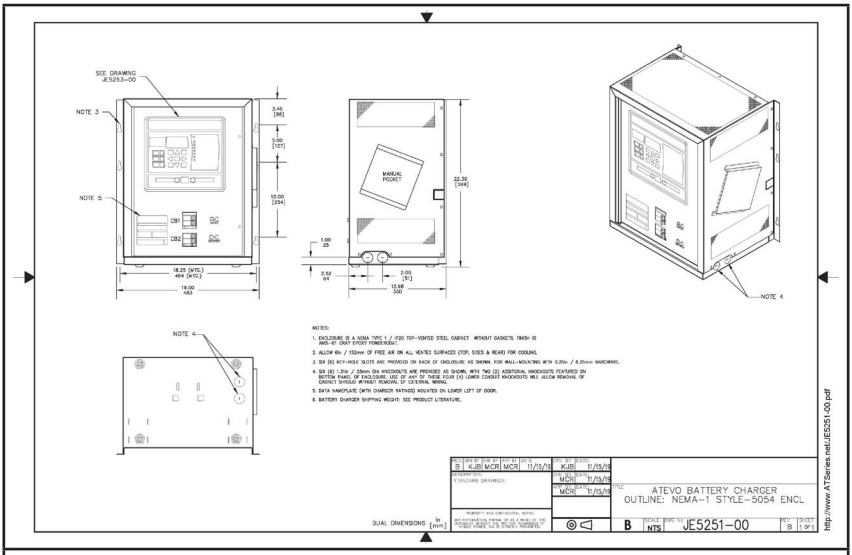
  (http://www.atseries.net/PDFs/JH0011-01.pdf)

- JH0011-21 - ATevo 1PH G1 (6-25 Adc) battery charger (**w/common options**)

  (http://www.atseries.net/PDFs/JH0011-21.pdf)

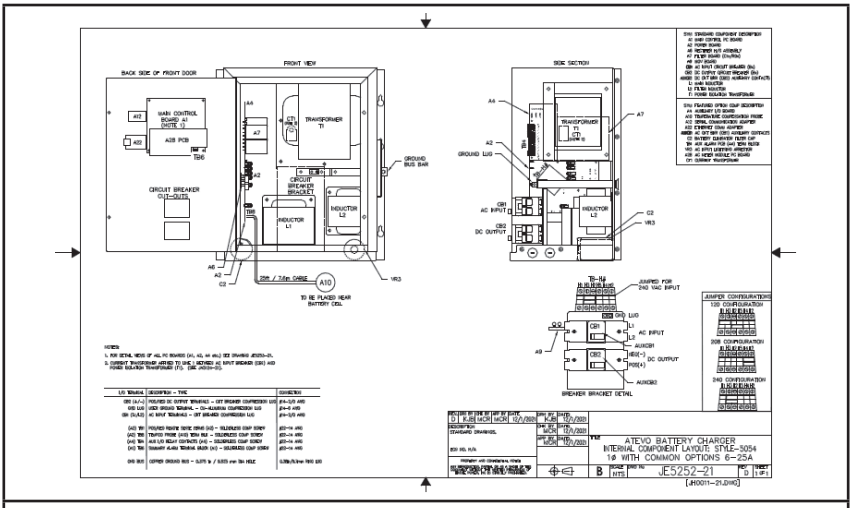
The individual drawings featured in these binders, are also available in the following five (5) tables.

ENCLOSURE OUTLINE DRAWINGS



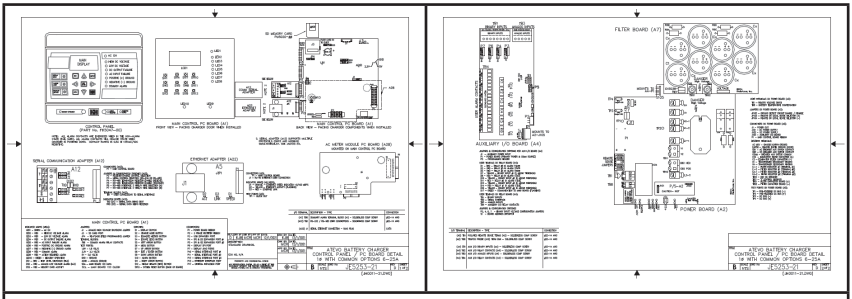
standard (http://www.atseries.net/PDFs/JE5251-01.pdf)
optional (http://www.atseries.net/PDFs/JE5251-21.pdf)

INTERNAL COMPONENT LAYOUT DRAWINGS



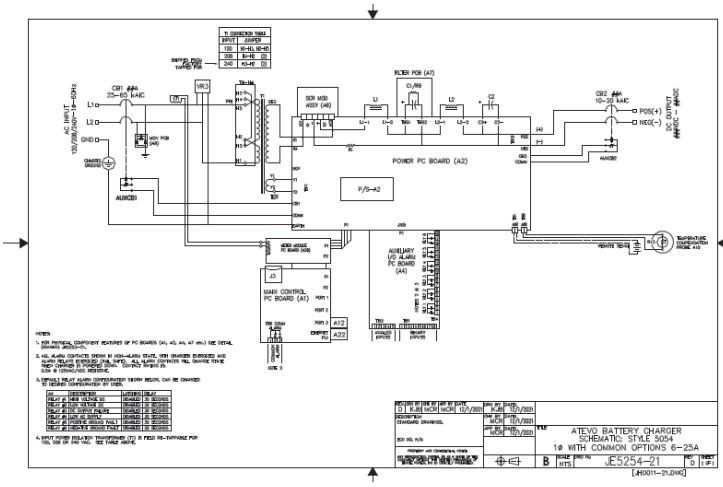
standard (http://www.atseries.net/PDFs/JE5252-01.pdf)
optional (http://www.atseries.net/PDFs/JE5252-21.pdf)

CONTROL PANEL / PC BOARD DETAIL DRAWINGS



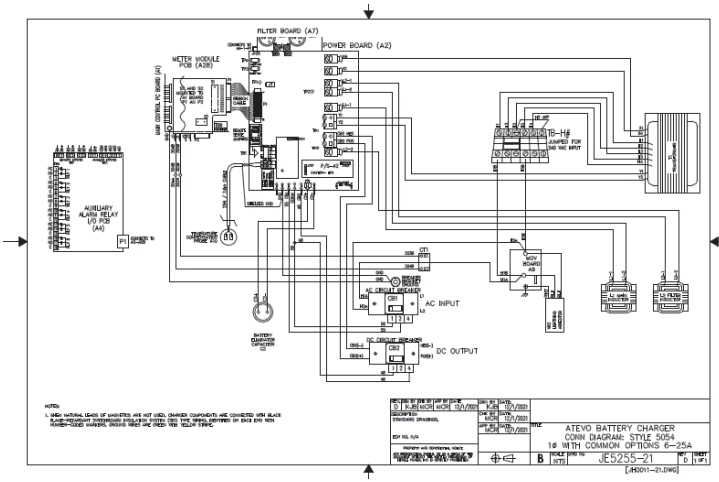
standard (http://www.atseries.net/PDFs/JE5253-01.pdf)
optional (http://www.atseries.net/PDFs/JE5253-21.pdf)

ELECTRICAL SCHEMATICS



standard (http://www.atseries.net/PDFs/JE5254-01.pdf)
optional (http://www.atseries.net/PDFs/JE5254-21.pdf)

CONNECTION (WIRING) DIAGRAMS



standard (http://www.atseries.net/PDFs/JE5255-01.pdf)
optional (http://www.atseries.net/PDFs/JE5255-21.pdf)

DOCUMENT NUMBER

The text and graphics contained within this manual are controlled by the manufacturer's internal part number (**JA5124-00**). The revision date of this manual's text and graphics is listed below. These controls supercede all other available dates. The first and last page of this manual are reserved for company-specific front and back cover artwork. Any revision levels, revision dates, or document numbers featured on the first two (2) and last two (2) pages of this manual refer to the cover artwork only.

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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 ATevo featuring same serial number listed on the Parts Data Package report.

DRAWINGS

A ***customized*** record drawing package is available for any ATevo, featuring:

- unit-specific drawing list / data nameplate detail
- enclosure outline drawing
- itemized internal component layout
- control panel / pc board detail
- functional electrical schematic with component ratings
- 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 Appendix B.

ONLINE AVAILABILITY

An ***unbranded*** version of this Operating and Service Instruction manual is available online at **http://www.ATSeries.net/PDFs/JA0102-51.pdf**. Other user documentation for ATevo Series microprocessor-controlled battery chargers and battery charger products is available online at **http://www.ATSeries.net/ATevo/**. Available documentation includes: operating manuals, feature and accessory instructions, standard drawings (including those listed in this manual), field installation and service instructions, and product application notes. Saved in Adobe Acrobat Portable Document Format (***.pdf**), they are ***freely*** available for downloading and printing.

If revision dates differ between the drawings embedded in this manual and the full online PDF drawings, refer to document with the later revision date. For availability of branded documents, and/or standard drawings, please contact your sales representative or visit the web site listed on the back cover of this manual.

ONLINE MANUAL

The manufacturer of **ATevo Series** Battery Chargers maintains an online, web-based version of this text, viewable in pc and phone browsers.

Access the following link...

(https://hindlepowerinc.com/atevo-manuals/)

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