Operating and Service Instructions

AT30 SERIES

MICROPROCESSOR-CONTROLLED

FLOAT BATTERY CHARGER

THREE PHASE INPUT

(25 - 1,000 Adc OUTPUT)

STORAGE BATTERY SYSTEMS, LLC.

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HOW TO READ THE AT30 MODEL NUMBER

The **AT30** configured model number is coded to describe the unit's features and options. Please identify the model number printed on the data nameplate decal, and write it in the spaces provided below.

AT30													
A	B	C	D	E	F	G	H	J	K	L	M	N	P

Follow the chart below to determine the configuration of the AT30.

	DESCRIPTION	CODE	FEATURE		
A	SERIES	AT30	AT30 BATTERY CHARGER		
B	NOMINAL DC OUTPUT VOLTAGE	012	12 Vdc		
		024	24 Vdc		
		048	48 Vdc		
		130	130 Vdc		
C	NOMINAL DC OUTPUT CURRENT	CODE	FEATURE	CODE	FEATURE
		025	25 Adc	200	200 Adc
		030	30 Adc	250	250 Adc
		040	40 Adc	300	300 Adc
		050	50 Adc	400	400 Adc
		075	75 Adc	500	500 Adc
		100	100 Adc	600	600 Adc
		125	125 Adc	800	800 Adc
		150	150 Adc	1K0	1,000 Adc
D	DC FILTERING	U	UNFILTERED		
		F	FILTERED (STANDARD)		
		E	BATT ELIMINATOR FILTER		
E	AC INPUT VOLTAGE	208	208 Vac 60 Hz		
		240	240 Vac 60 Hz		
		480	480 Vac 60 Hz		
		220	220 Vac 50/60 Hz		
		380	380 Vac 50/60 Hz		
		416	416 Vac 50/60 Hz		
	DESCRIPTION	CODE	FEATURE		

	DESCRIPTION	CODE	FEATURE
F	AC CIRCUIT BREAKER RATING (SEE TABLE)	S	STANDARD
		M	MEDIUM AIC
		H	HIGH AIC
		0	NO AC BREAKER
G	AC FUSES (200 kAIC)	F	SUPPLIED
		X	NOT SUPPLIED
H	DC CIRCUIT BREAKER RATING (SEE TABLE)	S	STANDARD
		M	MEDIUM AIC
		H	HIGH AIC
		0	NO DC BREAKER
J	DC FUSES (20 kAIC)	F	SUPPLIED
		X	NOT SUPPLIED
K	AUX ALARM RELAY BOARD	A	SUPPLIED
		X	NOT SUPPLIED
L	COPPER GROUND BUS	G	SUPPLIED
		X	NOT SUPPLIED
M	LIGHTNING ARRESTOR	L	SUPPLIED
		X	NOT SUPPLIED
N	FUNGUS PROOFING	F	APPLIED
		X	NOT APPLIED
P	STATIC PROOFING	S	APPLIED
		X	NOT APPLIED
	DESCRIPTION	CODE	FEATURE

INPUT AND OUTPUT INTERRUPTING CAPACITY RATINGS

ORDER CODE	CIRCUIT BREAKER TYPE	AC CIRCUIT BREAKER RATINGS (208/240/480 Vac) *	DC CIRCUIT BREAKER RATINGS (125/250 Vdc)
S	STANDARD	5,000 AIC	5,000 AIC
M	MEDIUM AIC	25,000 AIC	10,000 AIC
H	HIGH AIC	65,000 AIC	20,000 AIC

OPTIONAL AC FUSE RATING (208-600 Vac)	OPTIONAL DC FUSE RATING (12/24/48/130 Vdc)
200,000 AIC	20,000 AIC

* Contact your sales representative for 500-600 Vac circuit breaker AIC ratings.

NOTICE

The factory-configured model number printed on the AT30 data nameplate decal does not feature certain options and accessories. Nor does it feature any field-installed options. Check off below any options and/or accessories that are initially included, or are installed after shipment.

- ☐ wall/rack-mounting brackets
- ☐ NEMA-2 type drip shield
- ☐ NEMA-4 (12/13) type enclosure
- ☐ cabinet heater strips
- ☐ pad/key lock for front panel door
- ☐ analog ac voltmeter w/sel switch
- ☐ analog ac ammeter w/sel switch
- ☐ zero-center ground detection meter w/test switch
- ☐ end of discharge alarm relay
- ☐ battery discharge alarm relay
- ☐ barrier type auxiliary alarm terminal block(s)
- ☐ external temperature compensation probe
- ☐ DNP3 Level 2 / Modbus communications module
- ☐ forced load sharing interconnection cable

Please find the serial number on the data nameplate and record it here: _____

PLEASE READ AND FOLLOW ALL SAFETY INSTRUCTIONS

NOTICE

1. Before using the AT30, read all instructions and cautionary markings on: A) this equipment, B) battery, and C) any other equipment to be used in conjunction with the AT30.
2. This manual contains important safety and operating instructions, and should therefore be filed for easy access.
3. Remove all jewelry, watches, rings, etc. before proceeding with installation or service.
4. Maintain at least 6in / 152mm of free air on all vented surfaces for cooling. Allow sufficient clearance to open the front panel for servicing.
5. Connect or disconnect the battery only when the AT30 is off, to prevent arcing or burning.
6. Do not operate the AT30 if it has been damaged in any way. Refer to qualified service personnel.
7. Do not disassemble the AT30. Only qualified service personnel should attempt repairs. Incorrect reassembly may result in explosion, electrical shock, or fire.
8. Do not install the AT30 outdoors, or in wet or damp locations, unless specifically ordered for that environment.
9. Do not use the AT30 for any purpose **not** described in this manual.

⚠ WARNING

1. Do not touch any uninsulated parts of the AT30, 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 the AT30 or the battery.
3. Turn the AT30 **off** before connecting or disconnecting the battery to avoid a shock hazard and/or equipment damage.
4. De-energize and lock out all ac and dc power sources to the AT30 before servicing.
5. Do not operate the AT30 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.
6. Do not operate the AT30 with the Plexiglas safety shield or any other supplied guards removed or improperly installed.

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** A **customized record drawing package** is available for your particular AT30, featuring an itemized internal component layout, electrical schematic with component ratings, and a full connection diagram. If the standard drawings featured in this manual are not sufficient, please contact your Sales Representative for drawing availability from the AT30 manufacturer.*

1. RECEIVING THE AT30

1.1. STORING THE AT30

If you store the AT30 for more than a few days before installation, you should store it in its original shipping container, and 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 the limited shelf life of the dc filter capacitors when they are not in service.

1.2. REPORTING SHIPPING DAMAGE

Upon delivery of the AT30 (or related products) if you discover any damage or shortage, make notation on all copies of delivering carrier's delivery receipt before signing and notify the delivery person of your findings. If loss or damage is discovered after delivery, notify delivering carrier immediately and request an inspection. The manufacturer does not assume any liability for damage during transportation or handling.

Should the products require an inspection by (or return to) the manufacturer, please contact your sales representative for further instructions. Any returned material must be properly packed in compliance with shipping regulations. It is preferable to use the original shipping materials if possible. Mark the outside of the shipping container with the Return Material Authorization (RMA) number issued by the manufacturer.

1.3. UNPACKING AND INSPECTING THE AT30

Carefully remove all shipping materials from the AT30. Remove the AT30 from the shipping pallet for inspection. Save all shipping materials until you are sure that there is no shipping damage.

Once the AT30 is unpacked, inspect the unit for possible shipping damage, using the checklist below. If shipping damage has occurred, refer to Section 1.2 on this page for proper reporting.

INSPECTION CHECKLIST

- ☐ Enclosure exterior and interior are not marred or dented.
- ☐ There is no visible damage to exterior or interior components.
- ☐ All internal components are secure.
- ☐ Printed circuit boards are firmly seated on their standoffs.
- ☐ All hardware is tight.
- ☐ All wire terminations are secure.
- ☐ The User's Manual and Quick Setup Sheet are supplied.
- ☐ You received all items on the packing list.

1.4. MOVING THE AT30

Once you have established that the AT30 is undamaged, identify the enclosure style of your unit. Refer to the table below.

Standard AT30 NEMA-1 Type Enclosures
(**Style-5018** / **Style-5030** / **Style-163** / **Style-198**)

Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	n/a	n/a	n/a	Style-5018
30 Adc	n/a	n/a	n/a	Style-5018
40 Adc	n/a	n/a	n/a	Style-5018
50 Adc	Style-5018	Style-5018	Style-5018	Style-5018
75 Adc	Style-5018	Style-5018	Style-5018	Style-5018
100 Adc	Style-5018	Style-5018	Style-5018	Style-5030
125 Adc	Style-5030	Style-5030	Style-5030	Style-5030
150 Adc	Style-5030	Style-5030	Style-5030	Style-5030
200 Adc	Style-5030	Style-5030	Style-5030	Style-5030
250 Adc	Style-5030	Style-5030	Style-5030	Style-163
300 Adc	Style-5030	Style-5030	Style-5030	Style-163
400 Adc	n/a	Style-163	Style-163	Style-163
500 Adc	n/a	Style-163	Style-163	Style-198
600 Adc	n/a	Style-163	Style-198	Style-198
800 Adc	n/a	Style-198	Style-198	Style-198
1,000 Adc	n/a	Style-198	Style-198	Style-198

Comprehensive weight data for the different models is available in the AT30 product literature (**JF5018-00**). The four standard NEMA-1 type enclosures do not feature top lifting eyes for moving. Move the AT30 with a forklift whenever possible, using the supplied shipping pallet.

Place the AT30 onto a floor-mount installation using a forklift, lifting the enclosure from the bottom between the mounting legs. To lift the Style-5018 enclosure into a wall-mount or rack-mount installation, use a heavy-duty sling or a scissor lift.

For further AT30 standard cabinet information, refer to the table below and the standard drawings featured in Appendix C, starting on Page 66.

NEMA-1 Enclosure	Outline Drawing	Internal Layout Drawing
Style-5018	**JE5085-00**	**JE5088-99**
Style-5030	**JE5086-00**	**JE5089-99**
Style-163	**JE5095-00**	**JE5098-99**
Style-198	**JE5096-00**	**JE5099-99**

1.5. MOUNTING THE AT30

The AT30 must be installed in manner that allows easy access to the front ac (CB1) and dc (CB2) circuit breakers. Chose a mounting method for the AT30 enclosure from the table below.

MANUAL SECTION	MOUNTING METHOD	ENCLOSURE	
		Style-5018	Style-5030/163/198
1.5.1	Floor-Mounting	**STANDARD**	**STANDARD**
1.5.2	Wall-Mounting	OPTIONAL	n/a
1.5.3	19in / 483mm Rack-Mounting	n/a	n/a
	23-24in / 584-610mm Rack-Mounting	OPTIONAL	n/a

1.5.1. Floor-Mounting the AT30

Floor-mounting is the standard means of installing all the AT30 enclosures. When floor-mounting the AT30, consider the following:

1. Refer to the outline drawings in Appendix C, starting on Page 66, for the overall footprint of the Style-5018, Style-5030, and Style-163 enclosures.
2. Be conscious of planned ac input and dc output wiring to the AT30, selecting conduit entrances carefully. Note the standard pre-fab conduit knockouts located on the sides (and sometimes tops) of the enclosures.
3. The location:
   - Should be free of drips and splatter. If falling particles and liquids are a problem, install NEMA-2 type drip shield accessory (**EI0191-0#**). For kit availability, see ordering information in Appendix B on page 65.
   - Should be between 0 and 122 °F / -18 and 50 °C, with relative humidity between 5% 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 access to the AT30 for operation and maintenance.

PROCEDURE (Style-5018)

1. Install four (4) 0.25in / 6.4mm anchor bolts into the floor, per the mounting dimensions featured in the outline drawing (**JE5085-00**).
2. Carefully lift the AT30 above the anchor bolts using the methods described in Section 1.4. Guide the enclosure onto the floor bolt pattern and lower it into place.
3. Add appropriate mounting hardware onto the floor-mounting anchor bolts and tighten securely.

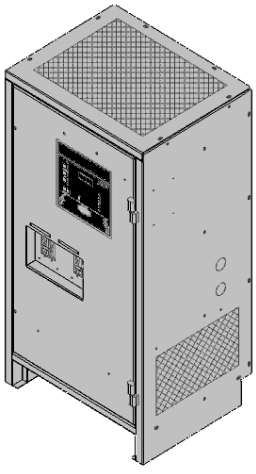
PROCEDURE (Style-5030)

1. Install four (4) 0.375 / 9.5mm or 0.5in/12.7mm anchor bolts into the floor, per the mounting dimensions featured in the outline drawing (**JE5086-00**).
2. Carefully lift the AT30 above the anchor bolts using the methods described in Section 1.4. Guide the enclosure onto the floor bolt pattern and lower it into place.
3. Add appropriate mounting hardware onto the floor-mounting anchor bolts and tighten securely.

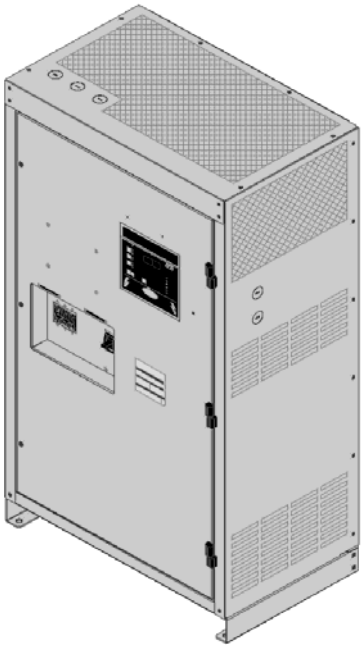
PROCEDURE (Style-163 / Style-198)

1. Install four (4) 0.5in/12.7mm anchor bolts into the floor, per the mounting dimensions featured in the outline drawings (**JE5095-00** / **JE5096-00**).
2. Carefully lift the AT30 above the anchor bolts using the methods described in Section 1.4. Guide the enclosure onto the floor bolt pattern and lower it into place.
3. Add appropriate mounting hardware onto the floor-mounting anchor bolts and tighten securely.

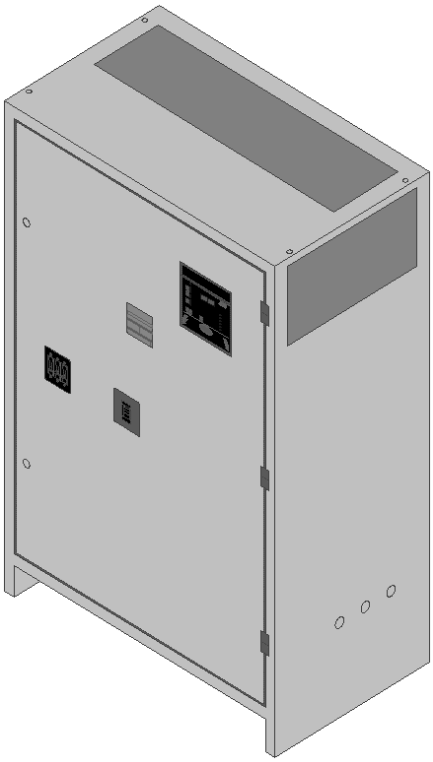
GRAPHICS - STANDARD NEMA-1 TYPE AT30 ENCLOSURES



Style-5018
see outline drawing
JE5085-00



Style-5030
see outline drawing
JE5086-00



Style-163
see outline drawing
JE5095-00

1.5.2. **Wall-Mounting the AT30** (Style-5018 enclosure only)

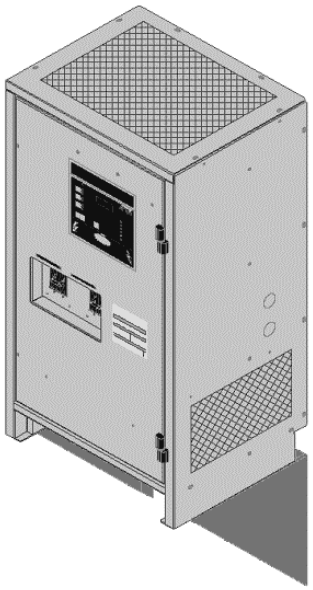
To install the AT30 onto a vertical surface, the standard Style-5018 enclosure does not need to be modified, but a special wall-mounting accessory (**EI5008-00**) is required. For kit availability see ordering information in Appendix B on page 65. The kit includes two (2) mounting brackets, appropriate hardware, and ***Installation Instructions*** (**JA5063-00**) for the wall-mounting procedure.

When wall-mounting the AT30, consider the following:

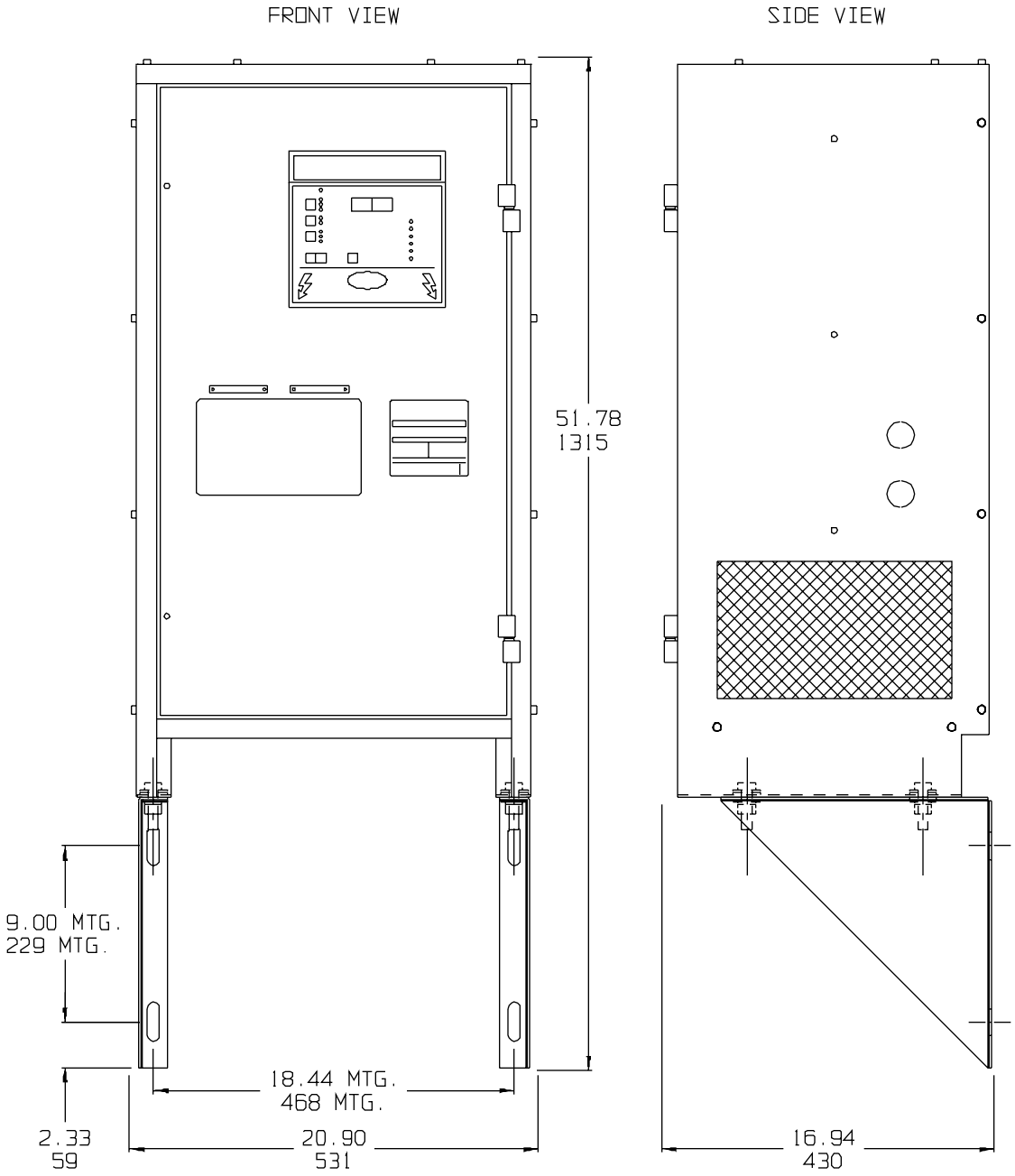
1. The wall must be strong enough to properly support the weight of the AT30 and the mounting brackets. Comprehensive weight data for the different models is available in the AT30 product literature (**JF5018-00**). The weight of your AT30 may be different from the literature value, depending on supplied features, options, or accessories.
2. Be conscious of planned ac input and dc output wiring to the AT30, selecting conduit entrances carefully. Note the standard pre-fab conduit knockouts located on the sides the Style-5018 enclosure.
3. The location:
   - Should be free of drips and splatter. If falling particles and liquids are a problem, install NEMA-2 type drip shield accessory (**EI0191-0#**). For kit availability, see ordering information in Appendix B on page 65.
   - Should be between 0 and 122 °F / -18 and 50 °C, with relative humidity between 5% 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 access to the AT30 for operation and maintenance.

PROCEDURE

1. Install eight (8) 0.25in / 6.4mm anchor bolts (not supplied) rated to support the AT30 weight plus a safety factor of at least two (2) times, into the wall.
2. Mount the triangular brackets to the wall.
3. Carefully lift the Style-5018 enclosure onto the mounted triangular brackets.
4. Use the supplied 0.25in / 6.4mm hardware to mount the enclosure to the wall-mounting brackets and tighten securely.
5. Refer to the graphics on the opposite page for the AT30 Style-5018 wall-mounting pattern and enclosure footprint.
6. Dimensions are in/mm.



GRAPHICS - WALL-MOUNTING THE AT30



NOTES

1. Refer to the Style-5018 enclosure outline drawing (**JE5085-00**) in Appendix C on Page 66 for overall size, mounting dimensions, and cabinet specifications.
2. See ***Installation Instructions*** (**JA5063-00**) for the special Style-5018 wall-mounting procedure.

1.5.3. **Rack-Mounting the AT30** (Style-5018 enclosure only)

Smaller AT30s can be installed in 23-24in /584-610mm relay racks with standard EIA hole spacing. The Style-5018 enclosure does not need to be modified for rack mounting, but a special kit (**EI0193-0#**) is required.

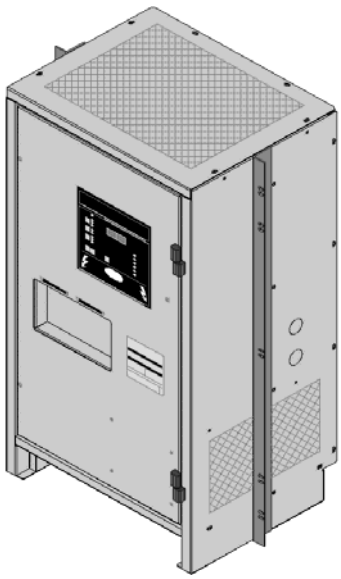
For kit availability see the ordering information in Appendix B on page 65. The kit includes two (2) mounting brackets, hardware, and ***Installation Instructions*** (**JA0091-03**) for the rack-mounting procedure.

When rack-mounting the AT30, consider the following:

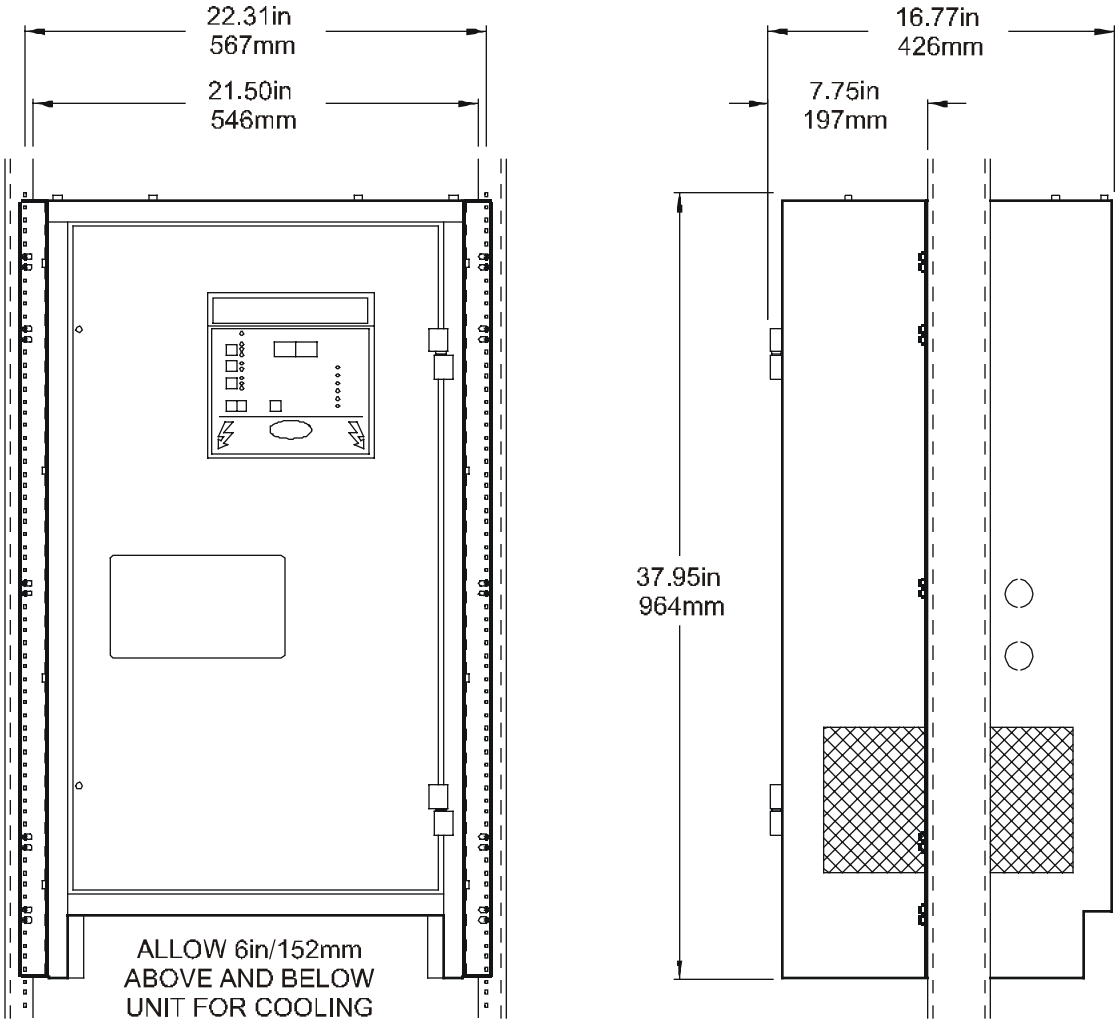
1. The relay rack must be strong enough to properly support the weight of the AT30. Comprehensive weight data for the different models is available in the AT30 product literature (**JF5018-00**). The weight of your AT30 may be different from the literature value, depending on supplied features, options, or accessories.
2. Be conscious of planned ac input and dc output wiring to the AT30, selecting conduit entrances carefully. Note the standard pre-fab conduit knockouts located on the sides of the enclosures. Ensure that planned conduit is accessible after the AT30 is rack-mounted.
3. The location:
   - Should be free of drips and splatter. If falling particles and liquids are a problem, install a NEMA-2 type drip shield accessory (**EI0191-02**). For kit availability, see ordering information in Appendix B on page 65.
   - Should be between 0 and 122 °F / -18 and 50 °C, with relative humidity between 5% 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 access to the AT30 for operation and maintenance.

PROCEDURE

1. Attach the two (2) relay rack-mounting brackets to the sides of the Style-5018 enclosure, using the four (4) small pre-fab knockouts as guides.
2. Mount the brackets to the AT30, using the supplied 0.25in / 6.4mm hardware and tighten securely.
3. Using a scissor lift, guide the AT30 into the front face of the 23in / 584mm EIA relay rack.
4. Adjust the height of the AT30 and mount in place using appropiate hardware (not supplied).
5. Refer to the graphics on the opposite page for the rack-mounted enclosure footprint.



GRAPHICS - RACK-MOUNTING THE AT30



NOTES

1. Rack-mount AT30 Style-5018 enclosures are installed from the front.
2. Refer to the Style-5018 enclosure outline drawing (**JE5085-00**) in Appendix C on Page 66 for overall size and cabinet specifications.
3. Refer to the detailed ***Installation Instructions*** (**JA0091-03**) supplied with the kit for the special rack-mounting procedure.

1.6. CHANGING THE TRANSFORMER TAPS

AT30s are normally designed for a ***single*** ac input supply voltage. Verify the ac voltage listed on the data nameplate decal, and the **CAUTION** tag attached to the ac input circuit breaker (CB1). The AT30 ac input transformer (T1) is designed with a voltage tolerance of +10% to -12%.

⚠ WARNING

If your particular site ac supply voltage does not match your AT30 ac input requirements, you may need to change the ac input circuit breaker (and/or fuses) and the input surge suppressors. In addition, you must replace (*or rewire*) the ac input power isolation transformer (T1) as described below.

Failure to use properly rated components may damage the AT30.

If your AT30 was supplied with the 480 Vac 60Hz ac input feature, the transformer will ***only*** accept the listed voltage.

NOTICE

Do not attempt to rewire the 480Vac transformer. *If a different ac input voltage feature for the AT30 is desired, please contact your sales representative for ordering replacement parts (T1, CB1, VR2-VR5).*

If your AT30 was supplied with one of the following ac input voltage features, the transformer ***is*** re-tappable:

- 208 ***or*** 240Vac 60Hz
- 220 ***or*** 240Vac 50/60Hz
- 380 ***or*** 416Vac 50/60Hz
- 550 ***or*** 600Vac 50/60Hz

Before you connect ac power to the AT30, inspect the ***primary*** wiring of the ac input transformer (T1). Make sure it is "tapped" for the desired ac input supply voltage.

NOTICE

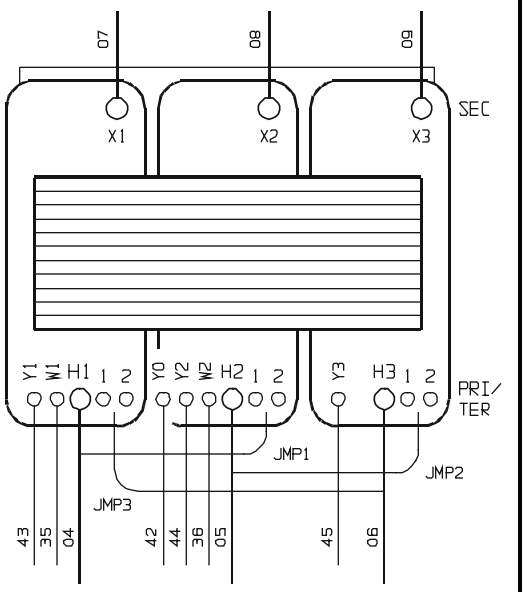
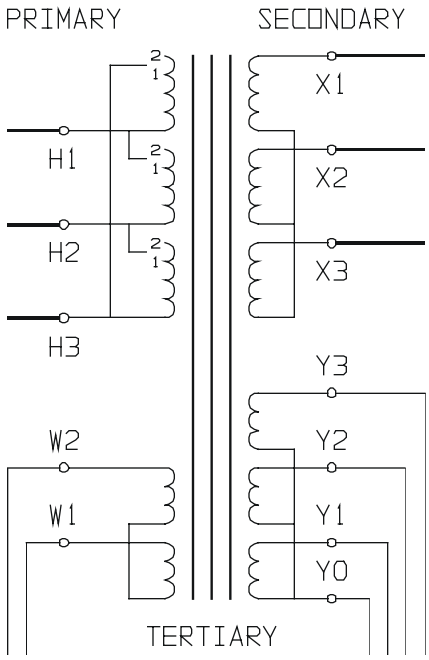
Before starting work, disconnect and lock out all external ac and dc power sources to the AT30. Merely turning off (opening) the front panel ac and dc circuit breakers (CB1/CB2) is not sufficient to eliminate live voltages inside the enclosure. Verify that no voltages are present inside the AT30, using a voltmeter at the ac terminals TB1-L1, TB1-L2 & TB1-L3, the dc terminals TB1(+) & TB1(-), the dc remote sense terminals, and any external wiring to alarm relay contacts.

PROCEDURE

1. See Section 3.5 for necessary steps to follow when accessing internal components within the AT30.
2. Shut down the AT30 and verify that no internal voltages are present.
3. Refer to the images below and identify the three (3) primary "taps" (T1-H1, T1-H2 & T1-H3) of the power isolation transformer.

AT30 THREE PHASE ISOLATION TRANSFORMER

(excludes 480 Vac non-tappable variant)

TOP VIEW LAYOUT (T1)	SCHEMATIC (T1)
	

4. Inside the AT30, inspect the transformer wiring, and identify the three (3) jumpers on the primary-side wire "taps" (T1-H1/H2/H3).
5. Change the jumpers on the primary-side taps as needed per the table below.

jumper setting **208** or **220** or **380** or **550 Vac**	jumper setting **240** or **416** or **600 Vac**
H1, H2 & H3 set to "1"	H1, H2 & H3 set to "2"

6. Check your work, making sure no exposed wiring is touching ground.
7. Always use all three (3) jumpers, and make sure all connections are tight.
8. Restart the AT30 using the startup procedure in Section 2.1.
9. For more information, see the schematics & wiring diagrams in Appendix C.
10. Contact the factory for a new data nameplate with revised ac input values.
11. For a list of maximum ac input current values, refer to standard (**DC5016-00**).

1.7. MAKING THE AC INPUT CONNECTIONS

⚠ WARNING

The A30 is a commercial product, and not intended for use in a residential environment, or to be powered by low-voltage public mains.

It is the responsibility of the ***installer*** of the AT30 to provide suitable ac supply wiring. Wiring must be approved for use in the country in which the AT30 is installed. When selecting wire sizes, consult the data nameplate decal affixed to the front panel of the AT30 for maximum voltage and current requirements. The AT30 must also be grounded in accordance with the electrical rules of the country where installed.

Follow these steps to connect ac power to the AT30:

1. Confirm that the AT30 main power transformer (T1) is properly jumpered for your ac input supply voltage. See Section 1.6 for details.
2. Use a branch circuit breaker or fused disconnect switch upstream from the AT30. This device should have lockout capability so that the ac input supply to the AT30 can be de-energized for charger maintenance. A time delay circuit breaker or slow-blow fuse is recommended.
3. Size the branch circuit breaker or fused disconnect switch for the maximum ac input current of the AT30. This rating is listed on the left-hand side of the AT30 data nameplate. For a comprehensive list of these maximum ac input values, access standard (**DC5016-00**).

NOTICE

If your AT30 is wired for 480 Vac input, and is equipped with the standard AIC ac input circuit breaker (no ac fuses), you need a feeder breaker or fuse rated to interrupt the short-circuit current of your ac supply.

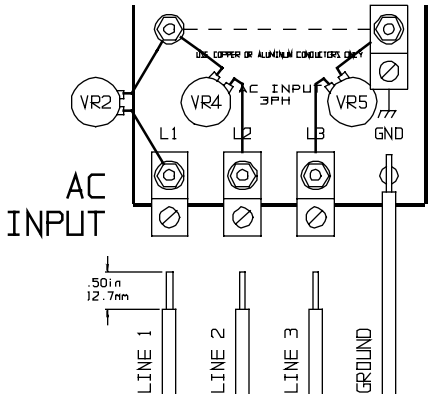
4. Size ac input wiring per the National Electric Code (NEC) and local codes for the trip rating of the branch circuit breaker or fused disconnect switch.
5. Do not run external ac input power wiring through the same conduit of the AT30 enclosure as external dc output power wiring.
6. All site requirements of your facility take precedence over these instructions.

PROCEDURE

1. Remove the Plexiglas safety shield (if supplied).
2. Run the ac input supply wiring into the AT30, ending at terminals TB1-L1, TB1-L2, TB1-L3, and TB1-GND on the I/O panel board.
3. The AT30 features four (4) CU-AL compression lugs on the ac input terminals.
   - Style-5018 and Style-5030 enclosure ac lugs accept #14 - 1/0 AWG wire
   - Style-163 and Style-198 enclosure ac lugs accept #6 AWG - 350 MCM wire
4. Strip 0.50in / 13mm from the insulation of the incoming ac input supply wiring.
5. Connect the wires to the appropriate ac lugs as shown on the next page.
6. Using proper tools, securely tighten the compression screws on the ac lugs to proper torque specifications.
7. Check all connections and reinstall the Plexiglas safety shield (if supplied).

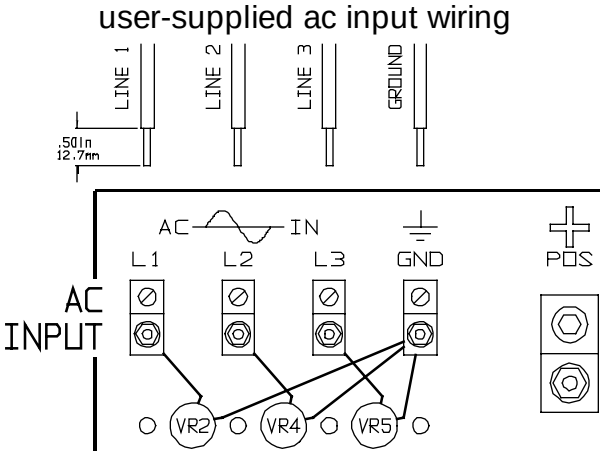
MAKING THE AC INPUT CONNECTIONS - GRAPHICS

Style-5018
I/O Terminal
Board (TB1)
Detail

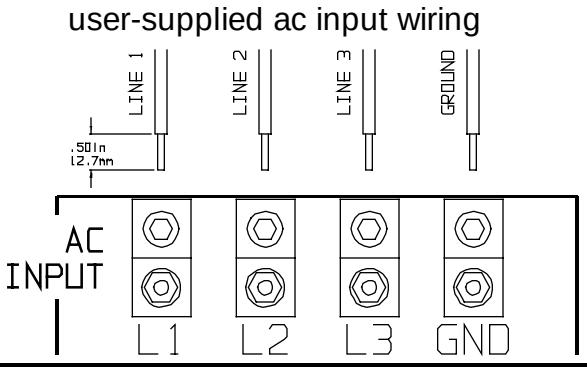


user-supplied ac input wiring

Style-5030
I/O Terminal
Board (TB1)
Detail



Style-163
I/O Terminal
Board (TB1)
Detail



NOTES

⚠ CAUTION

1. The ac input terminal hardware fastens other components mounted to the I/O panel (TB1-L#). Be careful not to disconect any other component leads.
2. Conduit must be properly grounded, and in compliance with the national wiring rules of the country where installed.
3. Use copper or aluminum conductors only.

1.8. MAKING THE DC OUTPUT CONNECTIONS

It is the responsibility of the ***installer*** of the AT30 to provide suitable dc output, battery, and dc load wiring. Follow these steps to connect the battery to the AT30:

1. Size the dc wiring to minimize voltage drop. The acceptable wire size depends on your installation. As a guideline, the voltage drop should not exceed 1% of nominal output voltage at full current.
2. Size the dc output wiring per your battery manufacturer's specifications and local codes for the rating of the batteries and/or load.
3. The AT30 is factory wired to regulate the output voltage at the output terminals. If the total voltage drop is greater than 1% (e.g., 1.3V for a 130 Vdc system), remote sense wiring is recommended, see Section 1.9.
4. Do not run the external dc power wiring through the same conduit of the AT30 enclosure as the external ac power wiring.
5. All specific requirements of your facility take precedence over these instructions.

PROCEDURE

1. Use a dc disconnect switch or circuit breaker between the AT30 and the dc bus. This device should have lockout capability to allow the AT30 to be disconnected from the dc bus for maintenance.
2. Remove the Plexiglas safety shield (if supplied).
3. Run the dc wiring to terminals TB1(+) and TB1(-) on the I/O panel board in the enclosure. CU-AL Compression lugs are supplied for your convenience.
   - Style-5018 enclosure dc output lugs accept #14 - 1/0 AWG wire
   - Style-5030/163 enclosure dc output lugs accept #6 AWG - 350 MCM wire
4. Strip the insulation 0.5in / 12.7mm on the incoming ac wires and connect the wires to the appropriate dc lugs as shown on the next page.
5. Using proper tools, securely tighten the compression screws on the lugs to proper torque values.
6. Check all connections and reinstall the Plexiglas safety shield (if supplied).

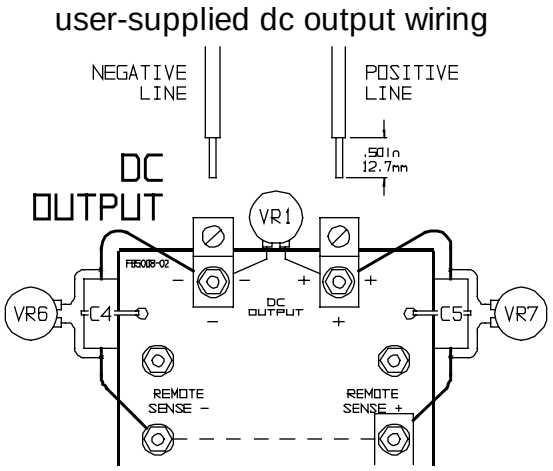
⚠ CAUTION

NOTES

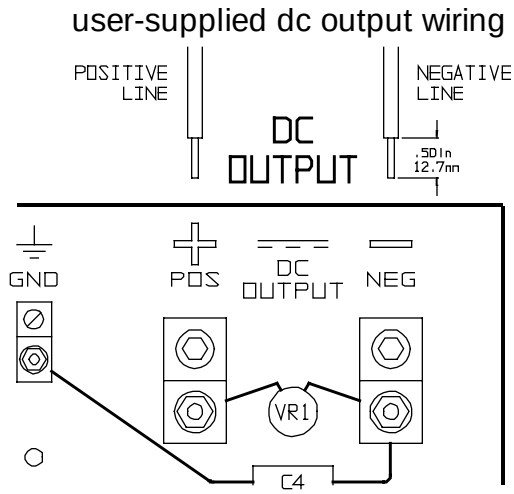
1. The dc output terminal hardware fastens other components mounted to the I/O panel. Be careful not to disconect any other component leads.
2. Always use a proper ground.
3. Use copper or aluminum conductors only.
4. Refer to images on the following page for I/O panel layout.

MAKING THE DC OUTPUT CONNECTIONS - GRAPHICS

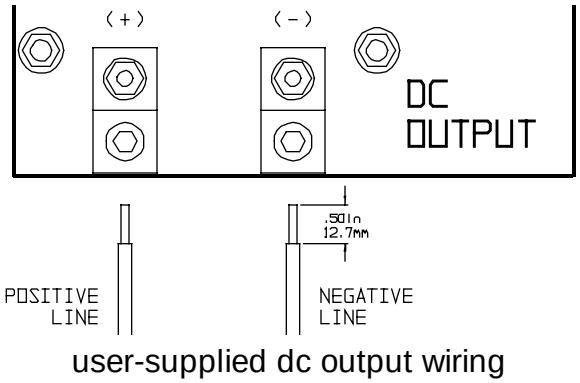
Style-5018
I/O Terminal
Board (TB1)
Detail



Style-5030
I/O Terminal
Board (TB1)
Detail



Style-163
I/O Terminal
Board (TB1)
Detail

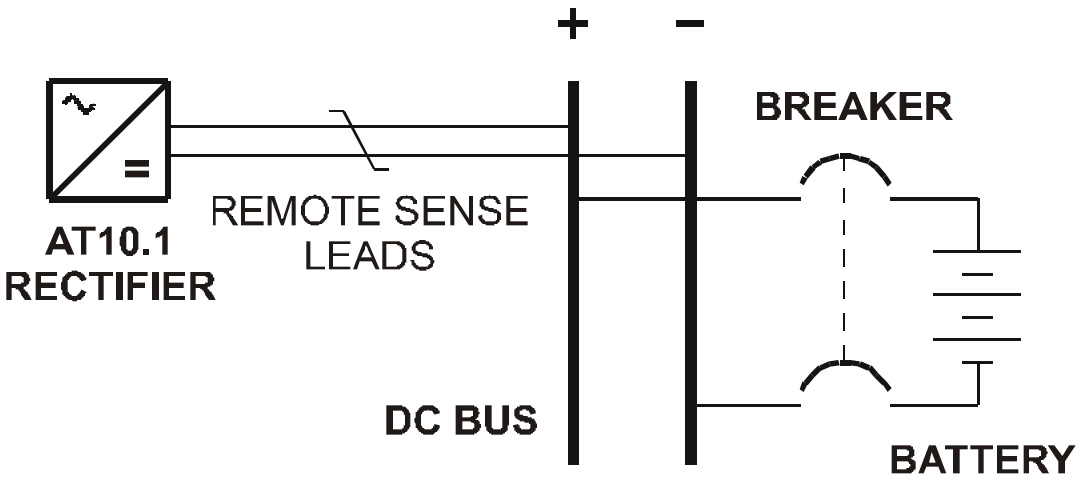


1.9. WIRING THE AT30 FOR REMOTE SENSING

You can wire the AT30 to regulate the output voltage at the battery terminals, instead of at the charger output terminals (TB1+/-). Remote sensing provides the following:

1. Compensates for voltage drop in the dc wiring between the AT30 and the battery.
2. Directly monitors the battery or dc bus voltage. The front panel meter displays the actual voltage on the battery or dc bus.

SCHEMATIC



You wire the AT30 for remote sensing by installing twisted pair cabling from the AT30 remote sense terminals to the battery terminals. The AT30 control circuitry then measures the dc voltage at the battery terminals, and controls the output of the charger to maintain the battery voltage at the desired float or equalize voltage.

NOTICE

*If the remote sense wiring fails, the AT30 detects the fault, and displays **E 06** on the front panel meter. See Section 3.2 for details.*

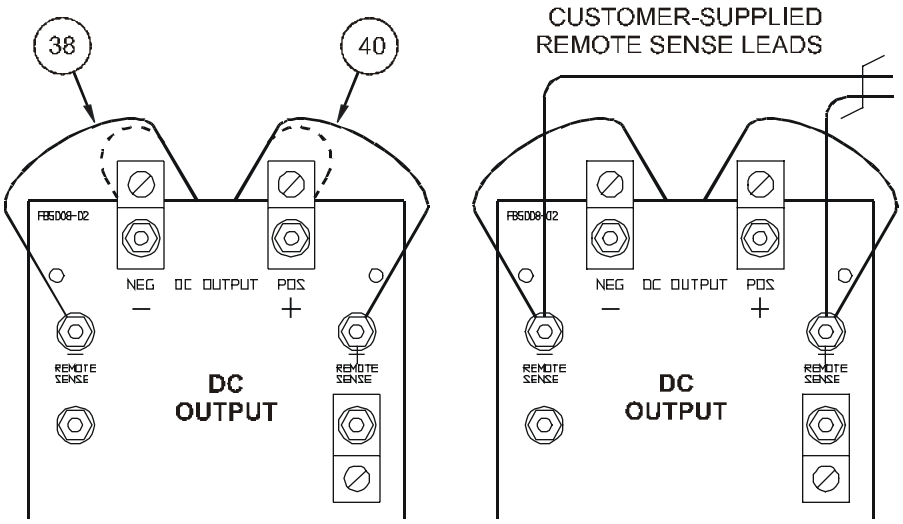
⚠ CAUTION

The AT30 cannot protect against short circuits in the remote sense wiring. You should install a 1.0A fuse at the battery or dc bus end of the remote sense cable.

PROCEDURE

1. De-energize and lock out all ac and dc voltages within the AT30 enclosure. Check with a voltmeter.
2. Remove safety shield (if supplied).
3. Remove the two (2) dc output CU-AL compression lugs.

4. Move wire # **38** from TB1(-) to REM SENSE(-).
5. Move wire # **40** from TB1(+) to REM SENSE (+).
6. Connect user-supplied external remote sense leads from the battery or dc bus to the remote sense terminals on the I/O panel.



7. Replace the two (2) dc output CU-AL compression lugs and tighten all hardware.
8. Check your work thoroughly. Replace the safety shield (if supplied) before re-eneregizing the AT30.
9. Restart the AT30 according to the instructions in Section 2.1.

NOTES

1. Use #16 AWG twisted pair.
2. Maximum current is 150 mA.
3. Run leads in their own conduit.
4. Fuse the wiring at the battery or dc bus.

DISABLING REMOTE SENSE

If you ever need to disable remote sense, follow the steps below:

1. De-energize and lock out all ac and dc voltages to the AT30.
2. Check with a voltmeter.
3. Disconnect the remote sense wires from the battery or dc bus ***first***.
4. Remove the remote sense leads from the remote sense (+) and (-) terminals on the I/O panel (TB1) ***second***.
5. Insulate each lead separately, coil up the wires, and leave them in the bottom of the AT30, in case you want to wire for remote sense in the future.
6. Reconnect wire # **40** to the dc output (+) terminal.
7. Reconnect wire # **38** to the dc output (-) terminal.
8. Restart the AT30 according to the instructions in Section 2.1.

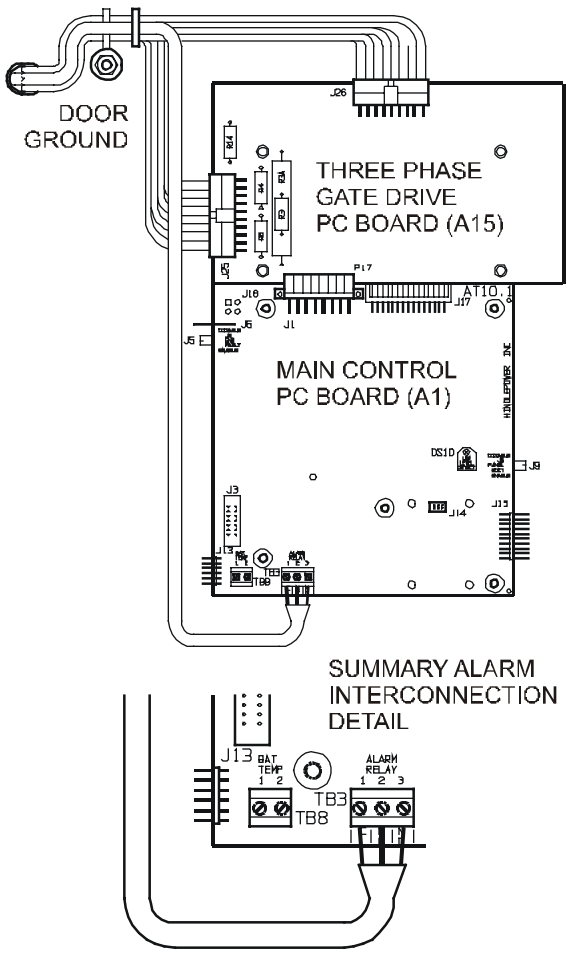
1.10. WIRING TO THE REMOTE ALARM CONTACTS

Built-in Summary "Common" Alarm Relay *(standard)*

The AT30 Main Control PC Board (A1) is equipped with a "common" Summary Alarm relay. This relay contact transfers when any one or more of the standard AT30 alarms exist.

See Sections 2.2.7 and 2.3.4 for a list of these alarms and status codes. One form-C alarm contacts are provided, and accessible via terminal block (TB3), as shown in the figure on the right.

Follow the procedure below to wire an annunciator to this contact.



PROCEDURE

1. Allow 30in / 762mm of wire inside the enclosure. Excess will be trimmed.
2. Route annunciator wires to the AT30 front panel door by following the existing harness through the door hinge as shown. Use two (2) wire ties and allow a 4-6in / 102-153mm loop for the hinge.
3. Trim wires to the proper length for connecting to TB3. Strip 0.25in / 6.4mm of insulation from the wires.
4. Make the connections at TB3, and securely tighten the screws.

NOTES

1. Alarm contacts are rated at 0.5A / 125 Vac or Vdc.
2. Summary Alarm relay terminal block (TB3) is compression type, accepting wire sizes #22-14 AWG.
3. Terminals are labeled in non-alarm condition.
4. If user alarm contacts (TB3 and/or TB4A/B) are to drive inductive **dc** loads (e.g. a larger dc relay) an external protective diode must be applied at the dc relay to avoid equipment damage. See ***Application Note*** (**JD5011-00**).

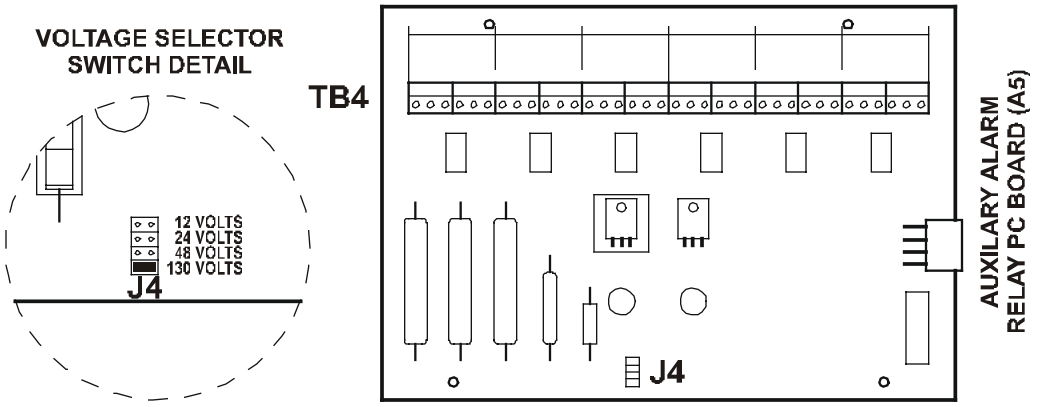
Auxiliary Alarm Relay PC Board *(optional)*

The optional Auxiliary Alarm Relay PC Board (A5), mounted on plastic stand-offs inside the enclosure, provides two (2) form-C contacts (TB4-1 through TB4-36) for each of the following individual alarms:

- High DC Voltage
- Low DC Voltage
- DC Output Failure
- AC Input Failure
- Ground Fault Detection (positive or negative)
- Summary (common) Alarm

Alarm contacts (TB4A/B), marked in non-alarm condition, are as follows:

HVDC	HVDC	LVDC	LVDC	DC OUT FAILURE	DC OUT FAILURE	AC FAIL	AC FAIL	GROUND DETECT	GROUND DETECT	SUMMARY	SUMMARY
C, NC, NO	C, NC, NO	C, NC, NO	C, NC, NO	C, NC, NO	C, NC, NO	C, NC, NO	C, NC, NO	C, NC, NO	C, NC, NO	C, NC, NO	C, NC, NO
1 2 3	4 5 6	7 8 9	10 11 12	13 14 15	16 17 18	19 20 21	22 23 24	25 26 27	28 29 30	31 32 33	34 35 36



PROCEDURE

1. De-energize and lock out all ac and dc voltages to the AT30.
2. Allow internal voltages to dissipate, then check with a voltmeter.
3. Remove the Plexiglas safety shield (if supplied).
4. Route your remote annunciator wiring into the enclosure through one of the unused conduit knockouts on the side of the enclosure.
5. As shown in the figure above, connect the wiring (use #22-14 AWG) to the appropriate terminals of TB4 on the Auxiliary Alarm Relay PC Board (A5).
6. Strip each wire 0.25in / 6.4mm and securely tighten the terminal screws.
7. Replace the safety shield, if supplied, and restart the AT30.

NOTES

1. Alarm contacts are rated at 0.5A / 125 Vac or Vdc.
2. Terminal block (TB4) is compression type, accepting #22-14 AWG wire.
3. Terminals are labeled in non-alarm condition.
4. For a detailed view of the optional Auxiliary Alarm Relay PC Board (A5), refer to drawing (**JE5091-39**) listed in Appenix C on Page 78.

1.11. INSTALLING THE TEMPCO PROBE ASSEMBLY (OPTIONAL)

The temperature compensation (or TempCo) probe contains a temperature-dependent resistor in an epoxy module that you install near your battery. There are three (3) steps in installing the assembly:

1. Mounting the probe assembly near the battery.
2. Installing the interconnection cable from the probe assembly to the AT30.
3. Wiring the ***charger end*** of the cable to a terminal block on the AT30.

The actual temperature compensation probe (A10), or puck, is the same for all battery types and all output voltages of the AT30. The accessory part numbers differ depending on cable length ordered. See the tables in Appendix B on page 65 for ordering information. Each kit contains detailed ***Installation Instructions*** (JA5015-00), and a separate ***Application Note*** (JD5003-00) for further user details. The main elements of the installation are outlined below.

⚠ WARNING

High voltages appear at several points inside the AT30. Use extreme caution when working inside the enclosure. Do not attempt to work inside the AT30 unless you are a qualified technician or electrician.

Disconnect and lock out all power from the AT30 before starting to remove or replace any components. Turn the ac power off at the distribution panel upstream from the charger. Disconnect the battery from the AT30 output terminals TB1(+/-).

PROCEDURE

1. De-energize and lock out all ac and dc voltage sources to the AT30, and check with a voltmeter before proceeding.
2. Mount the probe on a clean, dry surface, as close to the battery as possible, such as the battery rack. ***DO NOT*** mount the probe:
   - on the battery itself
   - on unpainted wood, or bare galvanized metal.
   - on plastic surfaces
3. To apply the probe, clean the mounting surface with isopropyl alcohol, and allow to dry thoroughly. Remove the protective backing from the double-faced adhesive tape on the probe, and securely press it onto the surface.
4. Install the cable supplied with the temperature compensation probe kit:
   - Start at the AT30. The end of the cable with two stripped wires and a quick-connect terminal will be installed inside the AT30.
   - Leave 30in / 762mm of cable inside the enclosure, and route the other end to the probe at the battery.

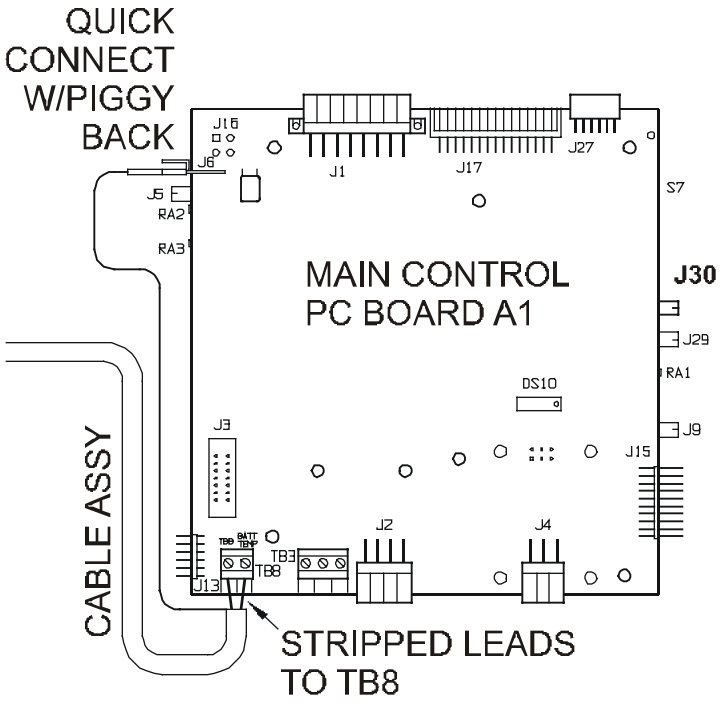
- Run the cable though a conduit if possible, but not through a conduit containing any power wiring.
- Route the other end to the probe at the battery and coil up excess cable.

NOTICE

If the standard (25ft / 7.6m) cable is not long enough, longer cable assemblies are available in lengths of 50, 100 & 200ft / 15.2, 30.5 & 61.0m. See Appendix B on page 65 for ordering information.

- Make sure wiring conforms to NEC, local, and site requirements.

5. Attach the interconnection cable to the AT30 as shown in the figure below:



- Route the cable within the AT30 enclosure so it runs with the wire harness to the back of the front panel, and easily reaches the Main Control PC Board (A1).
- At the Main Control PC Board (A1), insert one of the bare wires from the cable into each terminal of TB8. Polarity is not vital.
- Plug the connector at the end of the nylon-shielded wire of the cable assembly onto J6.
- Using plastic wire ties, fasten the interconnection cable loosely to the existing wire harness. Make sure that the cable conforms to the service loop at the hinge end of the door.

6. At the battery, connect the quick-connect terminals to the temperature compensation probe. Polarity is not vital. Coil up any excess wire and tape or tie it together to prevent damage.
7. Set jumper (J30) on the Main Control PC Board (A1) to positions 2-3 to use ***compensated*** voltages, or to positions 1-2 to use ***uncompensated*** voltages.

8. Check your work. Be sure that:
   - All connections are secure.
   - The shield is connected to ground at the ***charger end only*** (A1-J6).
   - The cable is connected to the 2-position terminal block (TB8) on the Main Control PC Board (A1). Other terminal blocks may look similar.
9. Restart the AT30 using the startup procedure in Section 2.1. During startup, the AT30 displays **Pb** on the front panel meter, indicating that the temperature compensation is set up for lead-acid battery types. While this is being displayed, you can press any front panel key to change the display to read **nicd**, to change the temperature compensation setup for nickel-cadmium batteries. The choice you make is saved internally, and will be used again by the AT30 the next time it starts.
10. Adjust the output float and equalize voltages to the battery manufacturer's recommended values, using the AT30 front panel meter, as described in Section 2.3.2.

NOTICE

*If the temperature compensation probe, or the probe wiring, is damaged and becomes an open circuit, the AT30 detects the damage and displays **E 08** on the front panel meter. The AT30 then reverts to normal non-temperature-compensated operation until the probe or wiring is repaired. Once the probe is repaired, you must restart the AT30 to activate the probe, as described in Section 2.1.*

Using temperature compensation

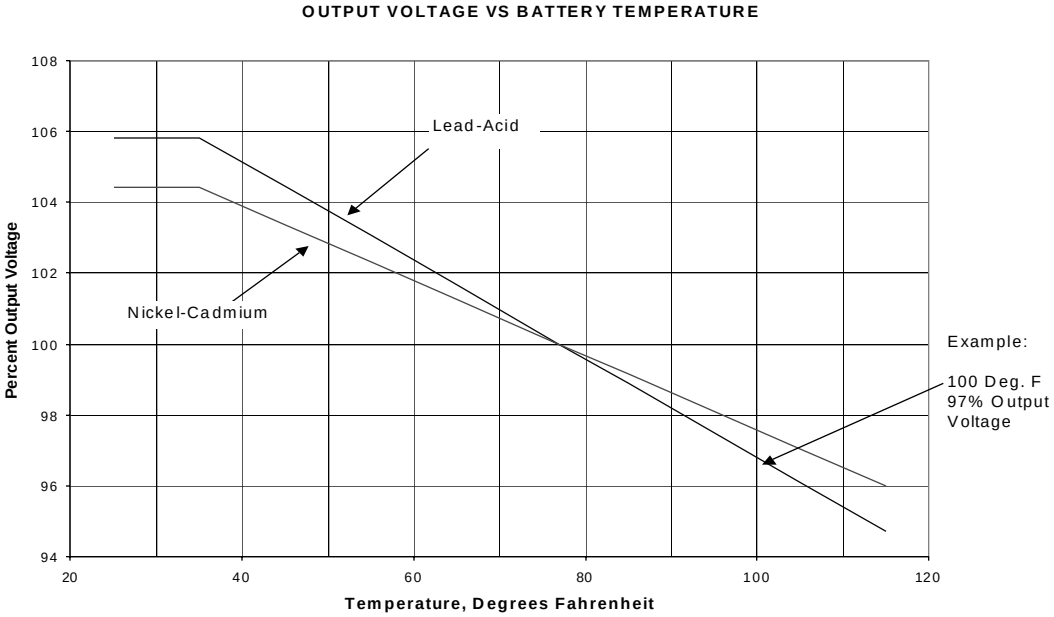
When an electric storage battery is being charged, the terminal voltage of the battery changes a small amount whenever the battery temperature changes. As the battery temperature increases, its terminal voltage decreases. When a constant output voltage float type rectifier charges a battery, float current increases when the temperature increases. This results in overcharging the battery, which can result in damage to the materials, or at least the need for more frequent maintenance.

When the AT30 is equipped with a temperature compensation probe, it is able to adjust the output voltage applied to the battery to keep the float current constant, thereby avoiding overcharging. The probe senses the ambient temperature at the battery, and adjusts the output float/equalize voltages to compensate for variations in temperature. If the ambient temperature increases, the AT30 output voltage decreases.

If you are experiencing any inconsistencies in the AT30 when the temperature compensation probe is utilized, temporarily disconnect the probe, and refer to the ***Application Note*** (**JD5003-00**) for further details.

Note the following:

- You should set the Float and Equalize voltages to the values recommended by your battery manufacturer for 77 °F / 25 °C.
- When you enter the **Edit Mode** to adjust the Float or Equalize voltage (see Section 2.3.2), the front panel meter displays the 77 °F / 25 °C value for the Float or Equalize voltage, even if the battery is warmer or cooler than 77 °F / 25 °C.
- The actual output voltage of the AT30 may be different from the value displayed on the front panel meter, if the battery is warmer or cooler than 77 °F / 25 °C.
- Use a digital meter to measure the actual output voltage of the AT30. If you know the temperature at the temperature compensation probe, you can use the graph below to determine that the output voltage is correct.
- If the battery temperature goes below 32 °F / 0 °C, there will be no further increase in AT30 output voltage. Likewise, if the battery temperature goes above 122 °F / 50 °C, there is no further decrease in output voltage.



EXAMPLE: Suppose you have a lead-acid battery whose temperature is 100 °F / 37.8 °C. As shown on the graph, the 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***

1.12. INSTALLING FOR REMOTE COMMUNICATION (OPTIONAL)

Refer to separate ***Operating Instructions*** (**JA0102-04**).

1.13. INSTALLING FOR FORCED LOAD SHARING (OPTIONAL)

Refer to Appendix F on page 92 or ***Operating Instructions*** (**JA5054-00**).

2. OPERATING THE AT30 BATTERY CHARGER

2.1. STARTING THE AT30

2.1.1. Understanding the startup sequence

The AT30 is set up at the factory to work with most common batteries and loads without further adjustment. When you start the AT30 for the first time, the factory settings (float voltage, equalize voltage, etc.) control the operation of the charger. You can change the settings after you start the AT30. The **FACTORY SETTINGS** are listed in table on page 25.

The AT30 startup routine takes about five seconds. The microprocessor that controls the AT30 initializes the charger by reading the settings that are stored internally. The control circuitry then "soft starts" the AT30 and the dc output voltage and current increase gradually to the rated value.

2.1.2. Checking the installation

Be sure that you have followed the installation instructions carefully. Check the ac input supply voltage and the battery voltage, and be sure that they match the information on the AT30 nameplate. *Verify that the jumpers on the main transformer (T1) are correct for your ac supply voltage*. Open the front panel, and check the battery polarity at the TB1 (+) and (-) terminals.

Using the Digital Meter

When you first start the AT30, the meter display alternates between dc output voltage and dc output current.

Each reading is held for two (2) seconds. Indicator lights to the left of the display indicate whether the meter is displaying voltage or current.

If you want to "freeze" the meter to display only voltage, press the **METER MODE** key on the front panel. To freeze the meter to display only current, press the key again. Press the key twice more to revert to the alternating display.

2.1.3. Starting the AT30

When you are sure that all connections to the AT30 are properly made, follow these steps to start up the AT30:

- Turn on the front panel dc circuit breaker. The digital meter indicates the battery voltage only. If the meter display does not light, *do not proceed*. Turn off the dc breaker, and check all connections and the battery polarity again. Also check the battery voltage. It must be above 50% of nominal voltage to turn on the display. If you cannot find the problem, refer to the *Troubleshooting Procedure* in Section 3.1 on page 44.

NOTICE

If you attempt to turn on the dc circuit breaker (CB2) with the battery connected in reverse polarity, the breaker will immediately trip. Do not try to close the dc breaker again, since this may damage the AT30. If your AT30 is equipped with dc fuses, one or both fuses will blow when the battery is reversed. Correct the battery polarity before proceeding.

- If you have an optional temperature compensation probe installed, the front panel displays **Pb** during startup, indicating that temperature compensation is set up for lead-acid battery types. While this is being displayed, you can press any front panel key to change the display to read **nicd**, to change the temperature compensation setup for nickel-cadmium batteries. The choice you make is saved internally, and will be used again by the AT30 then next time it starts.
- Turn on the front panel ac circuit breaker. The digital meter displays the output voltage and current. See *Using the Digital Meter* on page 24. You should hear a soft hum from the AT30 as the output current increases.

NOTICE

If you have a filtered model of the AT30, and you turn on the ac breaker (CB1) first, before the dc breaker (CB2), there is a possibility that the dc breaker will trip when you try to turn it on. This is caused by the filter capacitors (C1) discharging into the battery. To get around this problem, turn off the ac breaker. Restart the AT30 by turning on the dc breaker first.

- The green **FLOAT** indicator lights. Press the **CHRG MODE** key on the front instrument panel. The **FLOAT** indicator goes off, and the yellow **EQLZ** indicator lights. Press the **CHRG MODE** key again to return the AT30 to the float mode.

The table below lists the normal factory settings for float and equalize voltage, equalize time, Current Limit setting, and alarm settings. If your purchase order specified other float or equalize voltage settings, a tag attached to the front panel of the AT30 lists the actual voltage settings.

FACTORY SETTINGS FOR ALL PARAMETERS

Parameter	Nominal Vdc			
	12	24	48	130
Float Voltage	13	26	52	131
Equalize Voltage	14	28	56	139
HVDC Alarm	14.4	28.8	57.6	144
LVDC Alarm	12	24	48	120
Equalize Time	24 Hours			
Equalize Method	Manual Timer			
Current Limit	110% of nominal output current			
HVDC Shutdown	Disabled			

2.2. USING THE AT30 FRONT PANEL FEATURES

2.2.1. If the meter displays an error or status message

The AT30 microprocessor control circuitry performs diagnostic checks of the battery charger during system start-up, then continuously during operation. If it detects a failure (**E ##**) or special status (**A ##**), an intermittent code will appear on the front instrument panel, displayed between dc output values.

Code	Explanation	Summary
E 01	rating resistor R2 open or defective	**Yes**
E 02	short circuit on dc output	**Yes**
E 03	high dc voltage shutdown occurrence	**Yes**
E 04	internal memory failure	**Yes**
E 06	voltage sense failure (internal / external / remote)	**Yes**
E 07	dc breaker open, or dc output wiring defective	**Yes**
E 08	remote TempCo probe defective	**Yes**
E 10	open internal feedback loop	**Yes**
E 12	internal over-temp circuit defective	**Yes**
E 13	rectifier over-temperature occurrence	**Yes**
E 14	forced load sharing not working properly	No
E 15	battery open	**Yes**
E 16	remote shutdown	**Yes**
A 01	manual equalize enabled for more than 24 hours	**Yes**
A 02	equalize mode inhibited	No
A 04	voltmeter calibration inhibited w/TempCo active	No
A 05	dc output at Current Limit setting	No

See Section 3.2 on page 45 for a full explanation of each code. Codes **E 05**, **E 09**, **E 11**, and **A 03** are not used. Other codes are as follows.

Pb / nicd	battery type for active temperature compensation
LS-P / LS-S	forced load sharing status (primary / secondary)
AStL	latching alarm reset
test	battery open alarm test

2.2.2. Selecting the meter mode

- Press the **METER MODE** key to change the meter display mode. The digital meter has four operating modes:
    1. Alternating between output voltage and output current. When the AT30 is in a timed equalize mode, the meter alternates between output voltage, output current, and equalize hours remaining.
    2. Displaying output voltage only. The **DC Volts** indicator lights.
    3. Displaying output current only. The **DC Amperes** indicator lights.
    4. Displaying equalize hours remaining only. The **EQLZ HRS REMAINING** indicator lights. If the AT30 is not in a timed equalize mode, the meter displays the full programmed equalize time.

- When the AT30 starts initially, the meter alternates, displaying output voltage and output current. The **DC Volts** and **DC Amperes** indicators light alternately to indicate what is being displayed.

2.2.3. Selecting the Float or Equalize mode

The AT30 has two output voltage settings, Float and Equalize. Use the Float mode for all normal battery charging, and to operate your dc system. Use the Equalize mode if it is necessary to balance the level of charge among the cells of the battery. Consult your battery data sheets for information on equalize charging your battery.

- Press the **CHRG MODE** key to change to the equalize mode.

If the equalize method is set to manual timer or auto-equalize timer, the AT30 will revert to the float mode at the end of the selected equalize time.

- You can press the **CHRG MODE** key again at any time to change back to the float mode.

2.2.4. Choosing the Equalize method

Press the **EQLZ MTHD** key to choose the desired equalize method. The indicator next to the desired equalize method will light. Three (3) equalize methods are available in the AT30:

- Manual Timer
- Manual Equalize
- Auto-Equalize Timer

These equalize methods are described below.

Manual Timer Method

Choose the manual timer method if you perform regularly scheduled equalize charging, or if you base your equalize charging on regular readings of the specific gravity of each cell of your battery (for lead-acid batteries). When your battery requires equalize charging, adjust the manual timer to 1-2 hours for each 100 AH of battery capacity (see Section 2.3.3 to learn how to adjust the equalize time). The battery manufacturer can help you determine the best equalizing schedule for your battery.

After you select the manual timer method, press the **CHRG MODE** key to put the AT30 into the equalize mode. The **EQLZ** indicator will light. When the equalize timer is finished, the AT30 reverts automatically to the float mode, and the **FLOAT** indicator lights.

Any time during equalize charge, you can switch the AT30 back to float mode by pressing the **CHRG MODE** key. The **FLOAT** indicator will light.

If there is an ac power failure during the equalize charge, the AT30 remembers the remaining equalize time. When ac power is restored, it resumes the equalize charge where it left off.

Manual Equalize Method

Choose the manual equalize method when you want to equalize charge the battery, but only when you are able to monitor the battery voltage and gassing rate. After you select the manual equalize method, press the CHRG MODE key to put the AT30 into the equalize mode. The **EQLZ** indicator will light.

Press the CHRG MODE key again to return the AT30 to the float mode. The **FLOAT** indicator will light.

NOTICE

Never leave the AT30 unattended in the equalize mode with the manual equalize method selected. A sustained overcharge may cause permanent damage to the battery.

Auto-Equalize Timer Method

Choose the auto-equalize timer method if you have a ***flooded*** (non-sealed) battery, that is subject to infrequent discharges, or when the battery will be discharged by at least half of its rated capacity during an ac power failure. When ac power is restored to the AT30, it turns on in the equalize mode automatically, and the **EQLZ** indicator lights. At the end of the equalize charging time that you select, the AT30 reverts automatically to the float mode, and the **FLOAT** indicator lights. At any time during the equalize charge, you can switch the AT30 back to float mode by pressing the CHRG MODE key. The **FLOAT** indicator will light.

Consult your battery manufacturer's instructions before using the auto-equalize timer method with sealed (valve-regulated) lead-acid batteries.

Whenever the ac supply fails for 12 seconds or longer, the auto-equalize timer is enabled. For shorter periods, the timer behaves as listed below:

Mode before ac failure		AC falure duration		Mode after ac failure
FLOAT	→	less than 12 seconds	→	FLOAT
EQUALIZE	→	less than 12 seconds	→	Resume EQUALIZE with time remaining
FLOAT or EQUALIZE	→	12 seconds or greater	→	EQUALIZE with full time

Switching to Equalize Mode with Auto-Equalize Timer Method Selected

You can start an equalize charge at any time.

- Press the CHRG MODE key. The **EQLZ** indicator will light.

When the equalize timer is finished, the AT30 reverts automatically to the float mode, and the **FLOAT** indicator lights.

2.2.5. Testing the front panel indicators

- Press the DOWN key. This is also the LAMP TEST key.

The meter will display **8888**, and all status & alarm indicators will light.

The LAMP TEST key does not test the **AC ON** indicator. The **AC ON** indicator lights whenever ac power is present, and the ac circuit breaker is turned on. The LAMP TEST key does not operate when ac power is off.

To test the action of the AT30 summary alarm relay, press and hold the LAMP TEST key for four seconds to transfer the relay. If you are monitoring the relay with a remote annunciator, it will detect the alarm condition.

2.2.6. Testing the Auxiliary Alarm Relay PC Board (optional)

If you have the optional Auxiliary Alarm Relay PC Board (A5) installed, you can similarly test the six individual alarm relays. Press and hold the LAMP TEST key for four seconds to transfer the relays. If you are monitoring the relays with a remote annunciator, it will detect the alarm conditions.

2.2.7. Interpreting the alarm indicators

There are six red alarm indicators at the right side of the front panel. An indicator lights for each of the following alarm conditions:

- **HIGH DC VOLTAGE**: lights whenever the dc output voltage exceeds the specified alarm voltage setting. See Section 2.3.4 to learn how to adjust the HVDC alarm setting.
- **LOW DC VOLTAGE**: lights whenever the dc output voltage is below the specified alarm voltage setting. See Section 2.3.4 to learn how to adjust the LVDC alarm setting.
- **DC OUTPUT FAILURE**: lights whenever the AT30 cannot provide its full rated output voltage *or* its full rated output current. You cannot adjust this alarm setting.
- **AC INPUT FAILURE**: lights whenever the ac power supply to the AT30 is interrupted.
- **POS GND**: lights whenever leakage current from the battery positive terminal to ground exceeds a specified threshold. *
- **NEG GND**: lights whenever leakage current from the battery negative terminal to ground exceeds a specified threshold. *

** The ground fault detection sensitivity can be adjusted from 5 to 30 kΩ, see Section 2.3.4 on Page 32.*

When an alarm occurs, the indicators will light immediately. The AT30 also features a summary alarm relay with one (1) form-C contacts (TB3) rated 0.5A / 125 Vac/Vdc. If an alarm condition lasts for 30 seconds or longer, the summary alarm relay transfers. Under standard settings, when the alarm condition is corrected, the corresponding relay and indicator resets automatically. Latching alarm capability for the AT30 is available, featured in a supplemental ***Operating Instructions*** (**JA5098-00**).

2.3. SETTING PARAMETERS IN THE AT30

2.3.1. Understanding Parameter Settings

You can change the settings of the AT30 while it is operating, using the front panel controls. The changes you make take effect immediately, and are saved internally. If the AT30 is taken out of service, and then later returned to service, it restarts using the last values you set. You can adjust the following parameters:

- Float voltage
- Equalize voltage
- Equalize timer (in hours)
- High dc voltage alarm setting
- Low dc voltage alarm setting
- Current Limit value (in Amperes)
- High dc voltage shutdown feature (on or off)

Your choice of equalize method is also saved internally.

When you want to change any parameter, press the EDIT/ENTER key to put the AT30 into **Edit Mode**. The meter display flashes about once per second, and the status indicators prompt you to adjust the respective parameter. Adjust each parameter by pressing the UP or DOWN key until the meter displays the desired reading. You can make the display scroll up or down continuously by pressing and holding the UP or DOWN key.

You cannot exceed certain upper and lower limits for the operating parameters. To see what the limits are for your AT30, refer to the Specifications in Appendix A on page 64.

When you first press the EDIT/ENTER key, the AT30 prompts you to adjust the first parameter in the list above (float voltage). When you obtain the value you want on the display, press the EDIT/ENTER key again. The AT30 saves the new setting internally, and then prompts you to adjust the second parameter. You continue this way to adjust the first six parameters in the list above. If you want to skip adjusting any parameter, just press the EDIT/ENTER key again. The AT30 moves to the next parameter.

When you are finished adjusting the sixth parameter (Current Limit), press the EDIT/ENTER key again. The AT30 saves all adjustments you made internally, and reverts to normal operation. The new settings take effect immediately.

If you do not press any front panel key for 25 seconds, **Edit Mode** ends automatically, and any change you made to the last setting is not saved.

2.3.2. Setting the Float and Equalize voltages

- Press the EDIT/ENTER key.

The **FLOAT** and **DC VOLTS** indicators light, and the display flashes the present value of the float voltage. Press and release the UP or DOWN key to increase or decrease the value in the display by one count, or press and hold the UP or DOWN key to scroll the value in the display upward or downward. When the meter displays the desired float voltage, release the UP or DOWN key. If you go past the voltage you want, press the UP or DOWN key again to reach the voltage you want to set.

- Press the EDIT/ENTER key. The new float voltage setting is saved internally.

The **EQLZ** and **DC VOLTS** indicators light, and the display flashes the present value of the equalize voltage. Press and release the UP or DOWN key to increase or decrease the value in the display by one count, or press and hold the UP or DOWN key to scroll the value in the display upward or downward. When the meter displays the desired equalize voltage, release the UP or DOWN key. If you go past the voltage you want, press the UP or DOWN key again to reach the voltage you want to set.

- Press the EDIT/ENTER key. The new equalize voltage setting is saved internally.

If you want to adjust the equalize timer duration, skip to Section 2.3.3.

OR

If you want to exit the **Edit Mode** now, press the EDIT/ENTER key four more times until the AT30 returns to normal operation.

If you do not press any front panel key for 25 seconds, **Edit Mode** ends automatically, and any change you made to the last setting is not saved.

2.3.3. Setting the Equalize Timer

- Press the EDIT/ENTER key until the **EQLZ HRS REMAINING, MANUAL TIMER** and **AUTO EQLZ TIMER** indicators light, and the display flashes the present value of the equalize timer duration in hours.

Press and release the UP or DOWN key to increase or decrease the value in the display by one count, or press and hold the UP or DOWN key to scroll the value in the display upward or downward. When the meter displays the desired equalize time (in hours), release the UP or DOWN key. If you go past the number of hours you want, press the UP or DOWN key again to reach the number you want to set.

If you set the equalize time to zero hours, the equalize mode is disabled.

- Press the EDIT/ENTER key. The new equalize timer duration is saved internally. The same timer setting works for both the manual timer and the auto-equalize timer.

If you want to adjust the alarm settings, skip to Section 2.3.4.

OR

If you want to exit the **Edit Mode** now, press the EDIT/ENTER key three (3) more times until the AT30 returns to normal operation.

2.3.4. Setting the Alarms

After you save the equalize timer setting, the **Edit Mode** automatically prompts you to adjust the settings of the high dc voltage and low dc voltage alarms. There is a red indicator light on the front instrument panel of the AT30 for each of the following alarm conditions:

- High DC Voltage
- Low DC Voltage
- DC Output Failure
- AC Input Failure
- Positive (+) Ground Fault Detection
- Negative (-) Ground Fault Detection

When an alarm occurs, the indicator LEDs will light immediately. The AT30 also features a summary alarm relay with one (1) form-C remote contacts (TB3), rated 0.5A / 125 Vac/Vdc. If an alarm condition lasts for 30 seconds or longer, the summary alarm relay contacts transfer. When the alarm condition is corrected, the relay and all indicators reset automatically. If latching alarms/relays are enabled the relay will need to be reset manually, see Section 2.2.7 on page 29.

The summary alarm relay also transfers when the AT30 detects certain secondary errors, indicated by meter display codes rather than a discreet front panel red LED. Codes **E 01** through **E 13**, and **A 01** will trigger the summary alarm. See Section 3.2 on Page 45 for all error and status codes.

Setting the High DC Voltage Alarm

- Press the EDIT/ENTER key until the **HIGH DC VOLTAGE** indicator flashes, and the display flashes the present value of the high dc voltage alarm.

Press and release the UP or DOWN key to increase or decrease the value in the display by one count, or press and hold the UP or DOWN key to scroll the value in the display upward or downward. When the meter displays the desired high dc voltage alarm point, release the UP or DOWN key. If you go past the voltage you want, press the UP or DOWN key again to reach the voltage you want to set.

- Press the EDIT/ENTER key. The new high dc voltage alarm setting is entered into permanent memory.

Setting the low DC Voltage Alarm

- Press the EDIT/ENTER key until the **LOW DC VOLTAGE** indicator flashes, and the display flashes the present value of the low dc voltage alarm.

Press and release the UP or DOWN key to increase or decrease the value in the display by one count, or press and hold the UP or DOWN key to scroll the value in the display upward or downward. When the meter displays the desired low dc voltage alarm point, release the UP or DOWN key. If you go past the voltage you want, press the UP or DOWN key again to reach the voltage you want to set.

- Press the EDIT/ENTER key. The new low dc voltage alarm setting is entered into permanent memory.

If you want to adjust the Current Limit setting, skip to Section 2.3.5.

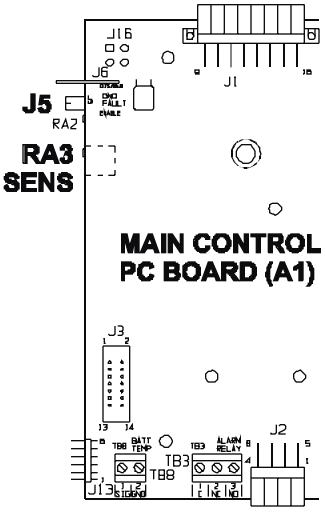
OR

If you want to exit the **Edit Mode** now, press the EDIT/ENTER key again to return the AT30 to normal operation.

Adjusting Ground Detection Sensitivity

The AT30 ground detection alarm sensitivity is adjustable from 5 to 30 kΩ. You must have a "test resistor" whose Ohmic value is the required ground sensitivity, and a small jeweler's screwdriver for adjustment.

The ground detection sensitivity is adjusted equally (+/-) from 5 to 10 kΩ, but slightly less equally from 10 to 30 kΩ. Adjustments are made via potentiometer labeled **RA3 SENS**, located on the Main Control PC Board (A1), as shown in the figure at the right.



NOTICE

*Do not try to adjust the upper potentiometer labeled **RA2 BALANCE**. This adjustment is made at the factory for proper circuit operation.*

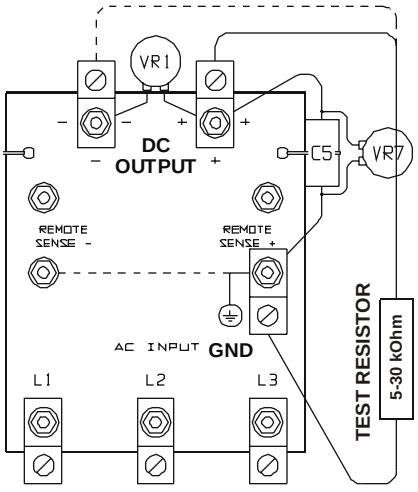
⚠ CAUTION

Before connecting or disconnecting a test resistor, de-energize and lock out all ac and dc voltage sources to the AT30.

*Check with a voltmeter before proceeding. Restart the AT30 only when necessary to make the sensitivity adjustment. If your battery is **grounded**, do not attempt this procedure.*

Refer to the image at the right, and the internal component layout drawings in Appendix C for specific I/O panel configurations and terminal specs.

Connect the test resistor between **TB1(+)** and ground. Adjust **RA3** counter-clockwise until the front panel indicator goes out, then adjust clockwise until the **POS GND** indicator ***just*** lights. Make this adjustment slowly, for the indicator is only updated once every four seconds.



De-energize and lock out power to the AT30. Remove the test resistor and verify the **POS GND** indicator goes out. Connect the test resistor between **TB1(-)** and ground. Verify that the **NEG GND** indicator lights. If not, adjust **RA3** clockwise until it ***just*** does.

Remove the test resistor and return the AT30 to normal operation.

Using Ground Detection in Charger Standby Mode

If you put the AT30 into standby mode by opening the dc circuit breaker (CB2), the ground detection circuit will send an erroneous ***positive (+)*** ground fault alarm. There are two ways to work around this:

- Disable the ground detection circuit while the AT30 is in standby, as described below.
- Put the AT30 into standby by opening the ac input circuit breaker (CB1), and leaving the dc circuit breaker (CB2) closed.

Operating the AT30 with the ac breaker (CB1) closed, but the dc breaker (CB2) open, is an ***abnormal*** condition. It is not recommended.

Disabling the Ground Detection Alarm

You can disable the ground detection alarm circuit, and isolate the circuit from chassis ground. If your battery is normally grounded, or you want to defeat the alarm for any other reason, follow these steps:

- Shut down the AT30 and lock out all ac and dc voltage sources. This includes alarm and remote sense wires if they were installed. Open the front panel door and check with a voltmeter before proceeding.
- Locate jumper **J5** at the top left of the Main Control PC Board (A1) as shown on the previous page. Move the jumper to the **DISABLE** position. The **POS GND** and **NEG GND** indicators and the summary alarm relay (TB3) will not respond to a ground fault.

Restart the AT30, following the instructions in Section 2.1.

2.3.5. Setting the Current Limit value

The AT30 automatically limits its dc output current in case of overload or battery discharge. You can adjust the value of the Current Limit from 50% to 110% of rated current. The factory setting is 110%.

The Current Limit adjustment is the last step in the normal **Edit Mode** sequence. If the AT30 is not in the **Edit Mode**, press the EDIT/ENTER key six (6) times, until the meter display flashes the value of the Current Limit setting (in Amperes). Press and release the UP or DOWN key to increase or decrease the value in the display by one count, or press and hold the UP or DOWN key to scroll the value in the display upward or downward. When the meters display the desired Current Limit value, release the UP or DOWN key. If you go past the number you want, press the UP or DOWN key again to reach the number you want to set.

- Press the EDIT/ENTER key.
- The new Current Limit setting is saved internally.
- The front panel display will flash **End** to confirm.

If you do not press any front panel key for 25 seconds, **Edit Mode** ends automatically, and any change you made to the last setting is not saved.

2.3.6. Enabling the High DC Voltage shutdown feature

The AT30 has a built-in high dc voltage shutdown feature. In case of any maladjustment or internal failure that results in a continuous output voltage that is too high, the AT30 shuts down after 30 seconds to protect the battery. The front panel meter displays code **E 03,** and the summary alarm relay contact (TB3) transfers.

NOTICE

*The AT30 is normally shipped from the factory with the High DC Voltage Shutdown feature **disabled**.*

You can adjust the high dc voltage shutdown (the setting is the same as the high dc voltage alarm setting). Refer to Section 2.3.4.

To enable the shutdown feature:

- The AT30 must be in normal operation (not the **Edit Mode**) to enable HVDC Shutdown.
- Press and hold the UP key, then...
- Press the CHRG MODE key.

The **HIGH DC VOLTAGE** indicator lights, and the display flashes **ON**. You can toggle the shutdown feature **OFF** and **ON** by pressing the CHRG MODE key repeatedly.

Parallel Operation

If two (or more) AT30s are connected in parallel, both sense the output voltage. If one AT30 runs away, it will supply all the output current. The other has zero output current. The high dc voltage shutdown does not operate in an AT30 with zero output current, so that only the ***defective*** AT30 (of two or more in parallel) shuts down. The other AT30 will continue to supply the load normally.

If you do not press any key within four (4) seconds, the last state indicated (**ON** or **OFF**) is saved internally. Note that you ***do not*** use the EDIT/ENTER key for this feature.

If the AT30 shuts down because of a high dc voltage, the meter displays error code **E 03**. Reset the AT30 by turning the ac input circuit breaker (CB1) off, then on again.

2.3.7. Adjusting the Voltmeter Accuracy

The AT30 voltmeter is adjusted at the factory to display the actual output voltage within ±0.25%. If you replace any component that affects meter accuracy, such as the Main Control PC Board (A1) or **R4**, you should readjust the meter. This adjustment procedure is different from all others, because the meter reading remains constant, while the output voltage of the AT30 changes. Do this adjustment with a fully charged battery and with no load connected.

First, enter **Edit Mode** to adjust the float voltage to the desired value. See Section 2.3.2 for instructions on setting the float voltage. Second, press and hold the UP key, then press the EQLZ MTHD key.

The **DC VOLTS** METER MODE indicator will light, and the meter display flashes the output voltage reading. Measure the output voltage of the AT30 using a dc meter accurate to ±0.25% or better.

While watching the meter connected to the AT30 output (not the front panel meter), press the UP or DOWN key until the actual output voltage matches the float setting on the front panel meter.

Each time you press UP or DOWN, you change the AT30 output voltage by a small amount. Continue to press UP or DOWN until the actual output voltage agrees with the front panel reading within ±0.25%

NOTICE

Allow one or two seconds for the output voltage to stabilize each time you press the UP or DOWN key.

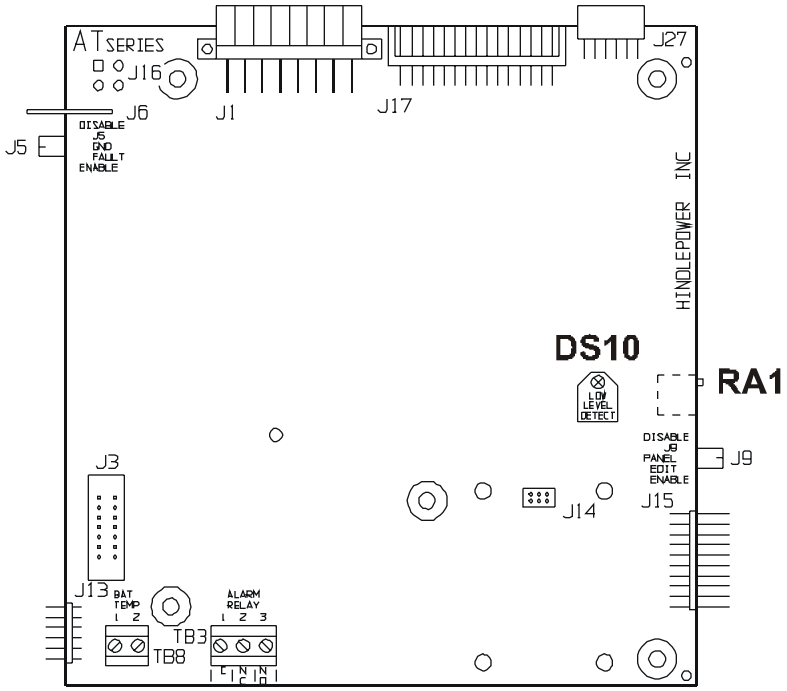
When you are finished adjusting the output voltage, the AT30 waits five (5) seconds, then the display returns to normal operation.

2.3.8. Using the Low Level Detector (LLD)

The AT30 is equipped with a summary (common) alarm relay safety override circuit. This feature forces the alarm relay contact to transfer, sending an alarm, even if there is a catastrophic failure of the AT30 control circuitry. A low battery voltage triggers the safety circuit.

Main Control PC Board (A1) hardware, not software, maintains the low level detect circuit. Therefore, to remotely monitor this alarm, user connections must be made at terminal block (TB3). The summary alarm contacts (TB4) on the Auxiliary Alarm Relay PC Board will not signal a low level detect alarm.

If you have a dc power supply, you can adjust the battery voltage that triggers the alarm. On the back of the Main Control PC Board (A1), find the potentiometer **RA1**, as shown in the figure below.



Disconnect all ac and dc power sources from the AT30, and connect your dc power supply to the dc output terminals of the charger (positive to positive and negative to negative). Adjust the power supply to the voltage at which you want to activate the alarm.

NOTICE

You need at least 50% of the nominal output voltage to power the AT30 Main Control PC Board (A1).

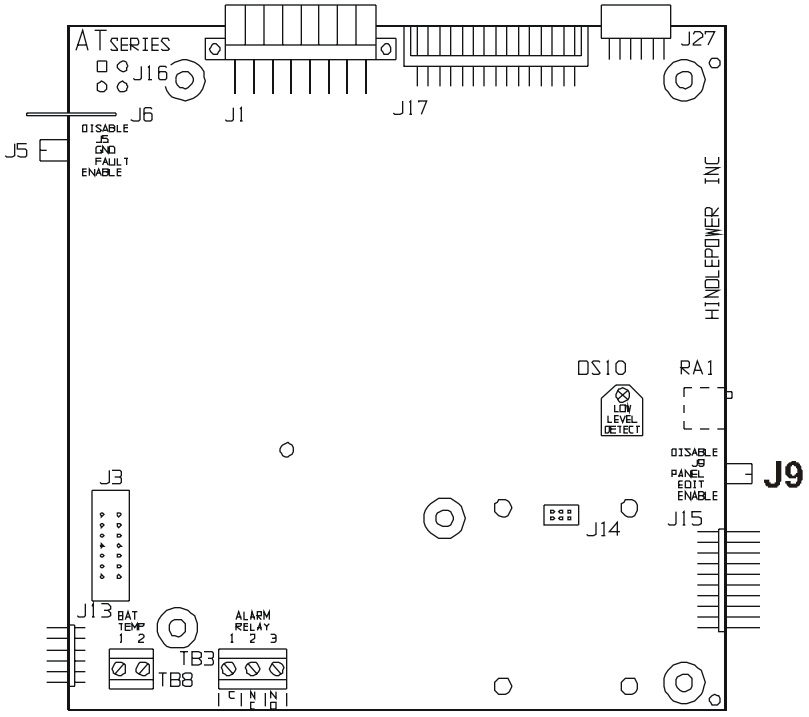
Adjust **RA1** with a small jeweler's screwdriver clockwise until the alarm just activates. A red LED indicator (**DS10**) next to **RA1** indicates when the alarm is active.

2.3.9. Using the front panel security feature

The AT30 is shipped from the factory with all the front instrument panel keys enabled. You can disable the following front panel functions:

- Selecting Equalize method
- Changing settings using the **EDIT/ENTER** key
- Toggling the high dc voltage shutdown feature

To disable the front instrument panel keys, open the AT30 door and locate the small plastic jumper **J9** on the right side of the Main Control PC Board (A1). See the figure below.



Move the jumper up to the **DISABLE** position (pins 2 and 3). With this setting, only the front panel **METER MODE** and **CHRG MODE** keys will function. All indicators will still work normally. Return the jumper down to the **ENABLE** position (pins 1 and 2) to return all front panel key functionality.

2.4. PERFORMING ROUTINE MAINTENANCE

⚠ WARNING

High voltages appear at several points inside the AT30. Use extreme caution when working inside the enclosure. Do not attempt to work inside the AT30 unless you are a qualified technician or electrician.

Disconnect and lock out all power from the AT30 before starting to remove or replace any components. Turn the ac power off at the distribution panel upstream from the charger. Disconnect the battery from the AT30 output terminals TB1(+/-).

2.4.1. Keep it clean

The AT30 charger is cooled by natural convection. At least once a year, vacuum the vents at the top and bottom of the enclosure to ensure that there is an adequate supply of cooling air. If you have 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.

The AT30 is rated for operation up to 122 °F / 50 °C. If your installation is in a warmer environment, or at an elevation over 3000ft / 914m, contact your sales representative for operating information.

2.4.2. Check power and signal connections

Check the tightness of all field connections inside the AT30, 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 the AT30.

2.4.3. Check remote sense wiring (optional)

If you wired the AT30 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, the AT30 displays the error code **E 06**. The AT30 returns to local control, sensing the output voltage at the charger output terminals (TB1+/-).

2.4.4. Check temperature compensation probe (optional)

If you are using the optional temperature compensation probe, make sure that the probe is securely installed. Make sure the connectors and the wiring from the probe to the AT30 are in satisfactory condition.

If there is a failure of the temperature compensation probe, or the wiring, the AT30 charger displays the error code **E 08**.

2.4.5. Measuring the output ripple voltage (filtered models only)

If your AT30 is a filtered model, measure the ac ripple at the battery terminals at least once a year. Use an rms responding ac voltmeter.[1] If the battery ampere-hour capacity is at least four (4) times the output current rating of the AT30, the ripple voltage should be no higher than the value featured in the specifications in Appendix A on page 64.

If you suspect that the output ripple voltage is too high, see "Output ripple voltage too high" of the *Troubleshooting Chart* in Section 3.4, page 54.

2.4.6. Viewing the voltage and alarm settings

You can review the parameter settings in the AT30 charger by pressing the **EDIT/ENTER** key on the front instrument panel. Each time you press the key, a different parameter displays, in the following order:

- Float voltage
- Equalize voltage
- Equalize time (in hours)
- High dc voltage alarm setting
- Low dc voltage alarm setting
- Current Limit (in Amperes)

[1] Do not use a dc voltmeter. The ripple voltage on a battery is a very small ac voltage.

SAMPLE PREVENTIVE MAINTENANCE PROCEDURE

AT30 BATTERY CHARGER (JD0064-00)

Suggested Frequency: every six (6) months

Maintenance date _____ Performed by _____

⚠ WARNING

High voltages appear at several points inside the AT30. Use extreme caution when working inside the enclosure. Do not attempt to work inside the AT30 unless you are a qualified technician or electrician.

Step (standard features)	Instructions	Results
Clean AT30	• All vents clean and open. • Remove dust and debris from inside unit.	☐ OK ☐ OK
Check all electrical connections and wiring	• TB1 connections all tight. • Internal wiring connections tight, slip-on connectors fully seated. Wire and lug insulation in satisfactory condition. • Terminations at battery or dc bus are tight and corrosion free.	☐ OK ☐ OK ☐ OK
Check ac input voltage	• Measure between TB1-L1, TB1-L2 & TB1-L3 using an ac voltmeter. Value must be within +10% & -12% of nominal voltage.	Input _____ Vac
Check dc output voltage	• Measure at TB1 (+) and TB1(-) using a dc voltmeter. Value should agree with the front panel voltmeter within +/-0.25%, and must be correct values for your battery. If the AT30 is using a temperature compensation probe, see the graph on page 23 to determine correct battery voltage. You need to know the battery temperature for this step.	Float _____ Vdc Equalize _____ Vdc
Check ripple voltage	• Measure at battery terminals using an ac voltmeter set to the milliVolts scale. Check against specification in Appendix A on page 64.	Ripple _____ mVac
Test font panel indicators	• Press **LAMP TEST** key on front panel.	☐ OK
Test summary alarm relay	• Press **LAMP TEST** key and hold for four (4) seconds. Summary alarm relay at TB3 will transfer.	☐ OK

Exercise front panel controls	• Switch from float to equalize, then back to float. • Turn off the dc circuit breaker. **E 07** may appear on display (requires at least 5% of rated output current). Reset breaker.	☐ OK ☐ OK
	• Cycle through meter modes.	☐ **VOLTS** OK ☐ **AMPERES** OK ☐ **HOURS** OK
	• Cycle through equalize methods.	☐ **MANUAL TIMER** OK ☐ **MANUAL EQLZ** OK ☐ **AUTO EQLZ TIMER** OK
	• Turn off ac circuit breaker. The **AC INPUT FAILURE** indicator should light. Reset breaker.	☐ Alarm OK
Check voltage and alarm settings	• Use **EDIT/ENTER** key to scroll through settings. See page 30.	☐ **FLOAT** OK ☐ **EQUALIZE** OK ☐ **HVDC** alarm OK ☐ **LVDC** alarm OK Current Limit _____ Adc
Final checks	• Make sure Plexiglas safety shield is in place (if supplied). • Restore charger to normal operation. • Close latch on front panel.	☐ OK ☐ OK ☐ OK

Step (optional features)	**Instructions**	**Results**
Test auxiliary alarm relays	• Press **LAMP TEST** key and hold for four (4) seconds. Alarm relays will transfer.	☐ OK
Check integrity of remote wiring	• Remote sense wiring. See page 16. • Temperature compensation wiring. See page 20. • Temperature compensation probe. See page 20.	☐ OK ☐ OK ☐ OK
Final checks	• Close padlock or key lock.	☐ OK

ONLINE SUPPLEMENTS

Preventive Maintenance Procedure
Downloadable Worksheet http://www.ATSeries.net/PDFs/JD0064-00.pdf

3. SERVICING THE AT30

3.1. A STEP-BY-STEP TROUBLESHOOTING PROCEDURE

The AT30 is fully tested and calibrated from the factory, and should work for years with a minimum of attention. If you do encounter trouble, there are three (3) steps you should take to identify the problem and return the AT30 to service.

1. Check the front panel meter for an error code. The microprocessor control circuitry is able to diagnose common problems with the AT30, or with the installation or application. If the front panel displays an error code, see Section 3.2, *Interpreting Front Panel Error Messages*, for help in interpreting the code and solving the problem.
2. If the AT30 does not work properly, but there is no front panel error code, turn off the front panel circuit breakers (or disconnect ac and dc power externally). Turn back on dc power ***first***, followed by ac power. This will return the charger to normal operation as long as there is no internal component failure.

NOTICE

Perform Step 2 only once. If the AT30 does not resume normal operation, go on to Step 3.

3. If the AT30 still does not work properly, make a list of the symptoms that you observe. Turn to *Using the troubleshooting chart* in Section 3.3. The troubleshooting chart relates common trouble symptoms to their causes, and gives the proper procedures for correcting the problem.
4. If the symptom does not appear on the troubleshooting chart, or if the recommended repair does not work, consult your sales or service representative to arrange for on-site or factory service.

3.2. INTERPRETING FRONT PANEL ERROR MESSAGES

If the AT30 control circuitry detects hardware or wiring problems, it may display an error code on the front panel meter. Certain non-error status codes are also displayed. To solve an error code problem, refer to the table below, which lists the codes and procedures to use.

⚠ WARNING

High voltages appear at several points inside the AT30. Use extreme caution when working inside the enclosure. Do not attempt to work inside the AT30 unless you are a qualified technician or electrician.

Disconnect and lock out all power from the AT30 before starting to remove or replace any components. Turn the ac power off at the distribution panel upstream from the charger. Disconnect the battery from the AT30 output terminals TB1(+/-).

Error Code	Meaning	Repair Procedure
E 01	resistor R2 open or defective	The Rating Resistor (R2) is installed at the back of the front panel in the Gate Driver PC Board (A15) input connector (J25). R2 is measured by the control circuitry on startup, and is used to determine some of the AT30 model-specific parameters, such as the float voltage. If the AT30 detects that R2 is defective (or improperly sized), it must be replaced. See Section 3.6 for parts ordering information. When you have completed the repair, restart the AT30 according to Section 2.1.
E 02	short circuit on dc output	The AT30 may display this error code if the battery is discharged to less than 6 volts. When the battery re-charges to greater than 6 volts, the error code will disappear. If you have a seriously discharged battery, allow the AT30 to run for 24 hours and check the battery voltage again. If it has not increased to the normal voltage rating, consult the battery manufacturer for help. If the battery voltage is normal, check the wiring at the AT30 dc output terminals (TB1+/-) for a short circuit. If the battery voltage is normal, and all external wiring is satisfactory, check the AT30 dc circuit breaker (CB2). If it is tripped, try ***once*** to reset it. If it trips again immediately, there may be an internal short circuit in the AT30. Check the internal wiring. If the AT30 is filtered, check the dc filter capacitors (C1/C2) and the polarity diode (CR1). The AT30 normally recovers automatically from an **E 02** condition. If you have shut down the AT30 for service, restart per Section 2.1.
E 03	High DC Voltage Shutdown activated	To restart the AT30, turn the ac breaker off, then on. Check the Equalize voltage and High DC Voltage alarm settings. The HVDC alarm setting must be higher than the Equalize voltage setting. If you get another High DC Voltage shutdown after a few minutes of operation, there may be an internal component failure. See **AT30 output voltage too high, or not controllable** of the troubleshooting chart on page 52 of Section 3.4.

Error Code	Meaning	Repair Procedure
E 04	internal memory failure	Any parameters that you set, such as Float or Equalize voltage, are saved internally. The internal memory is tested on startup. If the memory test fails, **E 04** appears on the front display. The error may also appear if the controller was trying to write to the memory while a power failure occured. If an **E 04** code appears, try shutting down the AT30. Restart by turning on the dc breaker (CB2) ***first***, followed by the ac breaker (CB1). If the AT30 restarts normally, you must reenter any changes you made to the factory settings (float voltage, etc.). If **E 04** appears repeatedly, the internal memory has been damaged. You must replace the Main Control PC Board (A1). See Section 3.6 for parts ordering information.
E 05	*not used*	This error code was formerly used to indicate a reverse battery connection. It is not available in the AT30.
E 06	defective R4 or R14 resistor, or remote sense wiring failure	Locate R4 and R14 on the Gate Driver PC Board (A15), mounted to the back side of the front instrument panel. Remove the wire harness plugs from J25 & J26, and remove A15 from the Main Control PC Board (A1). Use an Ohmmeter to measure the values of R4 and R14 (see table 3-1 for the correct value). If either resistor is not within 1% of the specified value, the entire Gate Driver PC Board (A15) must be replaced. If you are using remote sense wiring from the battery to the AT30, the wiring may have failed. The usual failure is an open circuit. A short circuit will usually be indicated by smoke or fire in the wiring. The AT30 displays error code **E 06** if it detects this wiring failure. You should respond to this problem ***quickly***, to make sure that the AT30 regulates the output voltage properly. Wire an annunciator (e.g. buzzer) to the summary alarm relay contact (TB3) for remote indication of any charger problem. Otherwise monitor the AT30 operation using the optional DNP3 Level 2 / Modbus Communications Module (**JA0102-04**). If you have a failure in remote sense wiring, the AT30 regulates its output voltage locally until you correct the problem, see Section 1.9. The locally controlled voltage may not reflect the true requirements of the battery. When you complete the repair, restart the AT30 per Section 2.1.
E 07	open dc breaker (CB2) or internal dc wiring failure	If the dc breaker (CB2) is open, open the ac breaker (CB1). Restart by closing the dc breaker (CB2) ***first***, followed by the ac breaker (CB1). If the dc breaker trips again, see the troubleshooting chart in Section 3.4. If the dc breaker (CB2) is closed, but the front panel meter dsiplays **E 07**, check your battery. If the battery is disconnected, and you ***then*** disconnect the dc load, the AT30 may display an **E 07** code. Restart the AT30 according to Section 2.1. If the battery and dc load are satisfactory, see the troubleshooting chart in Section 3.4 for help in locating the problem.
E 08	defective temperature compensation probe	See ***Application Note*** (**JD5003-00**) for more detailed user instructions. If a remote temperature compensation probe (A10) is connected to the AT30, the control circuitry detects the probe on startup and uses the temperature measured by the probe to control the output voltage of the charger. To understand temperature compensation, see Section 1.11. If the probe (A10) or the wiring that connects it to the Main Control PC Board (A1) fails during normal operation, the AT30 detects the failure and displays **E 08** on the front panel meter.

Error Code	Meaning	Repair Procedure
E 08	defective temperature compensation probe *(continued)*	Disconnect the wiring at the probe and measure the resistance across the quick-connect leads with an Ohmmeter. The resistance should measure approximately 10,000 Ω at normal room temperature (77 °F / 25 °C). If the probe reads open or shorted, it needs to be replaced. If the probe is satisfactory, examine the wiring between the probe and the AT30. Also, check the connection of the cable to TB8 on the Main Control PC Board (A1) on the back of the front panel. If the wiring is satisfactory, the probe needs to be replaced. Once you have replaced the probe, you must restart the AT30 to activate temperature compensation.
E 09	misadjusted Current Limit	This code has been discontinued with Main Ctrl PCB firmware version 6.52. See ***Application Note*** (JD5035-00) for a description of this code.
E 10	open internal feedback loop	A redundant internal feedback loop (control loop) is provided to increase reliability when remote sensing is used. If there is a problem with the internal loop wiring, the front panel meter will display **E 10**. Check the internal wiring in the signal harness, especially wire # **50**. Also check the harness connector (J25) on the Gate Driver PC Board (A15).
E 11	*not used*	This error code is not implemented at this time.
E 12	defective internal thermostat	The AT30 rectifier heat sinks assemblies (A16) are equipped with over-temperature thermostats (S2x). On startup, the AT30 tests the thermostats, and displays **E 12** if one or more are defective. Check each each thermostat (S2x) for continuity. Disconnect the wiring and resistor (R28x) from the quick-connect terminals. The thermostat switch should be closed (NC) at normal room temperature.
E 13	internal over-temperature	One or more of the rectifier thermostats (S2x) has detected an over-temperature condition. If the rectifier is equipped with fans (B2x), check all fans for proper operation. Also make sure that all enclosure vents are clear of debris, and that the ambient temperature is below 122 °F / 50 °C.
E 14	forced load sharing not working properly	See Appendix F on page 92. Verify both AT30s are functioning properly. Ensure that the forced load sharing interconnection cable assembly is not broken, is properly installed, and that the connector for the Secondary charger has the jumper as described. Ensure that both AT30s are connected to the same ac supply and that source phase rotation is the same for both AT30s.
E 15	battery open	The AT30 has detected an open battery, see ***Instructions*** (JA5108-00).
A 01	manual eqlz enabled for more than 24 hr	If the AT30 was accidentally left in manual equalize mode, switch the unit back to float, manual equalize timer, or auto-equalize timer mode, according to Section 2.2.4 on Page 27.
A 02	equalize mode inhibited	If you set the equalize timer to zero (0) hours, the equalize mode is inhibited. When you try to put the AT30 into equalize mode from the front panel controls, the meter displays status code **A 02**. If you want to enable the equalize mode, set the equalize timer to one (1) or more hours.
A 04	voltmeter calibration inhibited w/TempCo active	While using temperature compensation, the AT30 internal dc voltmeter cannot be calibrated. Disconnect one wire of the TempCo cable from TB8 on A1. Restart the AT30 and perform the voltmeter calibration according to Section 2.3.7 on Page 37. Reconnect the TempCo cable to TB8, and restart the AT30. See ***Application Note*** (JD5003-00) for further details.
A 05	dc output at Current Limit setting	The AT30 is in Current Limit mode. This will occur when there is a large load on the dc bus, or the battery has discharged. Make sure that the AT30 is sized correctly for the application, and that the Current Limit value has been set correctly. See Section 2.3.5 Page 35.

3.3. USING THE TROUBLESHOOTING CHART

⚠ WARNING

High voltages appear at several points inside the AT30. Use extreme caution when working inside the enclosures. Do not attempt to work inside the AT30 unless you are a qualified technician or electrician.

Disconnect and lock out all power from the AT30 before starting to remove or replace any components. Turn the ac power off at the distribution panel upstream from the charger. Disconnect the battery from the AT30 output terminals TB1(+/-).

Before you try to use the troubleshooting chart, be sure that you have followed the steps in Section 3.1.

The troubleshooting chart that begins on the next page is divided into three (3) columns. To use the chart:

1. Make a list of the charger's condition, including the trouble symptoms.
2. Find the symptom(s) in the first column of the chart.
3. The middle column contains common causes for the problem you observe, in order of probability.
4. Follow the action described in the right-hand column to correct the problem and return the charger to normal service.

Determining the condition of the AT30:

- Is the front panel **AC ON** indicator lit?
- What is the ac voltage at the input terminals (measured with an ac voltmeter)?
- What is the dc voltage at the output terminals (measured with a dc voltmeter)?
- Does the front panel meter display any voltage or current?
- Are any alarm indicators lit?
- Do the front panel status indicators work (Charge Mode, for example)?
- Can you change the charger to the Equalize mode and back to Float?
- Is the charger making any noise? Is it unusually loud?
- Is there any sign or smell of smoking or burning?

While using the Troubleshooting Chart, refer to the internal component layout drawings and connection diagrams in Appendix C. For instructions on replacing components, see Section 3.5.

3.4. TROUBLESHOOTING CHART

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
Front panel meter displays all segments **on** or all segments **off** AT30 may have no output	1. An external surge has interrupted operation of the microprocessor or the display controller.	1A. Soft Reset of control board by pressing S7 reset switch. S7 is located inside the charger, on the control board's right edge (as viewed from the rear of the front panel). This will restart the control board without modifying any settings. 1B. Hard Reset of control board by pressing and holding the **UP** button on the front instrument panel, and simultaneously pressing S7 reset switch. This will restart the control board and restore all settings to factory default. Reset parameters per Section 2.3 of this manual. 1C. Remove all power from the AT30 to allow control board to discharge all voltages. This can be done by opening the AC circuit breaker and disconnecting the control board plug(s). Keep power removed for approximately five (5) minutes to allow voltages to discharge.
AC breaker trips (or fuses clear) immediately	1. Shorted rectifier diode or SCR	1. Disconnect wires # **7**, **8** & **9** at the three (3) heat sink-mounted rectifier modules (A16x), or at the main power transformer (T1-X1/X2/X3). Measure the resistance between the ac (bottom) terminals of the rectifier module(s), checking both polarities. It should be at least 100,000 Ω. If resistance is low in any direction, replace the rectifier module(s) (A16x) as needed.
	2. Defective wiring to T1 or to rectifier bridge	2. Check spacing of terminals and check wiring for signs of insulation damage, burns, etc. Repair as necessary.
	3. Defective transformer T1	3. Test by disconnecting wires # **7**, **8** & **9** from the transformer secondary taps (T1-X1, X2 and X3). If ac breaker still trips, test by disconnecting wires # **42**, **43**, **44**, **45**, **35** and **36** from the tertiary taps (T1-Y0, Y1, Y2, Y3, W1 and W2). If ac breaker still trips, replace the transformer (T1).
AC breaker trips (or fuses clear) after a few minutes	1. Loose connection to breaker/fuse	1. Check and tighten connections as required.
	2. Wrong ac voltage, or T1 taps miswired	2. Be sure the transformer primary taps (T1-H1, H2 and H3) are wired correctly for your input voltage. See Section 1.6 for details.
	3. Open SCR	3. Use a clamp-on ammeter to measure the current in wires # **7**, **8** & **9**, between T1 and the rectifier modules. If it less than 50% of the dc output current, one of the six (6) SCRs or diodes is defective. Replace the rectifier module(s) (A16).
	4. SCR not controllable	4. Disconnect the wire harness plug from connector J26 on the top of the Gate Driver PC Board (A15) and restart the AT30. If you are able to measure output current, one of the SCRs is defective. Test and replace the rectifier module(s) (A16) as needed.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
DC breaker trips (or fuses clear) immediately	1. Battery connected with reverse polarity	1. Check and correct battery wiring if necessary.
	2. Defective rectifier bridge (if unfiltered AT30)	2. Test by disconnecting wires # **7**, **8** & **9** at the rectifier module(s) (A16) mounted on the main heat sink(s), or at the main transformer (T1). Measure resistance between the ac terminals (bottom terminals) on the rectifier module(s). It should be at least 100,000 Ω (check both polarities). If resistance is low in either direction, replace the rectifier module(s) (A16) as needed.
	3. Defective Free-Wheeling diode CR4	3. Disconnect wire # **15** from SCR module mounted on the heat sink assembly or from the positive bus bar. Measure the resistance through the Free-Wheeling diode (CR4). Check both polarities. It should be at least 100,000 Ω in one polarity, and less than 1,000 Ω in the other polarity. Replace CR4 if it is defective.
	4. Defective Polarity Diode CR1 (if filter assembly is installed)	4. Disconnect wire # **17** from the dc circuit breaker (CB2), or the optional dc fuse (F3). Measure the resistance through the Polarity Diode (CR1), mounted to the **negative** filter capacitor bus bar. Check both polarities. It should be at least 100,000 Ω in one polarity, and less than 1,000 Ω in the other polarity. Replace CR1 if it is defective.
	5. Defective wiring	5. Check spacing of terminals and check wiring for signs of insulation damage, burns, etc. Repair as necessary.
DC breaker trips (or fuses clear) after a few minutes	1. Loose connection to breaker	1. Check and tighten connections as required.
	2. Open SCR	2. Use a clamp-on ammeter to measure the current in wires # **7**, **8** & **9**, between T1 and the rectifier modules. If it less than 50% of the dc output current, one of the SCRs or diodes is defective. Replace the rectifier module(s) (A16).
	3. SCR not controllable	3. Disconnect the wire harness plug from connector J26 on the top of the Gate Driver PC Board (A15) and restart the AT30. If you are able to measure output current, one of the SCRs is defective. Replace the rectifier module(s) (A16) as needed.
	4. Defective Gate Driver PC Board (A15)	4. If the front panel meter displays more than 110% of rated dc current, the Gate Driver PC Board (A15) may be defective. Unplug A15 from the Main Control PC Board (A1). If the output current ***does not*** drop to zero, replace the Gate Driver PC Board (A15).
	5. Defective Main Control PC Board (A1)	5. If the front panel meter displays more than 110% of rated dc current, the Main Control PC Board (A1) may be defective. Unplug the system harness connectors (J25 and J26) from the Gate Driver PC Board (A15). If the output current drops to zero, replace the Main Control PC Board (A1).

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
No output current, and **AC ON** lamp is out, but ac and dc breakers are on	1. AC supply failure	1. If the **AC ON** indicator is out, check the feeder circuit breaker or fuse.
	2. Input fuse F1A/B/C blown	2. Remove the ac input fuses (F1A, F1B & F1C) from the fuse holder(s). Check if blown with an Ohmmeter or fuse tester, and replace F1A, F1B, and/or F1C as needed. **NOTICE** If replacement fuses immediately blow, see the Sections titled "AC breaker trips immediately" and "AC breaker trips after a few minutes" for further troubleshooting hints.
	3. Defective wiring	3. Check terminals and wiring between T1 and the rectifier bridge assembly, main inductor (L1), dc filtering assembly (if present), dc breaker (CB2), optional dc fuses (F3/F4), and the output terminals (TB1+/-). Check wires # **42** through # **45** from T1-Y0 through T1-Y3 to the Gate Driver PC Board connector (J25). Repair as necessary.
	4. Defective transformer T1	4. Use an ac voltmeter to measure the ac voltage from T1-X1 to T1-X2 and T1-X3. It is normally 50% to 80% higher than the rated dc output voltage. If it is too low, check the wiring of the transformer primary taps (T1-H1 through T1-H3). See Section 1.6 for details. If the ac primary voltage is **zero**, replace the T1.
No output current, but **AC ON** lamp is on, and ac and dc breakers are on	1. Battery is fully charged	1. This is normal operation in a system with little or no dc load. As long as the AT30 maintains Float voltage, it is operating normally.
	2. Float or Equalize voltage set too low	2. Check the Float and Equalize voltages and adjust them if necessary. Consult your battery manufacturer for the proper voltage settings.
	3. Wrong ac input voltage, or mis-tapped T1	3. Be sure the transformer primary taps (T1-H1, H2 and H3) are wired correctly for your input voltage. See Section 1.6 for details.
	4. Defective wiring	4. Check terminals and wiring between T1 and the rectifier bridge assembly, main inductor (L1), dc filtering assembly (if present), dc breaker (CB2), optional dc fuses (F3/F4), and the output terminals (TB1+/-). Repair as needed.
	5. Defective rectifier bridge	5. Use an ac voltmeter to measure the voltage between the SCR gate leads on each SCR module. If you measure about 1.0V rms, but there is no output current, replace the rectifier module(s) (A16) as needed.
	6. Defective Gate Driver PC Board (A15)	6. If you do not measure any ac voltage in Step 5 above, and the battery voltage is less than the Float voltage setting, replace the Gate Driver PC Board (A15).
	7. Defective transformer T1	7. Use an ac voltmeter to measure the ac voltage between the transformer secondary taps (T1-X1, T1-X2 & T1-X3). The line-to-line voltage is normally the same as the rated dc output voltage. If it is too low, check the wiring of the transformer primary taps (T1-H1, T1-H2 & T1-H3). See Section 1.6 for details. If the ac voltage on the transformer secondary taps is **zero**, replace T1.
	8. Defective inductor L1 or L2	8. Disconnect the wiring from inductor (L1) and measure the resistance between the terminals. If it is an open circuit, replace L1. Repeat for inductor (L2) if the optional dc filter is installed.
	9. Defective dc breaker (CB2)	9. Disconnect the battery, and connect a light dc load to the AT30. Measure the dc voltage across TB1(+) and TB1(-), with the dc circuit breaker (CB2) on. If no voltage is measured, replace CB2.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
Front panel is dead, but ac and dc voltages are present at TB1	1. Control boards are not connected	1. Make sure the Gate Driver PC Board (A15) is firmly connected to the Main Control PC Board (A1) via plugs (J17 to P17). Make sure the two signal harness plugs are firmly inserted into the Gate Driver PCB connectors (J25 and J26).
	2. Defective Main Control PC Board (A1)	2. If the **AC ON** indicator is lit, but the rest of the front panel is dead, replace the Main Control PC Board (A1).
	3. Defective wiring	3. Check the two harness wirings to the Gate Driver PC Board (A15) connectors (J25 and J26) for signs of insulation damage, burns, etc. Confirm all wires are securely crimped in the connector.
Front panel dies during ac power failure and dc voltage is present at TB1	1. Defective Power Supply Ballast Resistor (R3)	1. Use a dc voltmeter to measure the voltage from TB1(-) to J1 pin # **8** on the Main Control PC Board (A1). It is normally 12 Vdc when the rated dc output voltage is present at TB1(+/-). If it is not 12 Vdc, remove all power from the AT30, and measure the resistance of R3 from TB1(+) to J1 pin # **8**. See the table in Section 3.6 for the proper resistance value. If the resistance is not within 10% of the table value, replace R3.
	2. Defective wiring	2. Remove the safety shield, and check the wiring to and from TB1 and the Main Control PC Board (A1) for signs of insulation damage or burns. Repair any damaged wiring.
AT30 output voltage too high, or not controllable	1. Defective SCR	1. Disconnect the wire harness plug from connector J26 on the top of the Gate Driver PC Board (A15) and restart the AT30. If you are able to measure output current, one of the SCRs is defective. Replace the rectifier module(s) (A16) as needed.
	2. R4 or R14 is defective, or wrong value	2. See page 61 of Section 3.5. Locate R4 and R14 on the Gate Driver PC Board (A15). Remove one end of each resistor and measure its value with an Ohmmeter. See the table in Section 3.6 for resistance values. If either resistor is not within 1% of the specified value, replace R4 and/or R14 as needed.
	3. Defective temperature compensation probe (optional)	3. Remove one of the probe leads from TB8 and measure its resistance. At 77 °F / 25 °C the resistance should be about 10,000 Ω. If it is not, replace the probe assembly (A10).
	4. Defective Main Control PC Board (A1)	4. If the front panel meter displays more than 110% of rated dc current, the Main Control PC Board (A1) may be defective. Unplug the system harness connectors (J25 & J26) from the Gate Driver PC Board (A15). If the output current drops to zero, replace the Main Control PC Board (A1).

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
Output voltage does not agree with front panel meter	1. Temperature compensation probe is installed	1. If the optional temperature compensation probe is installed, the output voltage may be different from the selected float or equalize voltage. The difference in the voltages depends on the probe temperature. The front panel meter always displays the selected voltage as if the battery were at 77 °F / 25 °C.
	2. Main Control PC Board (A1), or another component may have been replaced	2. Recalibrate the voltmeter accuracy as described in Section 2.3.7.
	3. R4 or R14 is defective, or wrong value	3. See page 61 of Section 3.5. Locate R4 and R14 on the Gate Driver PC Board (A15). Remove one end of each resistor and measure its value with an Ohmmeter. See the table in Section 3.6 for resistance values. If either resistor is not within 1% of the specified value, replace R4 and/or R14 as needed.
	4. Defective Main Control PC Board (A1)	4. Turn off both front panel breakers. If the AT30 does not have breakers (fuses instead), lock out ac and dc power to the AT30 externally. Wait one minute. Return dc power to the AT30 ***first***, followed by ac power. If the AT30 still has the wrong output voltage, replace the Main Control PC Board (A1).
Charger never reaches float (or equalize) voltage (within 1%)	1. Current Limit set too low	1. If the AT30 is not in the **Edit Mode**, press the **EDIT/ENTER** key six (6) times, until the meter display flashes the Current Limit value (in Amperes). If the Current Limit is less than 110%, adjust it to 110% as described. See *Setting the Current Limit value*, Section 2.3.5 for details.
	2. Defective battery or dc load, or load is too great	2. Check each cell of the battery. If one or more cells are shorted, the AT30 may not be able to reach the Float voltage. You may have the same problem if the normal load current is more than the rated output current of the charger.
	3. Wrong ac input voltage, or voltage too low, or T1 wired incorrectly	3. Be sure the main transformer (T1) primary taps are wired correctly for your input voltage. See *Changing Transformer Taps*, Section 1.6. The actual ac input voltage must be at least 88% of the rated value for the AT30 to produce full output power.
	4. Defective rectifier bridge	4. Use a clamp-on ammeter to measure the current in wires # **7**, **8** & **9**, between T1 and the rectifier modules. If it less than 50% of the dc output current, one of the SCRs or diodes is defective. Replace the rectifier module(s) (A16) as needed.
	5. Defective Main Control PC Board (A1)	5. Turn off both front panel breakers. If the AT30 does not have breakers (fuses instead), lock out ac and dc power to the AT30 externally. Wait one minute. Return dc power to the AT30 ***first***, followed by ac power. If the AT30 output current is below the Current Limit value, but it still has the wrong output voltage, replace the Main Control PC Board (A1).

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
Input current too high	1. Wrong ac input voltage, or T1 wired incorrectly	1. Be sure the T1 primary taps are wired correctly for your input voltage. See *Changing Transformer Taps*, Section 1.6. The actual ac input voltage must be at least 88% of the rated value for the AT30 to produce full output power.
	2. Defective rectifier bridge	2. Disconnect the wire harness plug from connector J26 on the top of the Gate Driver PC Board (A15) and restart the AT30. If you are able to measure output current, one of the SCRs is defective. Replace the rectifier module(s) (A16) as needed.
	3. Defective T1	3. Test by disconnecting wires # **7**, **8** & **9** from the transformer secondary taps and wires # **42**, **43**, **44**, **45**, **35** and **36** from the tertiary taps. If ac input current is still too high, replace T1.
Output ripple voltage too high	1. AT30 is unfiltered	1. Verify by checking the data nameplate against the ordering code on page i. Order and install the dc filter option if desired.
	2. Battery is disconnected or defective	2. Be sure battery is connected. Inspect battery according to the manufacturer's instructions.
	3. Battery too small for AT30 rating	3. Check the measured ripple against the specification for your AT30 model on page 64. The ripple rating is for a battery whose Ampere-hours are four (4) times the charger Ampere rating. For a smaller battery, ripple voltage may be higher.
	4. Defective filter capacitors C1 and/or C2	4. Test with capacitance meter and replace as needed.
AT30 very noisy	1. Loose hardware or enclosure panel	1. Check and tighten all component mounting hardware and panel hardware.
	2. Defective rectifier bridge	2. Use a clamp-on ammeter to measure the current in wires # **7**, **8** & **9**, between T1 and the rectifier modules. If it less than 50% of the dc output current, one of the SCRs or diodes is defective. Replace the rectifier module(s) (A16) as needed.
Meter readings are erratic	1. Defective or disconnected battery	1. Turn off the AT30. With a light dc load connected to the battery, be sure each cell reads the nominal cell voltage (2.0V for lead-acid / 1.25V for Ni-Cd). Restart the AT30. Each cell should now read approximately the nominal Float voltage (2.2V for lead-acid / 1.35V for Ni-Cd).
	2. Defective scaling resistor R4 or R14	2. See page 61 of Section 3.5. Locate R4 and R14 on the Gate Driver PC Board (A15). Remove one end of each resistor and measure its value with an Ohmmeter. See the table in Section 3.6 for resistance values. If either resistor is not within 1% of the specified value, replace R4 and/or R14 as needed.
	3. Defective Main Control PC Board (A1)	3. If the output voltage is constant, but the front panel meter is erratic, replace the Main Control PC Board (A1).

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
Lamp test key does not work, or some lamps do not light	1. No Vac	1. The lamp test key does not work during an ac power failure.
	2. Main Control PC Board (A1) is not secured to front panel	2. Open the front panel, and make sure that the Main Control PC Board (A1) is securely mounted on the standoffs on the back of the panel. All indicators should extend about 0.125in / 3.18mm through the front of the panel.
	3. Defective Main Control PC Board (A1)	3. When you press the **LAMP TEST** key, if some but not all indicators light, or the digital meter does not display "***8888***", replace the Main Control PC Board (A1).
One or more front panel keys do not work	1. Front panel is locked	1. Open the front panel, and be sure that jumper (J9) on the Main Control PC Board (A1) is in the **ENABLE** position.
	2. Main Ctrl PCB is not secured to front panel	2. Open the front panel, and be sure that the Main Control PC Board (A1) is firmly seated on the standoffs on the back of the panel. Front panel keys must operate freely.
	3. Defective Main Control PC Board (A1)	3. Turn off both front panel breakers. If the AT30 does not have breakers (fuses instead), lock out ac and dc power to the AT30 externally. Wait one minute. Return dc power to the AT30 ***first***, followed by ac power. If some of the front panel keys still do not work, replace the Main Control PC Board (A1).
Two AT30.s connected in parallel, but only one has output current	1. If the forced load sharing option is not supplied, check for normal operation of both chargers	1. Multiple AT30s are not designed to share load current, without the optional forced load sharing kit (EJ5126-##) installed. When two or more AT30s are connected in parallel without this option, it is normal for one of the units to have no output current. You can check the operation of the "off" charger by increasing its Float voltage until it starts to deliver output current. When you have finished the test, be sure both AT30s are set to the same Float and Equalize voltages.
	2. EJ5126-## option	2. See Appendix F on page 92 for troubleshooting of Forced Load Sharing feature.
HIGH DC VOLTAGE indicator is on	1. HVDC alarm and Equalize voltage settings are mismatched	1. Be sure that the High DC Voltage alarm setting is higher than the Equalize voltage setting. See Sections 2.3.2 and 2.3.4.
	2. Defective rectifier bridge	2. Disconnect the wire harness plug from connector J26 on the top of the Gate Driver PC Board (A15) and restart the AT30. If you are able to measure output current, one of the SCRs is defective. Replace the rectifier module(s) (A16) as needed.
	3. Defective Main Control PC Board (A1)	3. Turn off both front panel breakers. If the AT30 does not have breakers (fuses instead), lock out ac and dc power to the AT30 externally. Wait one minute. Return dc power to the AT30 ***first***, followed by ac power. If the AT30 output voltage is normal, but the **HIGH DC VOLTAGE** indicator is still on, replace the Main Control PC Board (A1).
No alarm, but output voltage is above High DC Voltage setting	1. Output current is below 2%	1. Output current must be greater than 2% of rated current to produce a High DC Voltage alarm. See *Parallel Operation* portion in Section 2.3.6.
	2. Defective Main Control PC Board (A1)	2. Turn off both front panel breakers. If the AT30 does not have breakers (fuses instead), lock out ac and dc power to the AT30 externally. Wait one minute. Return dc power to the AT30 ***first***, followed by ac power. If the AT30 output voltage is above the alarm setting, but the **HIGH DC VOLTAGE** indicator still does not light, replace the Main Control PC Board (A1).

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
LOW DC VOLTAGE indicator is on, but ac & dc breakers are closed ac input voltage is normal, but there is output current	1. Battery is discharged	1. After an ac power failure, or a battery discharge for any other reason, it may take several hours to recharge the battery. It is normal for the **LOW DC VOLTAGE** indicator to be on until the battery voltage is above the Low DC Alarm voltage.
	2. Low DC Voltage alarm and Float voltage settings are mismatched	2. Be sure that the Low DC Voltage alarm setting is lower than the Float voltage setting. See Sections 2.3.2 and 2.3.4.
	3. Defective rectifier bridge	3. Use a clamp-on ammeter to measure the current in wires # **7**, **8** & **9**, between T1 and the rectifier modules. If it less than 50% of the dc output current, one of the SCRs or diodes is defective. Replace the rectifier module(s) (A16) as needed.
	4. Defective Main Control PC Board (A1)	4. Turn off both front panel breakers. If the AT30 does not have breakers (fuses instead), lock out ac and dc power to the AT30 externally. Wait one minute. Return dc power to the AT30 ***first***, followed by ac power. If the AT30 output voltage is normal, but the **LOW DC VOLTAGE** indicator is still on, replace the Main Control PC Board (A1).
	5. Defective dc circuit breaker CB2	5. Disconnect the battery, and connect a light dc load to the AT30. Measure the dc voltage across TB1(+) and TB1(-), with the breaker on. If no voltage is measured, replace the dc circuit breaker (CB2).
DC OUTPUT FAILURE indicator is on, but ac input voltage is normal, and ac & dc breakers are closed	1. Defective rectifier bridge	1. Use a clamp-on ammeter to measure the current in wire #**7**, #**8** and #**9**, between T1 and the rectifier module(s). If it less than 50% of the dc output current, one of the SCRs or diodes is defective. Replace the rectifier module.
	2. Defective Main Control PC Board (A1)	2. Turn off both front panel breakers. If the AT30 does not have breakers (fuses instead), lock out ac and dc power to the AT30 externally. Wait one minute. Return dc power to the AT30 ***first***, followed by ac power. If the AT30 output voltage and current are normal, but the **DC OUTPUT FAILURE** indicator is still on, replace the Main Control PC Board (A1).
	3. Defective transformer T1	3. Use an ac voltmeter to measure the ac voltage between the transformer secondary taps (T1-X1, T1-X2 & T1-X3). The line-to-line voltage is normally the same as the rated dc output voltage. If it is too low, check the wiring of the transformer primary taps (T1-H1, T1-H2 & T1-H3). See Section 1.6 for details. If the ac voltage on the transformer secondary taps is **zero**, replace T1.
	4. Defective dc circuit breaker CB2	4. Disconnect the battery, and connect a light dc load to the AT30. Measure the dc voltage across TB1(+) and TB1(-), with the breaker on. If no voltage is measured, replace the dc circuit breaker (CB2).

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
AC INPUT FAILURE indicator is on	1. AC power failure	1. If the ac input power fails, the front panel **AC ON** indicator goes out, and the **AC INPUT FAILURE** indicator goes on.
	2. Upstream feed breaker/fuse is tripped	2. Be sure the front panel ac circuit breaker (CB1) is closed. Measure the ac voltage at the AT30 input terminals (TB1-L1, TB1-L2 and TB1-L3). If it is zero, check the upstream distribution breakers and fuses.
	3. Defective wiring	3. Measure ac voltage at the transformer primary taps (T1-H1, T1-H2 & T1-H3). It should be the same as the ac supply voltage.
	4. Defective Main Control PC Board (A1)	4. Turn off both front panel breakers. If the AT30 does not have breakers (fuses instead), lock out ac and dc power to the AT30 externally. Wait one minute. Return dc power to the AT30 ***first***, followed by ac power. If the **AC ON** and **AC INPUT FAILURE** indicators are ***both*** still on, replace the Main Control PC Board (A1).
POS GND or **NEG GND** indicator is on	1. Ground fault on external dc bus	1. Shut down and disconnect the AT30 from the battery and dc bus. Check the battery and dc bus for a ground fault. See ***Application Note*** (JD5032-00) for assistance.
	2. DC circuit breaker is open and **POS GND** indicator is on	2. If the AT30 has been placed into "standby" by opening the dc breaker (CB2), the ground detection circuit supplies an erroneous alarm. This is considered an ***abnormal*** condition for the AT30, and is not recommended. Close the dc breaker and the alarm should end. To place the AT30 in "standby", open ***both*** front panel circuit breakers (CB1/CB2).
	3. Alarm needs calibration	3. Calibrate the AT30 ground detection sensitivity. See Section 2.3.4.
	4. Defective wiring	4. Turn off both front panel breakers. If the AT30 does not have breakers (fuses instead), lock out ac and dc power to the AT30 externally. Wait one minute. Return dc power to the AT30 ***first***, followed by ac power. Measure the voltage from TB1(+) to chassis, and from TB1(-) to chassis. The voltage readings should be equal, each approximately half of the total output voltage. If there is more than a 10% imbalance, turn the AT30 off and inspect all wiring from TB1 to the dc circuit breaker (CB2), and the rectifier bridge to the dc filter inductor (L1). Look for evidence of insulation damage, insufficient spacing between terminals and chassis, or wires run too close to metal edges.
	5. Defective Main Control PC Board (A1)	5. Turn off both front panel breakers. If the AT30 does not have breakers (fuses instead), lock out ac and dc power to the AT30 externally. Wait one minute. Return dc power to the AT30 ***first***, followed by ac power. If you are sure there is no ground fault on the external bus or within the AT30, but the **POS GND** or **NEG GND** indicator is still on, replace the Main Control PC Board (A1).
	6. Paralleled AT30s are shut down	6. Restart all other AT30s connected in parallel with unit that is experiencing ground fault. Otherwise, disconnect and lock out from the dc bus all shut down AT30s.
Summary alarm relay is in alarm mode, but no front panel alarm indicator is on	1. Defective Main Control PC Board (A1)	1. Turn off both front panel breakers. If the AT30 does not have breakers (fuses instead), lock out ac and dc power to the AT30 externally. Wait one minute. Return dc power to the AT30 ***first***, followed by ac power. If the relay remains in alarm mode, check the Low Level Detect indicator on Main Control PC Board (A1). See Section 2.3.8. If no other alarm is on, replace the Main Control PC Board (A1).

3.5. REPLACING DEFECTIVE COMPONENTS

⚠ WARNING

High voltages appear at several points inside the AT30. Use extreme caution when working inside the enclosure. Do not attempt to work inside the AT30 unless you are a qualified technician or electrician.

Disconnect and lock out all power from the AT30 before starting to remove or replace any components. Turn the ac power off at the distribution panel upstream from the charger. Disconnect the battery from the AT30 output terminals TB1(+/-).

NOTICE

While performing the following procedures, refer to the standard drawings in Appendix C for information on identifying internal components.

Removing the safety shield (if present)

AT30 Style-5018 and Style-5030 enclosures feature a Plexiglas safety shield as a second protective barrier between the user and the internal components. Some repair procedures requires removal of the shield to that covers the internal components mounted inside the enclosure.

Detach the shield by removing the side fasteners from the front lip of the enclosure. Do not lay the shield on top of the AT30, since the top vents are required for cooling. Always re-install the Plexiglas safety shield before restarting the AT30.

⚠ CAUTION

Hazardous ac and dc voltages are present inside the AT30, on the I/O panel (TB1) terminals and certain internal components.

Replacing the Main Control (A1) and/or Gate Driver (A15) PC Boards

For details of this procedure, refer to ***Service Instruction*** (JD5012-00).

NOTICE

Printed circuit boards are sensitive to damage from static discharges. Leave replacement 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.

Turn off and remove all power to the AT30. Disconnect the battery from the dc output terminals. Remove any optional user wiring from the various Main Control PC Board (A1) terminals (e.g. TB3, TB8/J6, J3, etc.).

Note that A1 and A15 are mounted together as a pair. Remove the signal wire harness plugs (J25/J26) from the top and left edges of A15. The boards are mounted on ten (10) plastic standoffs. Compress the tab on each standoff, and pull the boards toward you until they clear all the standoffs. If you are replacing only one board, carefully separate the existing boards (A1 & A15) and reconnect the replacement board.

Insert the replacement board(s) onto the instrument panel with the same orientation, and push them onto the standoffs. Make sure the board is fully seated on all ten (10) standoffs. Reconnect the signal wire harness plugs (J25/J26) to the Gate Driver PC Board (A15), matching the orientation when removed. Replace any user wiring to the various Main Control PC Board (A1) terminals (e.g. TB3, TB8/J6, J3, etc.).

See Section 2.1 for the steps to restart the AT30. If your parameters (float voltage, etc.) are different from the factory preset values, you should program in the new values now. See Section 2.3. You should also recalibrate the dc voltmeter according to Section 2.3.7.

Replacing the ac input or dc output circuit breaker (CB1/CB2)

Turn off and remove all power to the AT30. Remove the Plexiglas safety shield. Disconnect the battery from the dc output terminals TB1(+/-). This includes remote sense wires if they were installed. Check with a voltmeter before proceeding.

Remove the mounting screws from the circuit breaker on the mounting bracket, and carefully remove the breaker from the AT30. Remove the wires from the terminals, one at a time, and transfer the wires to the terminals of the replacement breaker. ***Be sure the terminal fasteners are tight.*** Install the replacement breaker into the bracket, reversing the procedure above, using the original mounting screws.

Replacing the ac surge suppressors (VR2, VR4 or VR5)

Turn off and remove all power to the AT30. Remove the Plexiglas safety shield. Disconnect the battery from the dc output terminals TB1(+/-).

For VR2 (connected to L1), VR4 (connected to L2) or VR5 (connected to L3), remove the hardware from the input terminal L*x*, and remove the lugged lead of the ac surge suppressor. Install one lead of the replacement surge suppressor onto the L*x* terminal. Replace the other wires and the L*x* terminal hardware. Repeat procedure for the I/O ground stud. Tighten all hardware.

NOTICE *The ac surge suppressors are not polarized.*

Replacing the dc surge suppressor (VR1)

Turn off and remove all power to the AT30. Remove the Plexiglas safety shield. Disconnect the battery from the dc output terminals TB1(+/-).

Remove the hardware from the output terminal TB1(+), and remove the lead of the dc surge suppressor. Install one lead of the replacement surge suppressor. Replace the other wires and the hardware. Repeat for the output terminal TB1(-). Tighten all hardware.

NOTICE *The dc surge suppressor is not polarized.*

Replacing the dc EMI filter networks (VR6/C4, VR7/C5)

Replace these networks as assemblies. Do not replace individual parts.

Turn off and remove all power to the AT30. Remove the Plexiglas safety shield. Disconnect the battery from the dc output terminals TB1(+/-).

To replace the network VR6/C4, remove the hardware from the output terminal TB1(-), and remove the lead of the network. Cut the plastic wire ties holding the assembly tight against the I/O panel. Install one lead of the replacement network. Replace the other wires and the hardware. Repeat for the other lead of the network on the I/O ground stud. For the network VR7/C5, use the above procedure, but start with the lead on TB1(+). Tighten all hardware. Replace cut wire ties if possible.

NOTICE *The dc EMI filter networks are not polarized.*

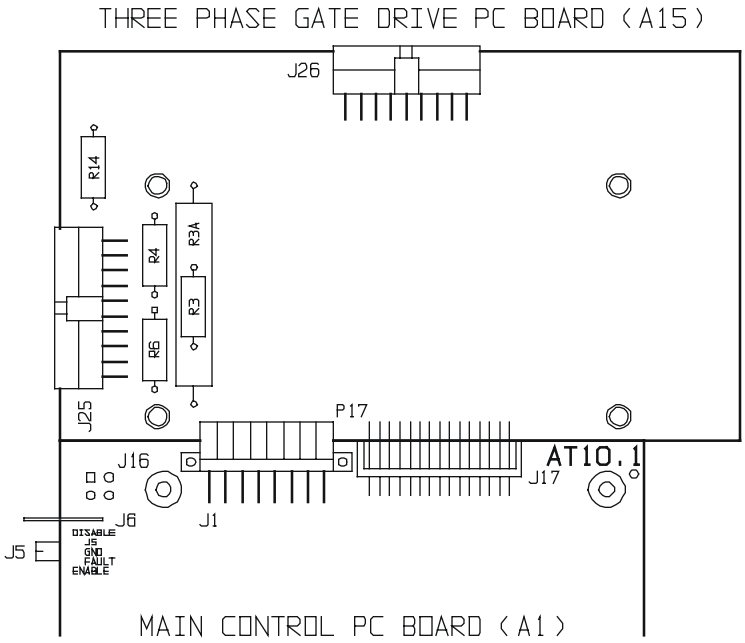
Replacing the power (ballast) resistor (R3) - 48 and 130 Vdc units only

For 48 Vdc and 130 Vdc AT30s, R3 is mounted with metal brackets onto the back panel of the enclosure. Cut wires # **49** and # **51** connected to R3 as close to the resistor leads as possible. Strip off 0.25in / 6.4mm of insulation from the cut ends of the wires. Unscrew the top mounting bracket and remove the existing resistor. Mount the new R3 and replace the top mounting bracket. Polarity is not vital. Carefully re-solder the cut wires to R3, remount the resistor and top bracket.

For further information, refer to ***Service Instruction*** (JD5010-00).

Replacing resistors (R3, R4, R6 & R14) on the Gate Driver PCB (A15)

In all AT30s, resistors R4, R6 and R14 are soldered directly onto the Gate Driver PC Board (A15). For 12 Vdc and 24 Vdc AT30s, R3 is also soldered directly onto A15. For proper location see the figure below.



If any of these resistors need to be replaced we suggest you order a new Gate Driver PC Board (A15). See *Replacing the Main Control PC Board (A1) and/or Gate Driver PC Board (A15)* on page 59.

If any of these resistors *must* be replaced without replacing A15, select the proper part number listed in the table starting on page 62 and order it from the factory or your sales representative.

Remove A15 as described on page 59. Using wire cutters, clip the soldered leads of the old resistor and remove it from A15. Carefully solder on the new resistor, making sure not to damage any other components on A15. Polarity is not vital for these resistors. Once the solder cools, replace A15 as described on page 59.

3.6. ORDERING REPLACEMENT PARTS

All AT30 Series battery chargers ship with a supplemental **Parts Data Package** report, itemizing all components within the unit. Contact your sales representative to place an order for spare or replacement parts.

Please provide the following information for each component:

- Model number and serial number of your AT30 Series battery charger
- Reference Designator, factory part number and description
- Quantity required

NOTICE

*Some of the factory part numbers listed on the **Parts Data Package** report may differ from the standard replacement part numbers listed in this manual. Custom parts may have replaced standard parts to satisfy your specification. In that case, you should order the part number(s) listed on the report.*

*The following table may specify part replacement **kits** that include other materials, such as installation instructions and packaging materials. You may order spare parts using either the report part number or listed kit. The factory may make necessary adjustments to your order to ensure proper delivery of a complete kit.*

Refer to the table below for the most common items.

Table 3-1: REPLACEMENT PARTS

Reference Designator	Description	Factory Part Number				Rec. Spare
		12 Vdc	24 Vdc	48 Vdc	130 Vdc	
A1	Main Control PC Board (EN5002-00)	EJ1243-10				Y
A5	Auxiliary Relay PC Board (EN0027-00)	EJ1243-03				Y
A10	Temperature Compensation Probe assembly	See Appendix B, Table 2				
A15	Gate Driver PC Board (EN5008-0#)	EJ5199-01	EJ5199-02	EJ5199-03	EJ5199-04	Y
A16	SCR Rectifier Module(s) - (Q1-Q6)	*see supplied Parts Data Package*				Y
A17x	SCR Snubber PC Board (EN5012-00)	EJ5200-00				
C1	Filter Capacitor (standard)	*see supplied Parts Data Package*				Y
C2	Filter Capacitor (battery eliminator)	*see supplied Parts Data Package*				Y
C4	EMI Filter Capacitor	see VR6/C4				
C5	EMI Filter Capacitor	see VR7/C5				
CB1	AC Input Circuit Breaker	*see supplied Parts Data Package*				
CB2	DC Output Circuit Breaker	*see supplied Parts Data Package*				
CR1	Polarity Diode (25-50 Adc ratings)	RK0013-14				Y
CR1	Polarity Diode (75 Adc rating)	RK0014-14				Y
CR1	Polarity Diode (100-400 Adc ratings)	RK0017-14				Y
CR1	Polarity Diode (500-600 Adc ratings)	RK0028-12				Y
CR1	Polarity Diode (800-1K0 Adc ratings)	PM0003-00				Y
CR4	Free-Wheeling Diode (25-50 Adc ratings)	RK0013-14				Y
CR4	Free-Wheeling Diode (75 Adc rating)	RK0014-14				Y
CR4	Free-Wheeling Diode (100-400 Adc ratings)	RK0017-14				Y
CR4	Free-Wheeling Diode (500-600 Adc ratings)	RK0028-12				Y
CR4	Free-Wheeling Diode (800-1K0 Adc ratings)	PM0003-00				Y

Reference Designator	Description	Factory Part Number				Rec. Spare
		12 Vdc	24 Vdc	48 Vdc	130 Vdc	
F1A/B/C	AC Input Fuses	*see supplied Parts Data Package*				Y
F3/F4	DC Output Fuses	*see supplied Parts Data Package*				Y
L1	Main Inductor	*see supplied Parts Data Package*				
L2	Optional Filter Inductor	*see supplied Parts Data Package*				
P5	Jumper for disabling Ground Detection circuit	RC0100-00				
P7	Jumper for voltage selection on A5 pc board	RC0100-00				
P9	Jumper for front panel lockout feature on A1	RC0100-00				
R1	Main DC Shunt (25 Adc)	RB0008-13				
R1	Main DC Shunt (30-100 Adc)	RB0008-03				
R1	Main DC Shunt (125-400 Adc)	RB0008-10				
R1	Main DC Shunt (500-800 Adc)	RB0008-18				
R1	Main DC Shunt (1000 Adc)	RB0008-19				
R2	Current Rating Resistor	*see supplied Parts Data Package*				
R3	Power Supply (Ballast) Resistor	RJ0007-26 12 Ω 2W	RJ0035-25 68 Ω 11W	EJ1127-12 150 Ω 50W	EJ1127-13 500 Ω 100W	
R4	Positive External Scaling Resistor	RJ0056-48 3160 Ω	RJ0056-81 6980 Ω	RJ0075-14 14.0 kΩ	RJ0075-56 38.3 kΩ	
R6	Voltage (Crowbar) Resistor	RJ0063-76	RJ0064-11	RJ0064-41	RJ0064-80	
R9	Filter Capacitor (C1) Bleed Resistor	RJ0028-25	RJ0028-25	RJ0028-27	RJ0036-40	
R14	Negative External Scaling Resistor	RJ0074-48 3160 Ω	RJ0074-81 6980 Ω	RJ0075-14 14.0 kΩ	RJ0075-56 38.3 kΩ	
T1	Main Power Isolation Transformer	*see supplied Parts Data Package*				
TB1-X	Style-5018 input/output/ground terminal CU-AL compression lug for #14 - 1/0 AWG	RC0056-18				
TB1-AC	Style-5030 input/ground terminal CU-AL compression lug for #14 - 1/0 AWG	RC0056-18				
TB1-DC	Style-5030 output terminal CU-AL comp lug for #6 AWG - 350 MCM	RC0056-03				
TB1-X	Style-163 input/output/ground terminal CU-AL comp lug for #6 AWG - 350 MCM	RC0056-03				
VR1	Output Surge Suppressor (Style-5018)	EJ1132-11				Y
VR1	Output Surge Suppressor (Style-5030)	EJ1132-21				Y
VR1	Output Surge Suppressor (Style-163)	EJ1132-31				Y
VR2/4/5	208/240 Vac Input Surge Suppressor (St-5018)	EJ1132-11				Y
VR2/4/5	208/240 Vac Input Surge Suppressor (St-5030)	EJ1132-21				Y
VR2/4/5	208/240 Vac Input Surge Suppressor (St-163)	EJ1132-31				Y
VR2/4/5	480 Vac Input Surge Suppressor (Style-5018)	EJ1132-12				Y
VR2/4/5	480 Vac Input Surge Suppressor (Style-5030)	EJ1132-22				Y
VR2/4/5	480 Vac Input Surge Suppressor (Style-163)	EJ1132-32				Y
VR3	AC Input Lightning Arrestor	EJ1074-02				
VR6/C4	EMI Output Filter Network (Style-5018)	EJ5021-03				Y
VR6/C4	EMI Output Filter Network (Style-5030)	EJ5021-04				Y
VR7/C5	EMI Output Filter Network (Style-163)	EJ5021-05				Y

Note 1: In older 130 Vdc units, the 500 Ω 50W power supply resistor (R3) mounted to the galvanized base may be comprised of an assembly of two (2) 250 Ω resistors connected in series.

Note 2: Listed part numbers subject to change without notice. Refer to data listed in AT30 Parts Data Package report.

APPENDIX A

SPECIFICATIONS

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

Specification	Conditions	12 Vdc	24 Vdc	48 Vdc	130 Vdc
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	20-100% load change, with battery connected	Output voltage change ± 4% maximum Recovery to ± 2.0% in 200 ms Recovery to ± 0.5% in 500 ms			
Efficiency	All ratings	82-90%			

Output ripple voltage (per **NEMA PE5-1996**)	Unfiltered (with battery)	1% rms (typ.)	2% rms
		at battery terminals	
	Filtered (with battery)	30 mV rms (max.)	100 mV
		at battery terminals	
	Filtered (without battery)	1% rms (typ.)	2% rms
	Battery Eliminator Filter Option (without battery)	30 mV rms	100 mV

Current Limit	adjustable	50-110 % of rated output current
Soft start	0 to 100% load	4 seconds

Voltage adjustment ranges	Float	11.0-14.5	22.0-29.5	44.0-58.0	110-141
	Equalize	11.7-16.0	23.4-32.0	46.8-61.0	117-149
	High DC Voltage alarm	12-19	24-38	48-76	120-175
	Low DC Voltage alarm	7-14.5	15-29.5	30-58	80-141
Voltmeter range (Vdc)		0 - 21	0 - 42	0 - 75	0 - 195
Ammeter range (Adc)	25 Adc nom. output	0 - 30			
	30-100 Adc nom. output	0 - 150			
	125-400 Adc nom. output	0 - 500			
	500-800 Adc nom. output	0 - 1000			
	1,000 Adc nom. output	0 - 1,200			

Surge withstand capability	test per **ANSI C37.90.1-1989**	no erroneous outputs
Reverse current from battery	ac input power failure, no options installed	90 mA maximum
Audible noise	average for four (4) sides, 5ft / 1.5m from enclosure	less than 65 dBA
Cooling		natural convection
Ambient temperature	operating	0 to 122 °F / -18 to 50 °C
Elevation		3,000ft / 1,000m without derating
Relative humidity		0 to 95% non-condensing

Alarm relay contact rating	120 Vac / 125 Vdc	0.5A resistive

FIELD INSTALLABLE ACCESSORIES AND OPTIONS

All options and accessories listed below are available in kits for field installation. Kits contain all parts and hardware with detailed installation instructions. To order accessories/options, please provide the following information for each kit:

- Model number, enclosure style, and serial number of your AT30
- Factory part number and description, from the table below
- Quantity required

Contact your sales representative to place an order for options & accessories.

Description	Kit Part Number
standard DC Output Filtering (per NEMA PE5-1996)	*contact sales representative*
Battery Eliminator Filtering (per NEMA PE5-1996)	*contact sales representative*
Auxiliary Alarm Relay PC Board (A5) option	EI0213-02, -03, -04
Copper Ground Bus with one (1) CU-AL compression box lug	EI0195-02, - 03, -03
AC Input Lightning Arrestor (VR3) option	EJ1074-02
Wall-Mounting Kit for Style-5018 Enclosure	EI5008-00
Relay Rack-Mtg. Kit for Style-5018 Enclosure (23-24in/584-610mm)	EI0193-03
NEMA Type 2 Drip Shield for Style-5018, -5030, -163 Enclosure	EI0191-02, - 03, -04
Cabinet Heater Strips for Style-5018 Enclosure	EJ5042-00
Cabinet Heater Strips for Style-5030 Enclosure	EJ5166-00
Cabinet Heater Strips for Style-163 Enclosure	EJ5183-00
Padlock for Style-5018, -5030, -163 Enclosure Front Panel Door	EI0215-01, - 01, -02
Remote Temperature Compensation Probe Assembly (EJ5033-##)	*see table below*
DNP3 Level 2 / Modbus Communications Module	*see Appendix E*
Forced Load Sharing Accessory	EJ5126-##

Remote Temperature Compensation Probe

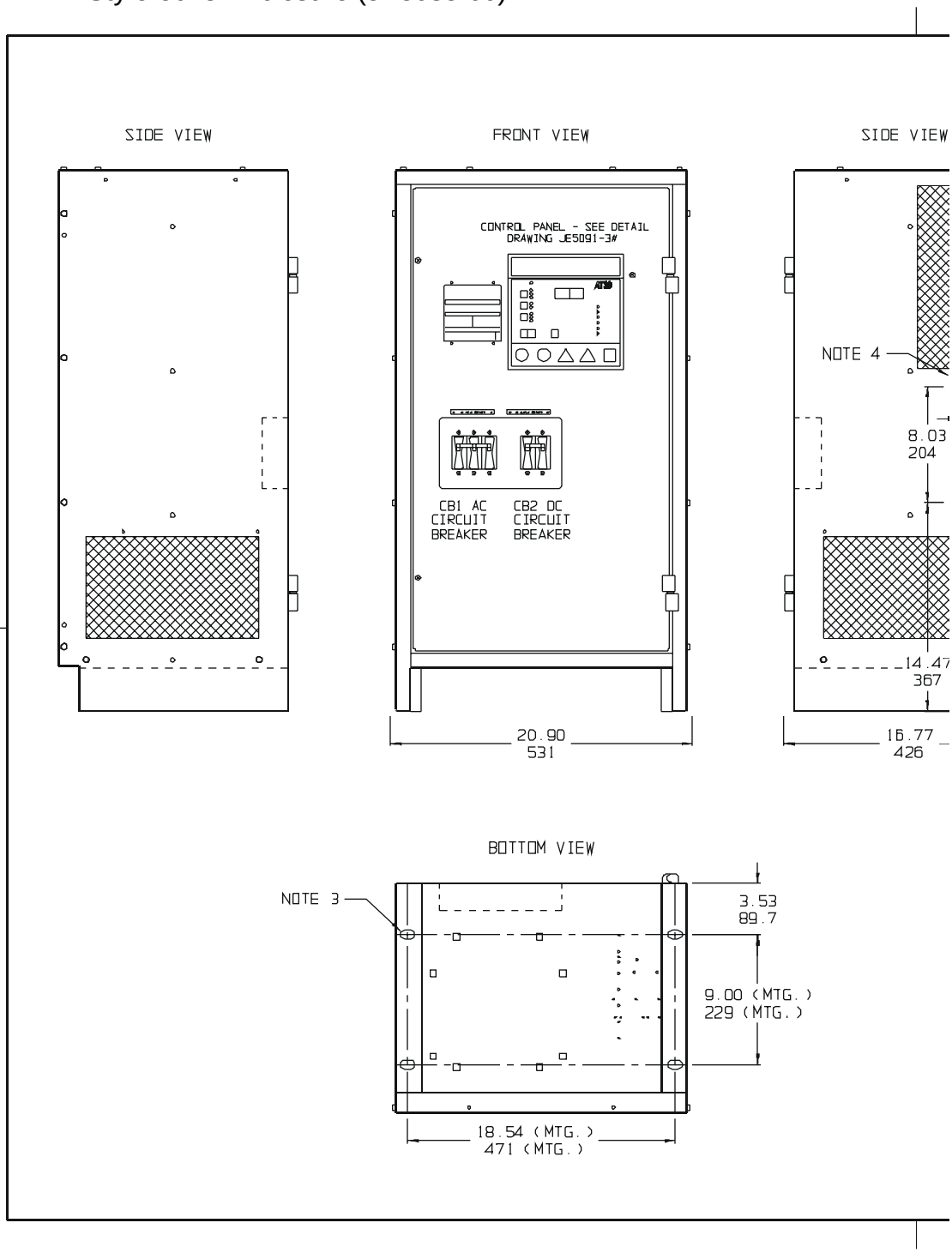
Full Option Part Number (includes cable & probe)	Cable Length	Replacement Cable Part Number
EJ5033-00	25ft / 7.6m	EJ5011-00
EJ5033-01	50ft / 15.2m	EJ5011-01
EJ5033-02	100ft / 30.5m	EJ5011-02
EJ5033-03	200ft / 61.0m	EJ5011-03

The remote battery temperature compensation option is supplied as a bagged kit, consisting of a single probe and user-specified cable. Also supplied are ***Installation Instructions*** for the option and a special ***Application Note***, see Section 1.11.

1. Use a single cable assembly. Do not try to splice cables together to increase the length. If you need a longer cable, order a replacement from the table above.
2. To order a replacement probe (or puck), request part number EJ5032-00. This probe (A10) is good for all AT30 output voltages and all battery types.

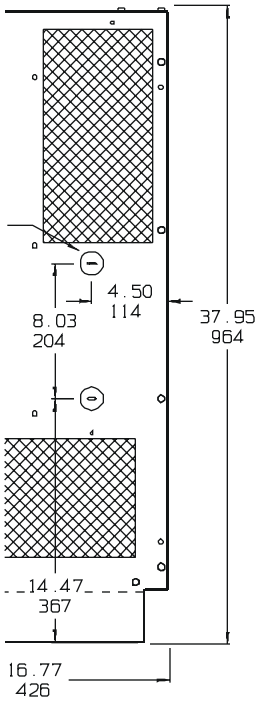
APPENDIX C (Standard Drawings)

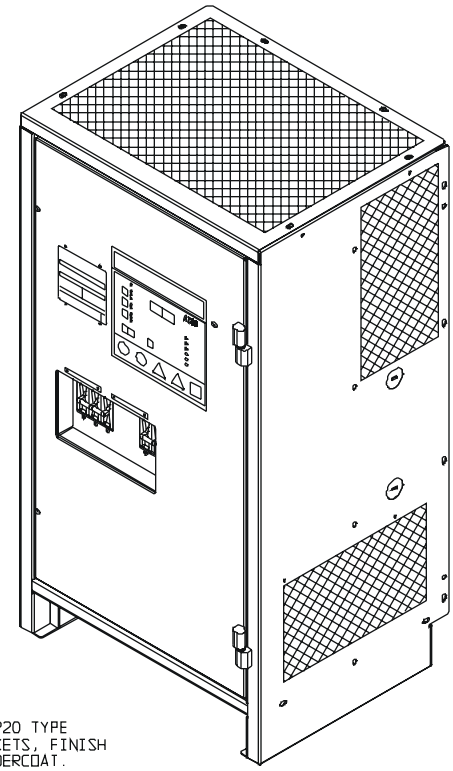
Outline: AT30 Battery Charger
NEMA-1 Style-5018 Enclosure (**JE5085-00**)



Outline: AT30 Battery Charger
NEMA-1 Style-5018 Enclosure (**JE5085-00**)

]E VIEW





NOTES:

1) ENCLOSURE IS A NEMA-1 / IP20 TYPE STEEL CABINET WITHOUT GASKETS, FINISH IS ANSI-61 GRAY EPOXY POWDERCOAT.

2) ALLOW 12in / 305mm OF FREE AIR ON TOP, SIDES, AND FRONT OF CABINET FOR VENTILATION.

3) FOUR (4) 1in x 0.625in / 25mm x 16mm FLOOR-MOUNTING SLOTS ARE PROVIDED ON BOTTOM OF ENCLOSURE AS SHOWN.

4) TWO (2) 1.31in / 33mm DIA STANDARD PRE-FAB KEY-SLOT KNOCKOUTS ARE PROVIDED AS SHOWN FOR 1in / 25mm CONDUIT ENTRY. IF ADDITIONAL CONDUIT ENTRANCES ARE REQUIRED, ENCLOSURE SHOULD BE FIELD-MODIFIED BY INSTALLER.

5) BATTERY CHARGER SHIPPING WEIGHT: (SEE PRODUCT LITERATURE)

DUAL DIMENSIONS in / mm

REV	ECN No	DATE
1	23261	071412
0	20343	092506

THIRD ANGLE PROJECTION

DRAWN BY MCR 092506

ELECTRONIC APPROVAL SIGNATURES MAINTAINED BY MFG ECN LOG

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

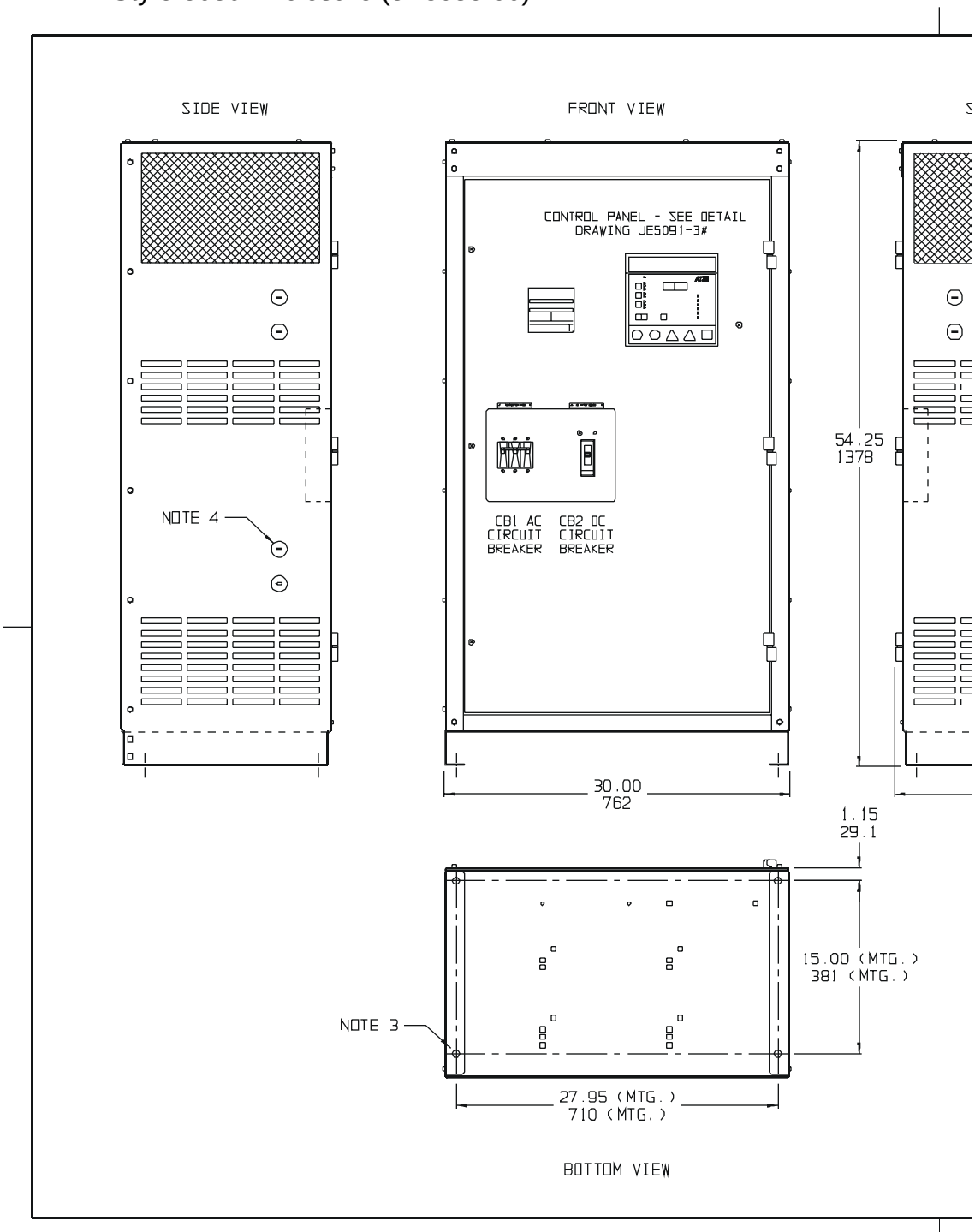
TITLE AT30 SERIES BATTERY CHARGER OUTLINE: NEMA-1 STYLE-5018 ENCLOSURE

DRAWING No JE5085-00 REV 1 B

SCALE NTS PART No JE5085-00 SHEET 1 OF 1

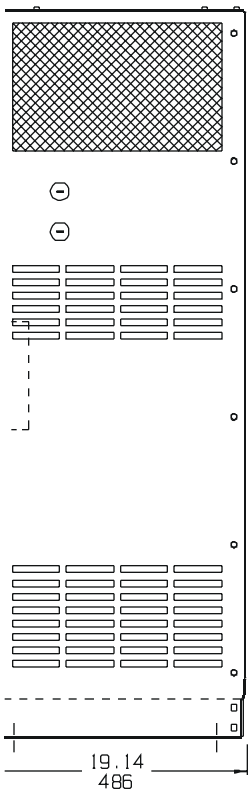
http://www.ATSeries.net/PDFs/JE5085-00.pdf

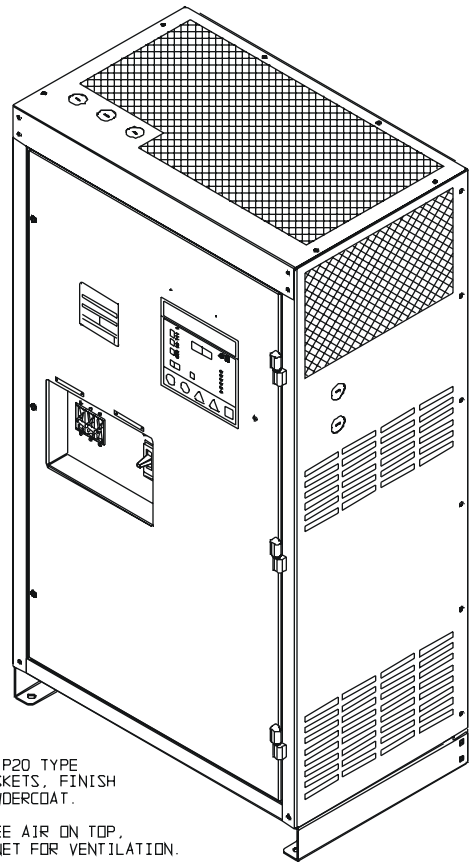
Outline: AT30 Battery Charger
NEMA-1 Style-5030 Enclosure (**JE5086-00**)



Outline: AT30 Battery Charger
NEMA-1 Style-5030 Enclosure (**JE5086-00**)

SIDE VIEW





NOTES:

1) ENCLOSURE IS A NEMA-1 / IP20 TYPE STEEL CABINET WITHOUT GASKETS, FINISH IS ANSI-61 GRAY EPOXY POWDERCOAT.

2) ALLOW 12in / 305mm OF FREE AIR ON TOP, SIDES, AND FRONT OF CABINET FOR VENTILATION.

3) FOUR (4) 0.625in / 16mm FLOOR-MOUNTING HOLES ARE PROVIDED ON BOTTOM OF ENCLOSURE AS SHOWN.

4) NINE (9) 1.31in / 33mm DIA STANDARD PRE-FAB KEY-SLOT KNOCKOUTS ARE PROVIDED AS SHOWN FOR 1in / 25mm CONDUIT ENTRY. IF ADDITIONAL CONDUIT ENTRANCES ARE REQUIRED, ENCLOSURE SHOULD BE FIELD-MODIFIED BY INSTALLER.

5) BATTERY CHARGER SHIPPING WEIGHT: (SEE PRODUCT LITERATURE)

DUAL DIMENSIONS in / mm

REV	ECN No	DATE
1	23261	071412
0	20343	092506

THIRD ANGLE PROJECTION

DRAWN BY MCR 092506

ELECTRONIC APPROVAL SIGNATURES MAINTAINED BY MFG ECN LOG

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

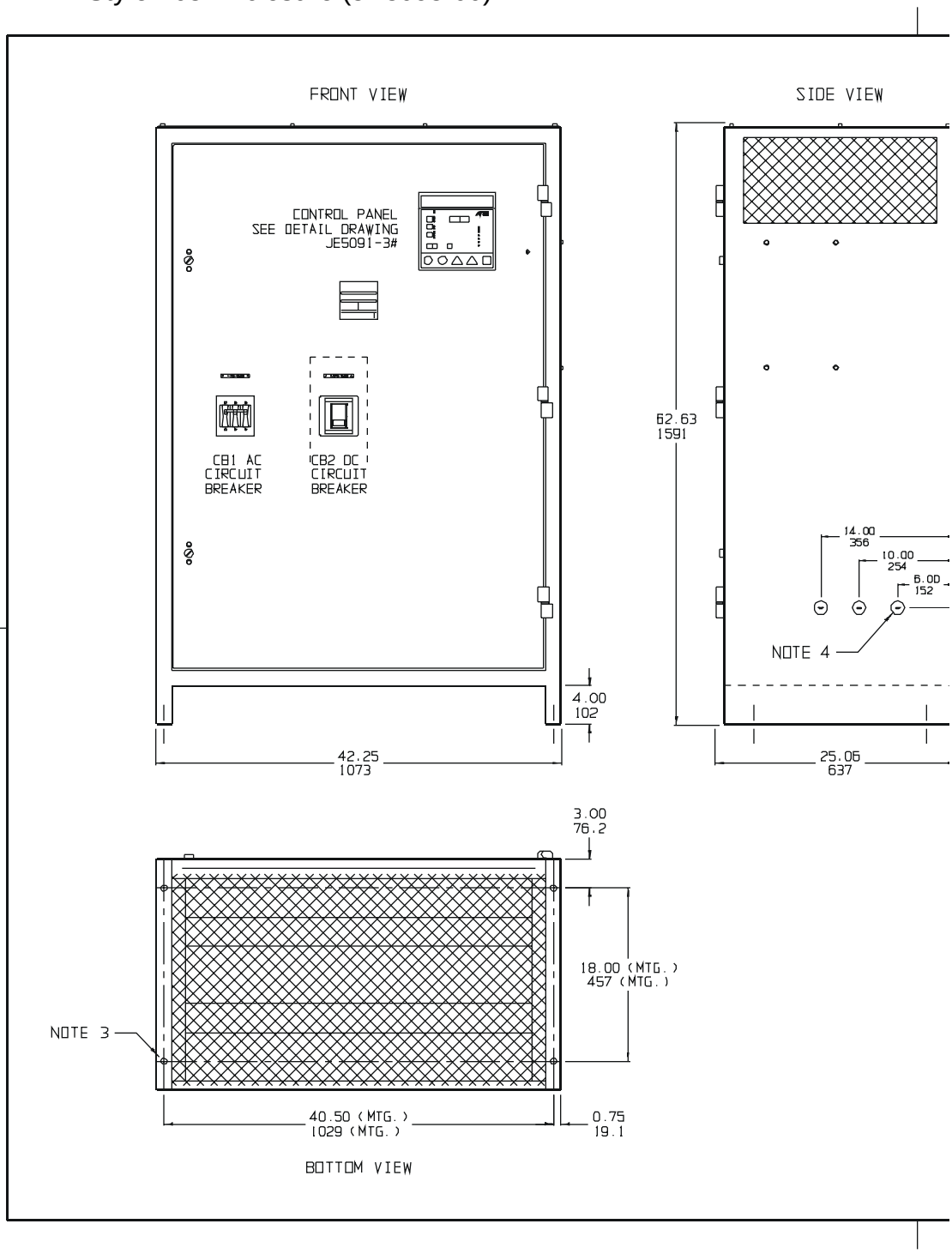
TITLE AT30 SERIES BATTERY CHARGER OUTLINE: NEMA-1 STYLE-5030 ENCLOSURE

DRAWING No JE5086-00 REV 1 B

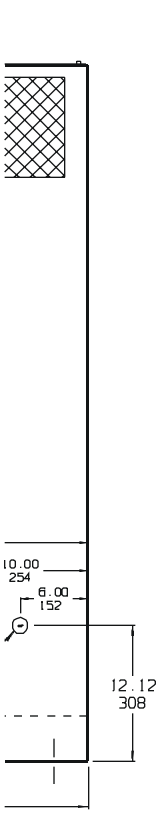
SCALE NTS PART No JE5086-00 SHEET 1 OF 1

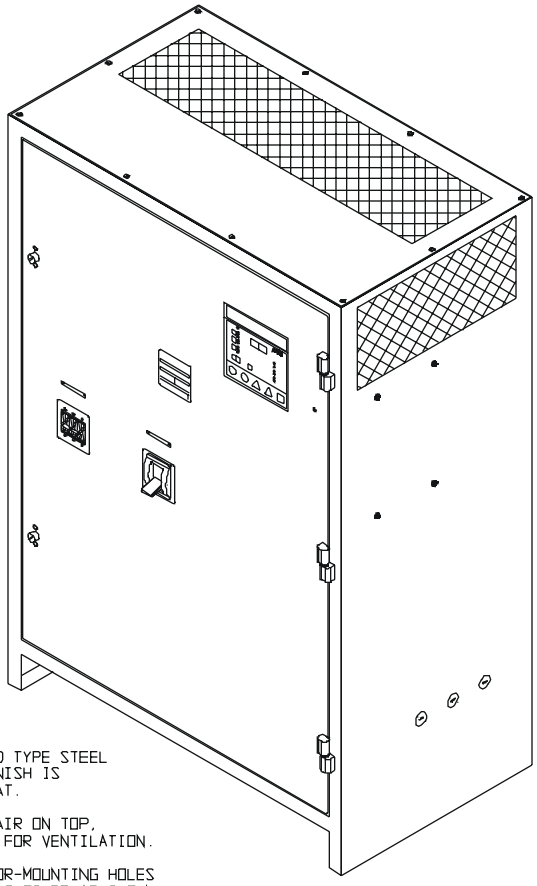
http://www.ATSeries.net/PDFs/JE5086-00.pdf

Outline: AT30 Battery Charger
NEMA-1 Style-163 Enclosure (**JE5095-00**)



Outline: AT30 Battery Charger
NEMA-1 Style-163 Enclosure (**JE5095-00**)





NOTES:

1) ENCLOSURE IS A NEMA-1 / IP20 TYPE STEEL CABINET WITHOUT GASKETS, FINISH IS ANSI-61 GRAY EPOXY POWDERCOAT.

2) ALLOW 12in / 305mm OF FREE AIR ON TOP, SIDES, AND FRONT OF CABINET FOR VENTILATION.

3) FOUR (4) 0.625in / 16mm FLOOR-MOUNTING HOLES ARE PROVIDED ON BOTTOM OF ENCLOSURE AS SHOWN.

4) SIX (6) 1.31in / 33mm DIA STANDARD PRE-FAB CONDUIT KNOCKOUTS ARE PROVIDED AS SHOWN FOR 1in / 25mm CABLE ENTRY. BOTTOM CONDUIT ENTRY IS POSSIBLE THROUGH EXPANDED METAL UNDERSIDE. IF ADDITIONAL CONDUIT ENTRANCES ARE REQUIRED, ENCLOSURE SHOULD BE FIELD-MODIFIED BY INSTALLER.

5) BATTERY CHARGER SHIPPING WEIGHT: (SEE PRODUCT LITERATURE)

DUAL DIMENSIONS in / mm

REV	ECN No	DATE
1	23261	071412
0	20343	092506

THIRD ANGLE PROJECTION

DRAWN BY MCR 092506

ELECTRONIC APPROVAL SIGNATURES MAINTAINED BY MFG ECN LOG

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

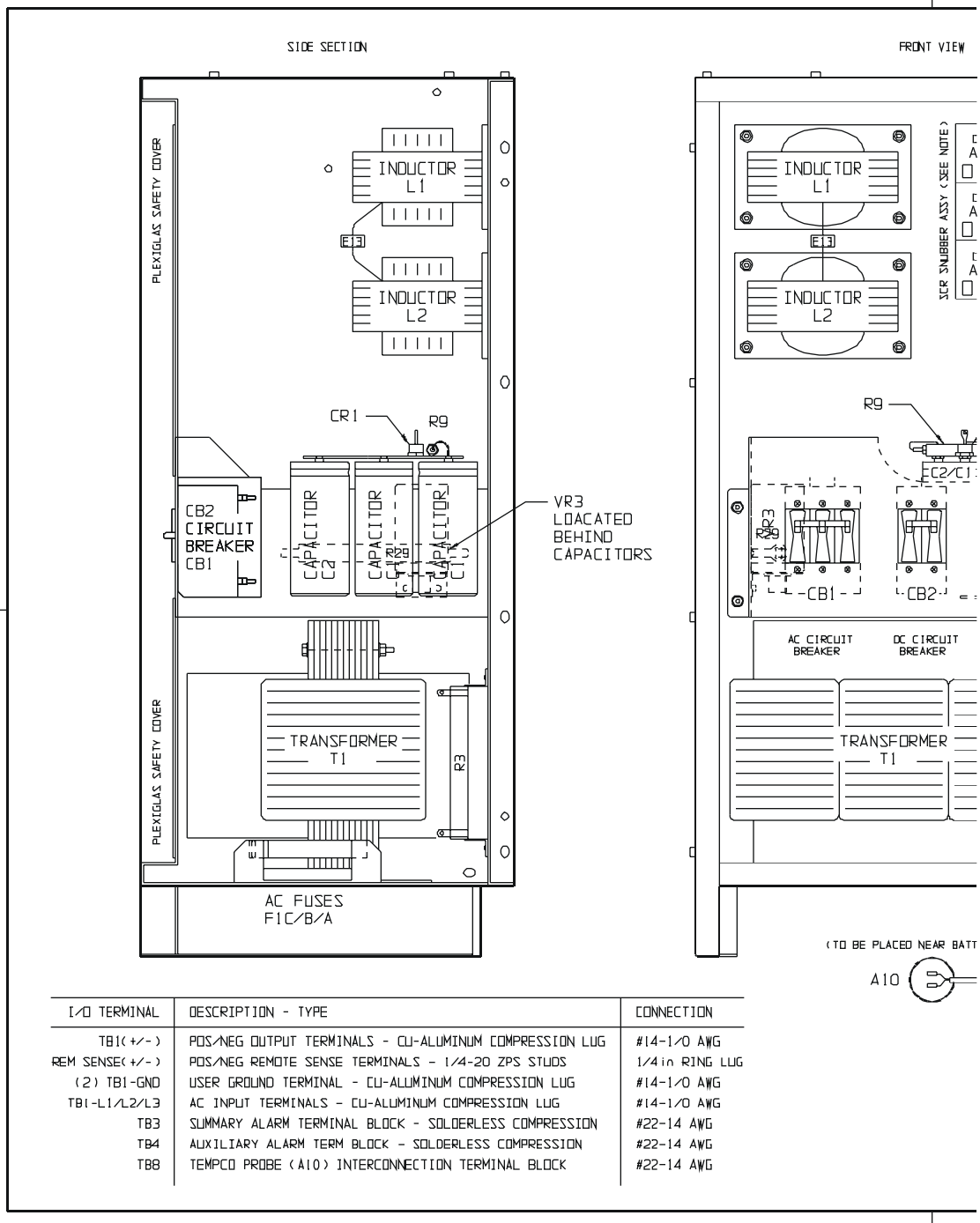
TITLE AT30 BATTERY CHARGER OUTLINE: NEMA-1 STYLE-163 ENCLOSURE

DRAWING No JE5095-00 REV 1 B

SCALE NTS PART No JE5095-00 SHEET 1 OF 1

http://www.ATSeries.net/PDFs/JE5095-00.pdf

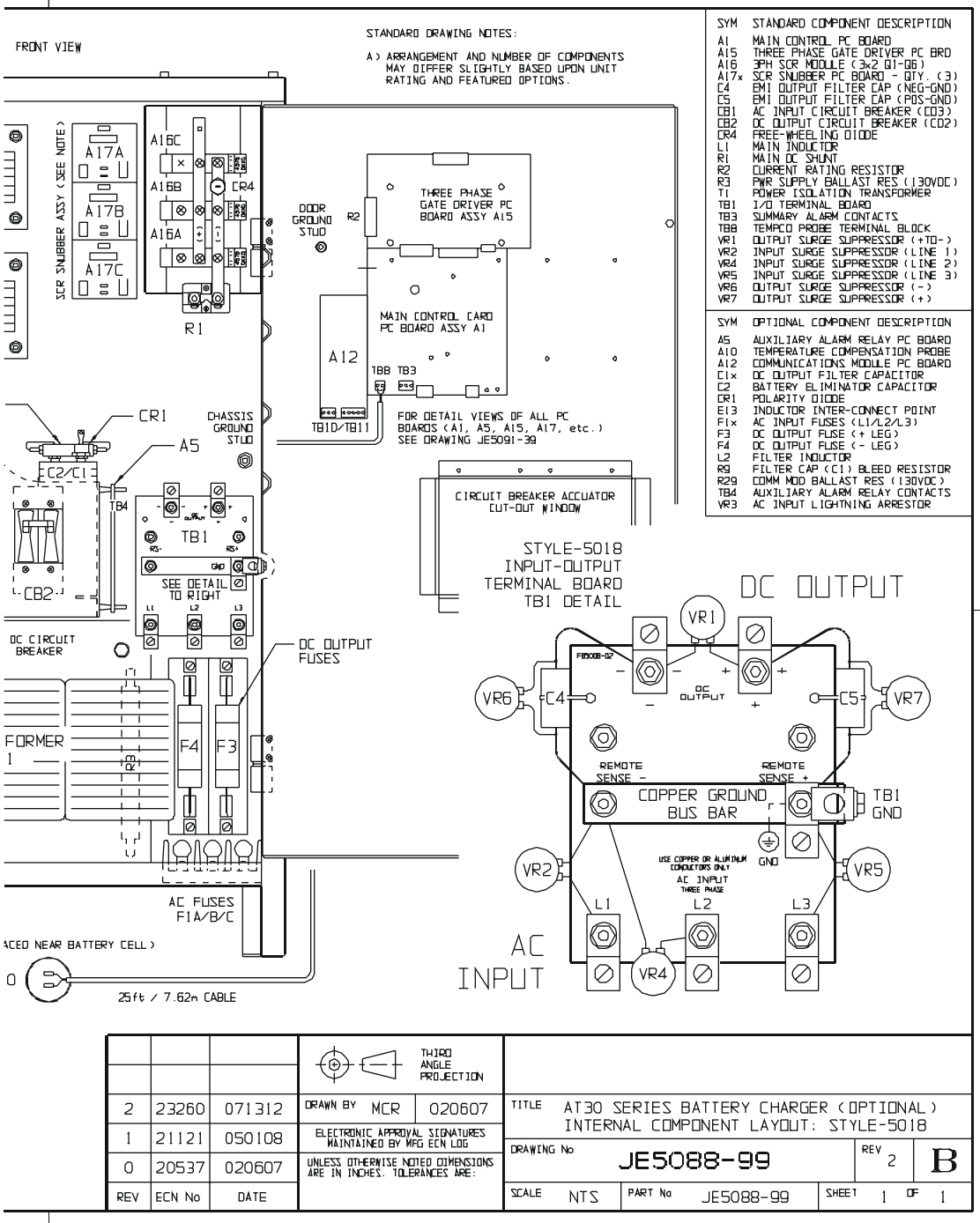
Internal Component Layout: AT30 Battery Charger
Style-5018 Enclosure w/Common Options (**JE5088-99**)



I/O TERMINAL	DESCRIPTION - TYPE	CONNECTION
TB1(+/-)	POS/NEG OUTPUT TERMINALS - CU-ALUMINUM COMPRESSION LUG	#14-1/0 AWG
REM SENSE(+/-)	POS/NEG REMOTE SENSE TERMINALS - 1/4-20 ZPS STUDS	1/4in RING LUG
(2) TB1-GND	USER GROUND TERMINAL - CU-ALUMINUM COMPRESSION LUG	#14-1/0 AWG
TB1-L1/L2/L3	AC INPUT TERMINALS - CU-ALUMINUM COMPRESSION LUG	#14-1/0 AWG
TB3	SUMMARY ALARM TERMINAL BLOCK - SOLDERLESS COMPRESSION	#22-14 AWG
TB4	AUXILIARY ALARM TERM BLOCK - SOLDERLESS COMPRESSION	#22-14 AWG
TB8	TEMPCO PROBE (A10) INTERCONNECTION TERMINAL BLOCK	#22-14 AWG

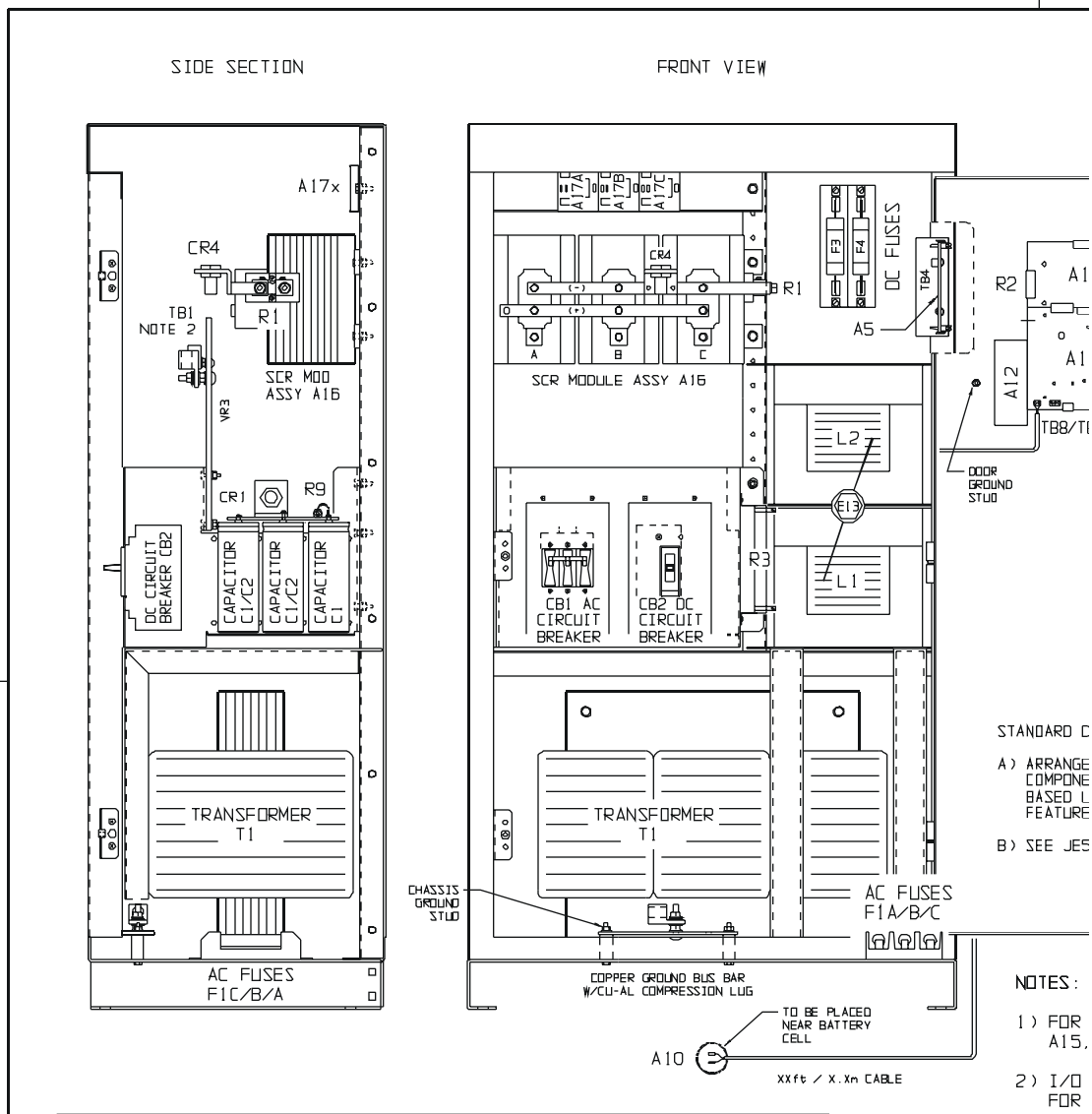
NOTICE This internal component layout drawing (**JE5088-99**) depicts an AT30 Series battery charger housed in a Style-5018 enclosure, with ALL available options. Standard components (A1 through VR7) are supplied in all such units. Optional components (A5 through VR3) are supplied only in those AT30s configured with such options.

Internal Component Layout: AT30 Battery Charger
Style-5018 Enclosure w/Common Options (**JE5088-99**)



http://www.ATSeries.net/PDFs/JE5088-99.pdf

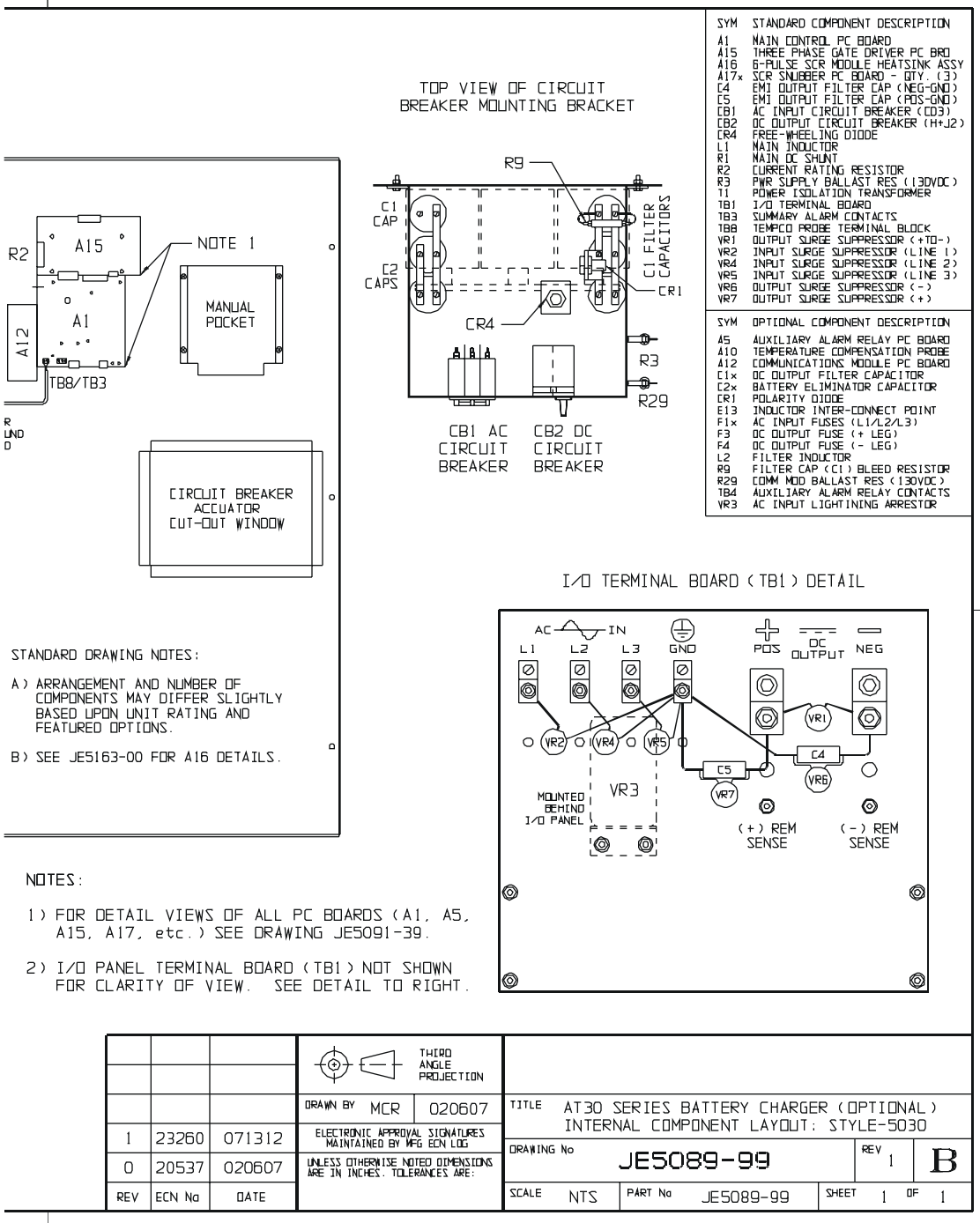
Internal Component Layout: AT30 Battery Charger
Style-5030 Enclosure w/Common Options (**JE5089-99**)



I/O TERMINAL	DESCRIPTION - TYPE	CONNECTION
TB1(+/-)	POS/NEG OUTPUT TERMINALS - CU-ALUMINUM COMPRESSION LUG	#6 AWG-350 MCM
REM SENSE(+/-)	POS/NEG REMOTE SENSE TERMINALS - 1/4-20 ZPS STUDS	1/4in RING LUG
(2) TB1-GND	USER GROUND TERMINAL - CU-ALUMINUM COMPRESSION LUG	#14-1/0 AWG
TB1-L1/L2/L3	AC INPUT TERMINALS - CU-ALUMINUM COMPRESSION LUG	#14-1/0 AWG
TB3	SUMMARY ALARM TERMINAL BLOCK - SOLDERLESS COMPRESSION	#22-14 AWG
TB4	AUXILIARY ALARM TERM BLOCK - SOLDERLESS COMPRESSION	#22-14 AWG
TB8	TEMPCO PROBE (A10) INTERCONNECTION TERMINAL BLOCK	#22-14 AWG

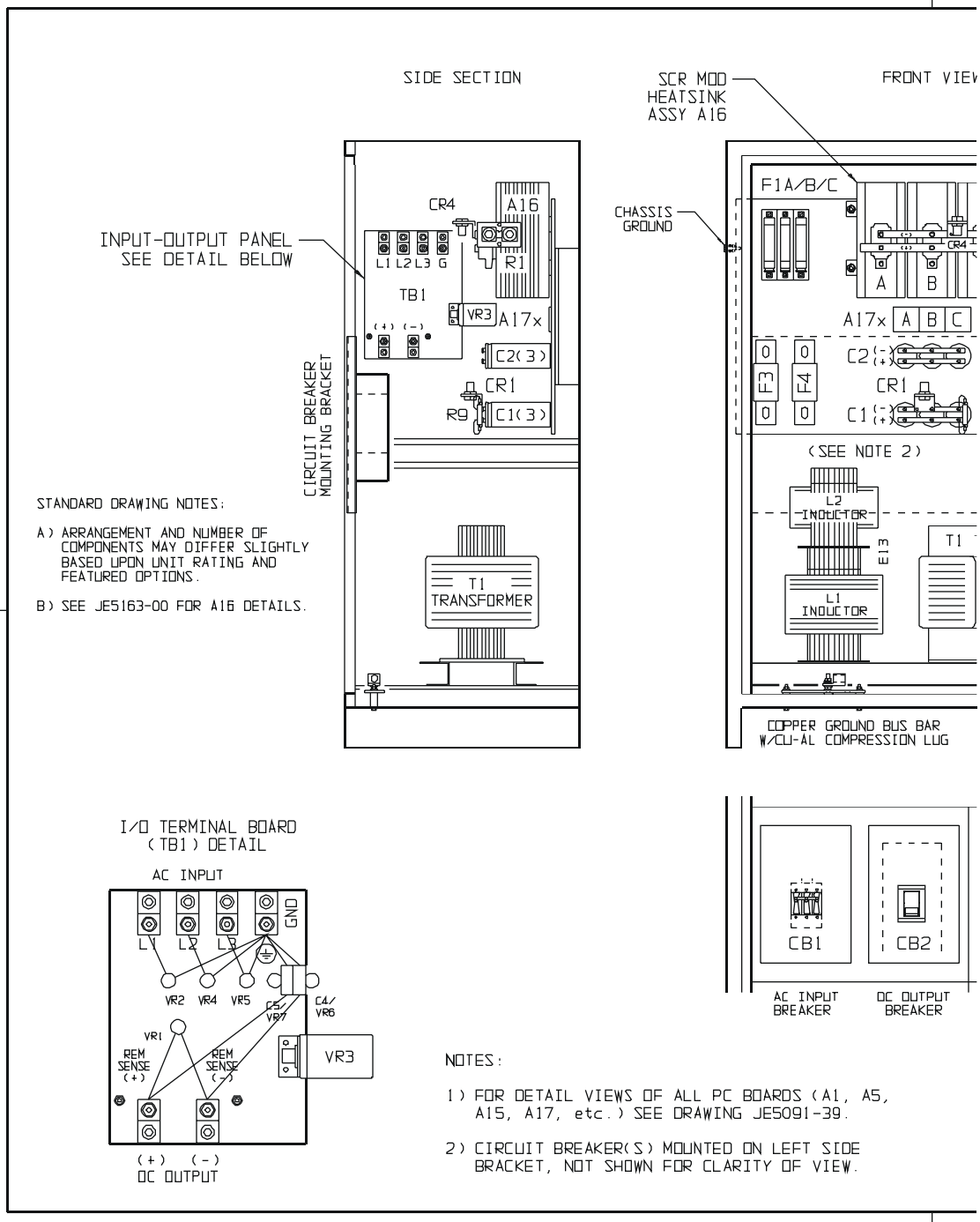
NOTICE This internal component layout drawing (**JE5089-99**) depicts an AT30 Series battery charger housed in a Style-5030 enclosure, with ALL available options. Standard components (A1 through VR7) are supplied in all such units. Optional components (A5 through VR3) are supplied only in those AT30s configured with such options.

Internal Component Layout: AT30 Battery Charger Style-5030 Enclosure w/Common Options (**JE5089-99**)



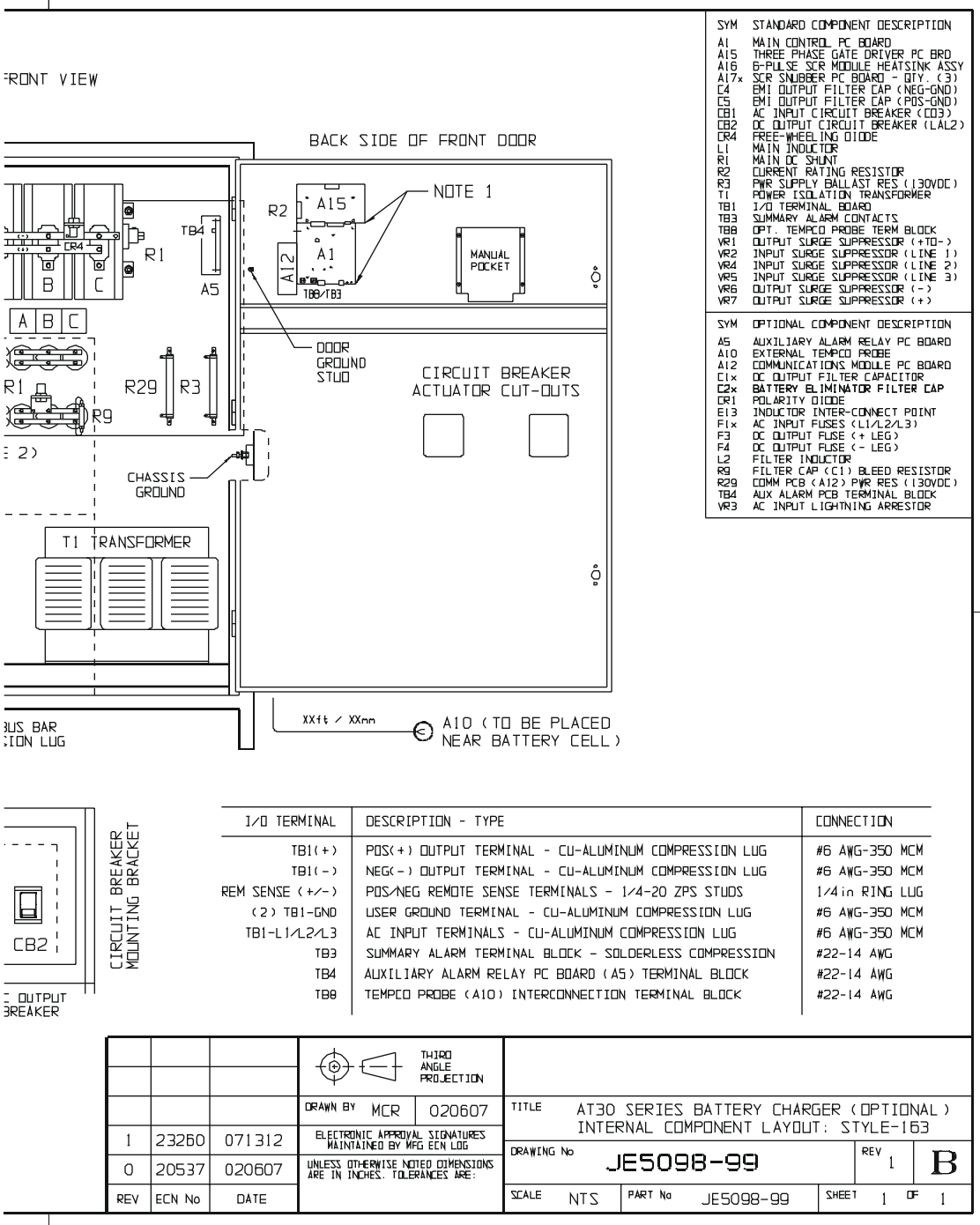
http://www.ATSeries.net/PDFs/JE5089-99.pdf

Internal Component Layout: AT30 Battery Charger
Style-163 Enclosure w/Common Options (**JE5098-99**)



NOTICE This internal component layout drawing (**JE5098-99**) depicts an AT30 Series battery charger housed in a Style-163 enclosure, with ALL available options. Standard components (A1 through VR7) are supplied in all such units. Optional components (A5 through VR3) are supplied only in those AT30s configured with such options.

Internal Component Layout: AT30 Battery Charger
Style-163 Enclosure w/Common Options (**JE5098-99**)



SYM	STANDARD COMPONENT DESCRIPTION
A1	MAIN CONTROL PC BOARD
A15	THREE PHASE GATE DRIVER PC BRD
A16	6-PULSE SCR MODULE HEATSINK ASSY
A17x	SCR SNUBBER PC BOARD - QTY. (3)
C4	EMI OUTPUT FILTER CAP (NEG-GND)
C5	EMI OUTPUT FILTER CAP (POS-GND)
CB1	AC INPUT CIRCUIT BREAKER (CB3)
CB2	DC OUTPUT CIRCUIT BREAKER (LAL2)
CR4	FREE-WHEELING DIODE
L1	MAIN INDUCTOR
R1	MAIN DC SHUNT
R2	CURRENT RATING RESISTOR
R3	PWR SUPPLY BALLAST RES (130VDC)
T1	POWER ISOLATION TRANSFORMER
TB1	I/O TERMINAL BOARD
TB3	SUMMARY ALARM CONTACTS
TB8	OPT. TEMPCO PROBE TERM BLOCK
VR1	OUTPUT SURGE SUPPRESSOR (+TO-)
VR2	INPUT SURGE SUPPRESSOR (LINE 1)
VR4	INPUT SURGE SUPPRESSOR (LINE 2)
VR5	INPUT SURGE SUPPRESSOR (LINE 3)
VR6	OUTPUT SURGE SUPPRESSOR (-)
VR7	OUTPUT SURGE SUPPRESSOR (+)

SYM	OPTIONAL COMPONENT DESCRIPTION
A5	AUXILIARY ALARM RELAY PC BOARD
A10	EXTERNAL TEMPCO PROBE
A12	COMMUNICATIONS MODULE PC BOARD
C1x	DC OUTPUT FILTER CAPACITOR
C2x	BATTERY ELIMINATOR FILTER CAP
CR1	POLARITY DIODE
E13	INDUCTOR INTER-CONNECT POINT
F1x	AC INPUT FUSES (L1/L2/L3)
F3	DC OUTPUT FUSE (+ LEG)
F4	DC OUTPUT FUSE (- LEG)
L2	FILTER INDUCTOR
R9	FILTER CAP (C1) BLEED RESISTOR
R29	COMM PCB (A12) PWR RES (130VDC)
TB4	AUX ALARM PCB TERMINAL BLOCK
VR3	AC INPUT LIGHTNING ARRESTOR

I/O TERMINAL	DESCRIPTION - TYPE	CONNECTION
TB1(+)	POS(+) OUTPUT TERMINAL - CU-ALUMINUM COMPRESSION LUG	#6 AWG-350 MCM
TB1(-)	NEG(-) OUTPUT TERMINAL - CU-ALUMINUM COMPRESSION LUG	#6 AWG-350 MCM
REM SENSE (+/-)	POS/NEG REMOTE SENSE TERMINALS - 1/4-20 ZPS STUDS	1/4in RING LUG
(2) TB1-GND	USER GROUND TERMINAL - CU-ALUMINUM COMPRESSION LUG	#6 AWG-350 MCM
TB1-L1/L2/L3	AC INPUT TERMINALS - CU-ALUMINUM COMPRESSION LUG	#6 AWG-350 MCM
TB3	SUMMARY ALARM TERMINAL BLOCK - SOLDERLESS COMPRESSION	#22-14 AWG
TB4	AUXILIARY ALARM RELAY PC BOARD (A5) TERMINAL BLOCK	#22-14 AWG
TB8	TEMPCO PROBE (A10) INTERCONNECTION TERMINAL BLOCK	#22-14 AWG

REV	ECN No	DATE
1	23260	071312
0	20537	020607

THIRD ANGLE PROJECTION

DRAWN BY MCR 020607

ELECTRONIC APPROVAL SIGNATURES MAINTAINED BY MFG ECN LOG

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

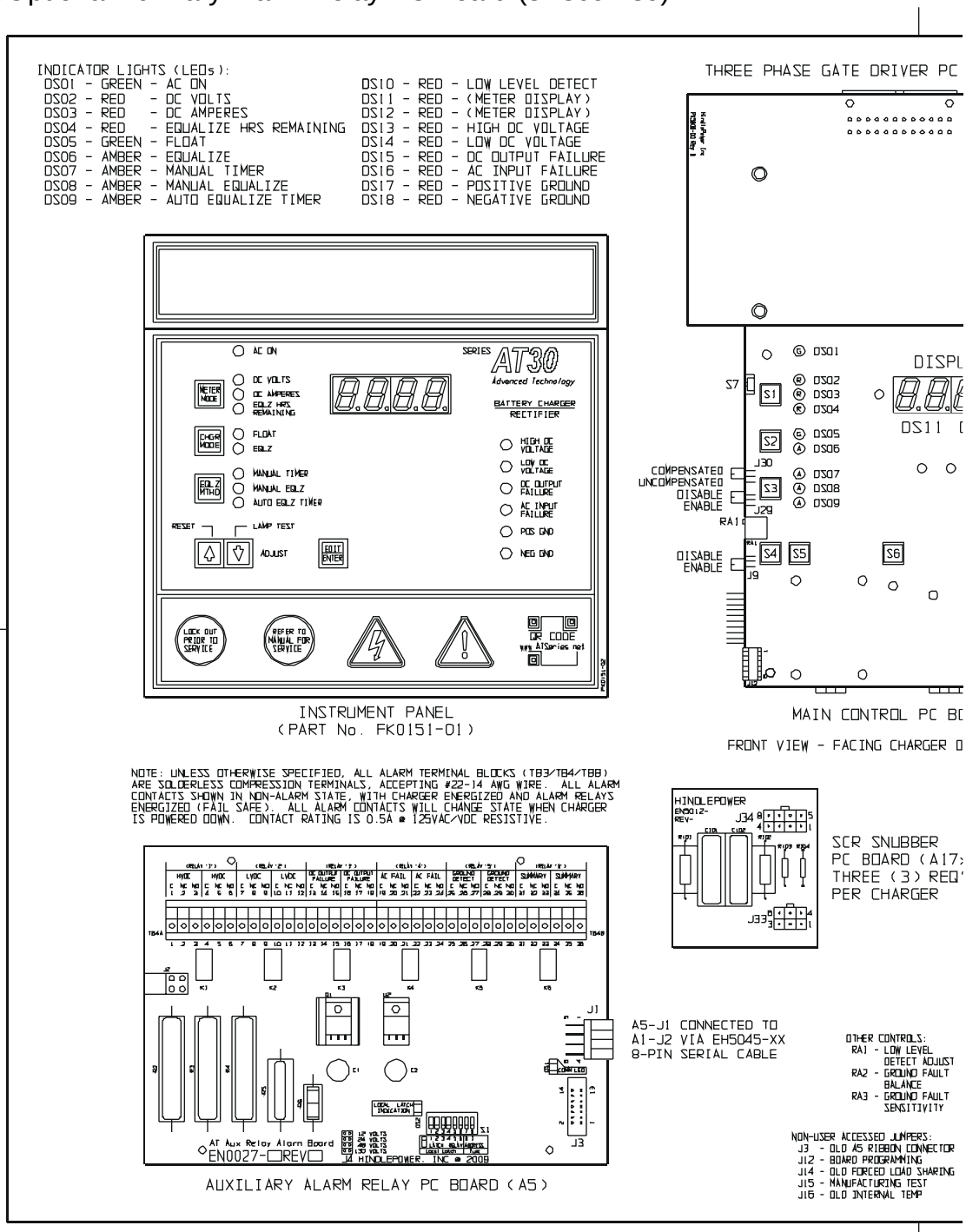
TITLE AT30 SERIES BATTERY CHARGER (OPTIONAL) INTERNAL COMPONENT LAYOUT: STYLE-163

DRAWING No JE5098-99 REV 1 B

SCALE NTS PART No JE5098-99 SHEET 1 OF 1

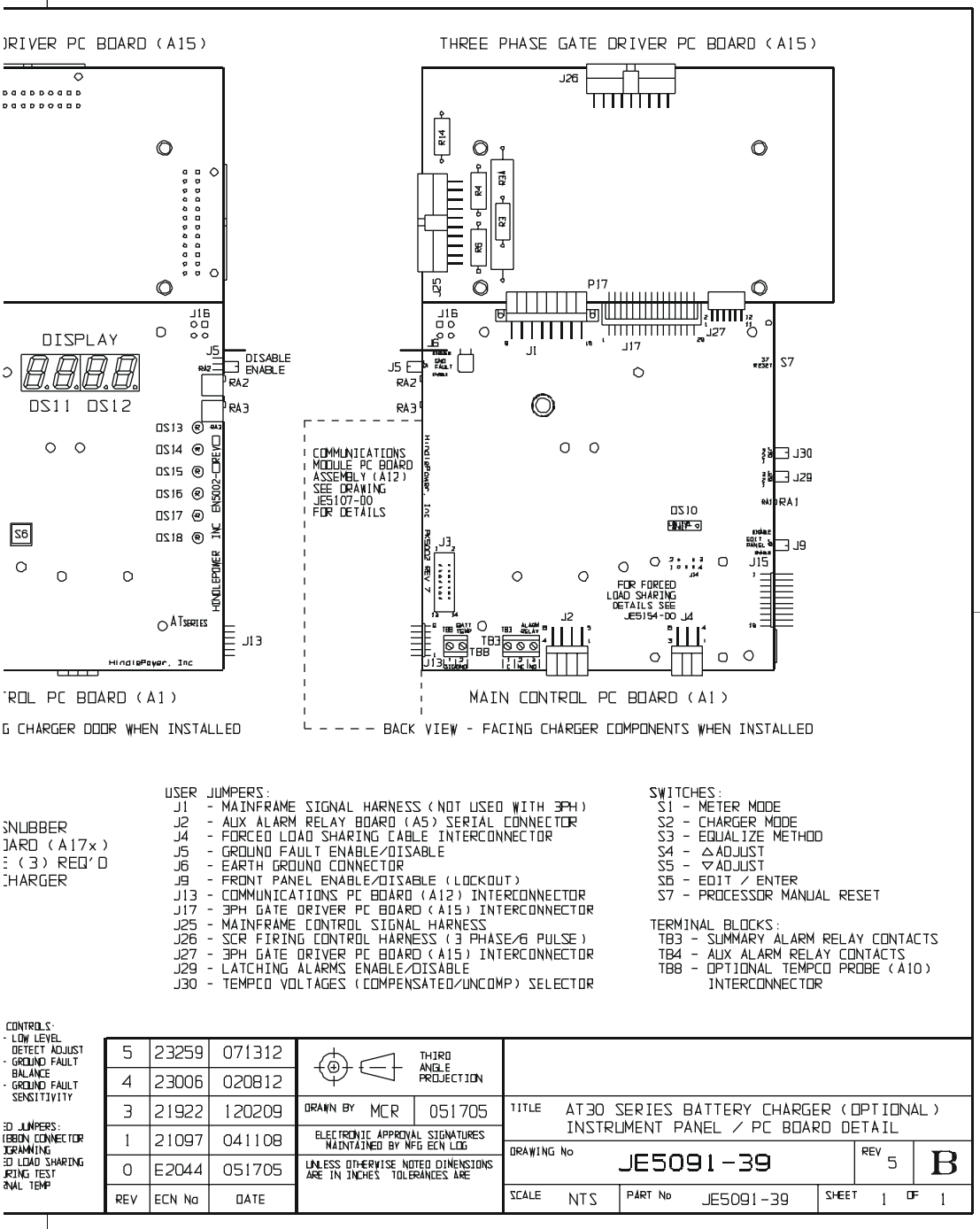
http://www.ATSeries.net/PDFs/JE5098-99.pdf

Instrument Panel / PC Board Detail: AT30 Battery Charger w/Optional Auxiliary Alarm Relay PC Board (**JE5091-39**)



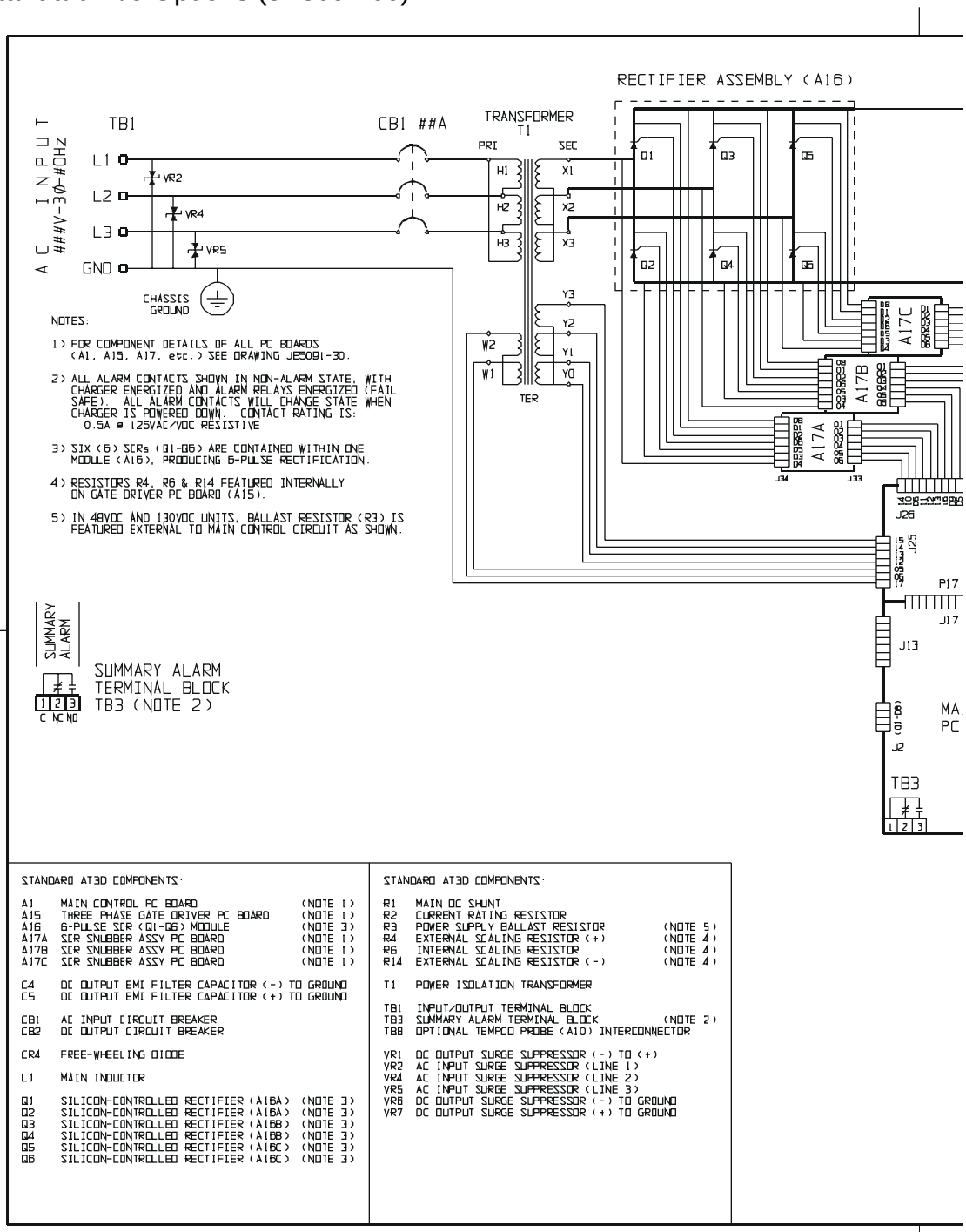
NOTICE This instrument panel drawing (**JE5091-39**) depicts the optional Auxiliary Alarm Relay PC Board (A5), which provides two (2) sets of individual form-c contacts (TB4) for all alarm conditions. Standard AT30 battery chargers feature one (1) set of form-c summary (common) alarm contacts (TB3).

Instrument Panel / PC Board Detail: AT30 Battery Charger w/Optional Auxiliary Alarm Relay PC Board (**JE5091-39**)



http://www.ATSeries.net/PDFs/JE5091-39.pdf

Schematic: AT30 Battery Charger
Standard w/o Options (**JE5092-00**)



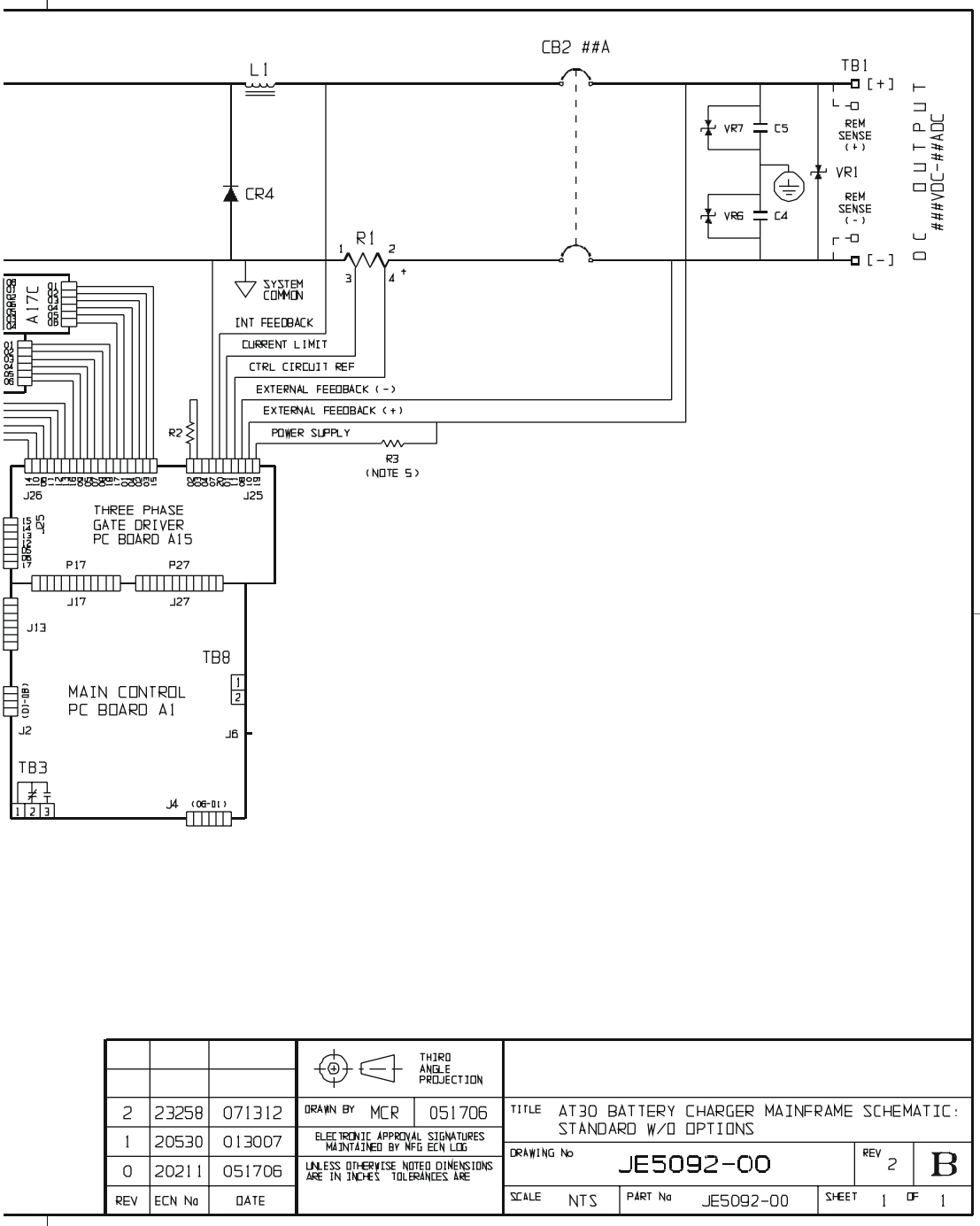
STANDARD AT30 COMPONENTS:

A1	MAIN CONTROL PC BOARD	(NOTE 1)
A15	THREE PHASE GATE DRIVER PC BOARD	(NOTE 1)
A16	6-PULSE SCR (Q1-Q6) MODULE	(NOTE 3)
A17A	SCR SNUBBER ASSY PC BOARD	(NOTE 1)
A17B	SCR SNUBBER ASSY PC BOARD	(NOTE 1)
A17C	SCR SNUBBER ASSY PC BOARD	(NOTE 1)
C4	DC OUTPUT EMI FILTER CAPACITOR (-) TO GROUND	
C5	DC OUTPUT EMI FILTER CAPACITOR (+) TO GROUND	
CB1	AC INPUT CIRCUIT BREAKER	
CB2	DC OUTPUT CIRCUIT BREAKER	
CR4	FREE-WHEELING DIODE	
L1	MAIN INDUCTOR	
Q1	SILICON-CONTROLLED RECTIFIER (A16A)	(NOTE 3)
Q2	SILICON-CONTROLLED RECTIFIER (A16A)	(NOTE 3)
Q3	SILICON-CONTROLLED RECTIFIER (A16B)	(NOTE 3)
Q4	SILICON-CONTROLLED RECTIFIER (A16B)	(NOTE 3)
Q5	SILICON-CONTROLLED RECTIFIER (A16C)	(NOTE 3)
Q6	SILICON-CONTROLLED RECTIFIER (A16C)	(NOTE 3)

STANDARD AT30 COMPONENTS:

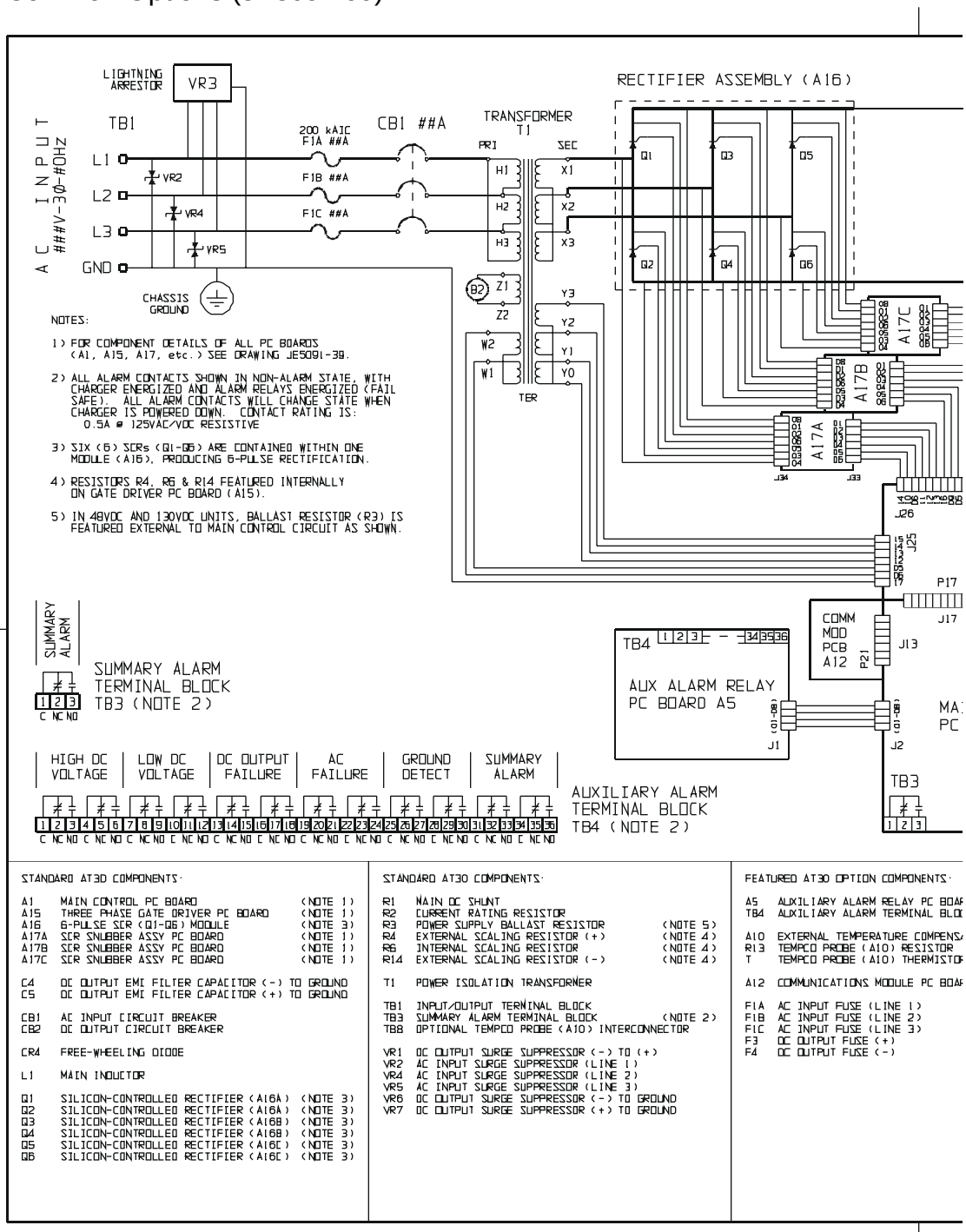
R1	MAIN DC SHUNT	
R2	CURRENT RATING RESISTOR	
R3	POWER SUPPLY BALLAST RESISTOR	(NOTE 5)
R4	EXTERNAL SCALING RESISTOR (+)	(NOTE 4)
R6	INTERNAL SCALING RESISTOR	(NOTE 4)
R14	EXTERNAL SCALING RESISTOR (-)	(NOTE 4)
T1	POWER ISOLATION TRANSFORMER	
TB1	INPUT/OUTPUT TERMINAL BLOCK	
TB3	SUMMARY ALARM TERMINAL BLOCK	(NOTE 2)
TB8	OPTIONAL TEMPCO PROBE (A10) INTERCONNECTOR	
VR1	DC OUTPUT SURGE SUPPRESSOR (-) TO (+)	
VR2	AC INPUT SURGE SUPPRESSOR (LINE 1)	
VR4	AC INPUT SURGE SUPPRESSOR (LINE 2)	
VR5	AC INPUT SURGE SUPPRESSOR (LINE 3)	
VR6	DC OUTPUT SURGE SUPPRESSOR (-) TO GROUND	
VR7	DC OUTPUT SURGE SUPPRESSOR (+) TO GROUND	

Schematic: AT30 Battery Charger
Standard w/o Options (**JE5092-00**)

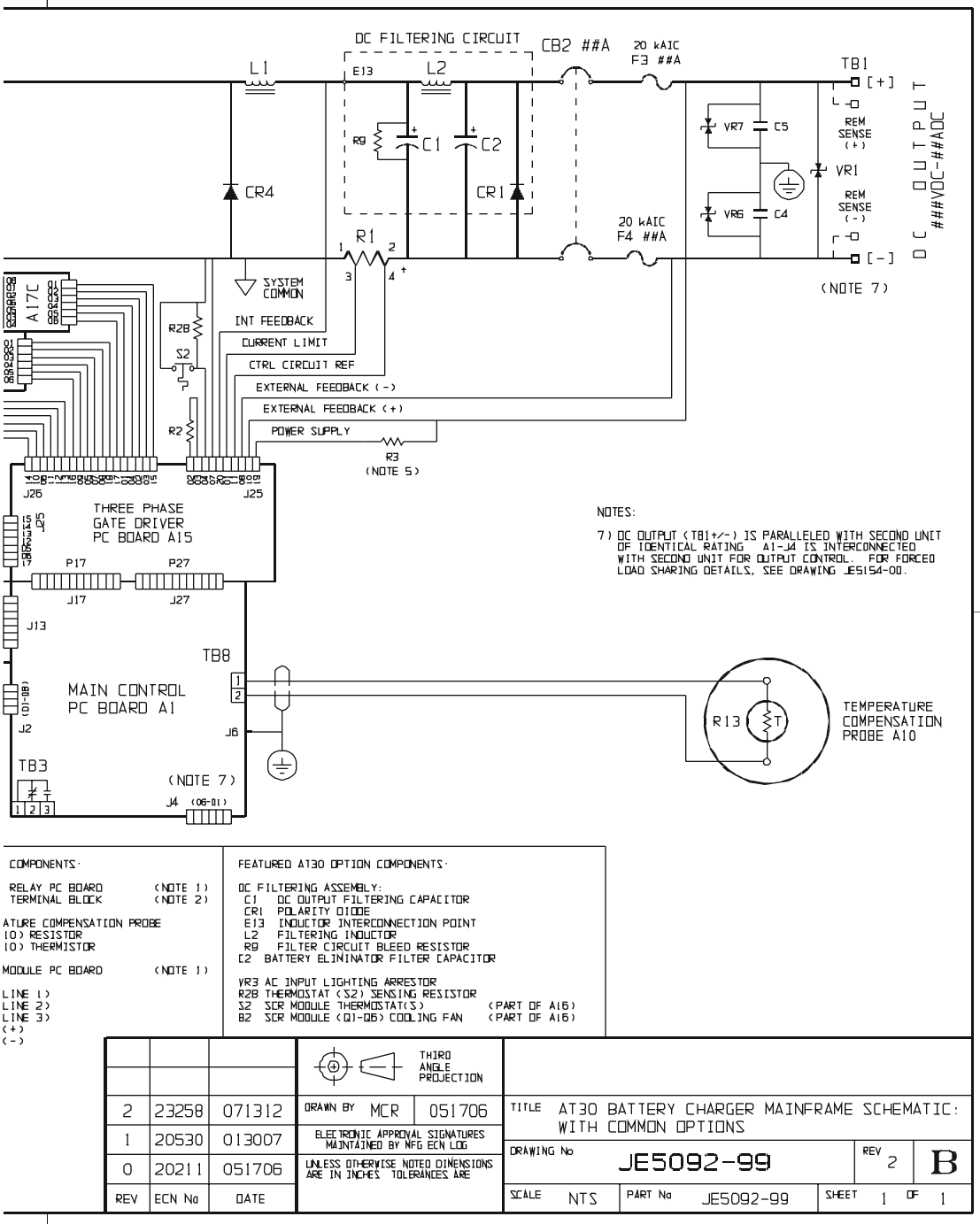


http://www.ATSeries.net/PDFs/JE5092-00.pdf

Schematic: AT30 Battery Charger
w/Common Options (**JE5092-99**)

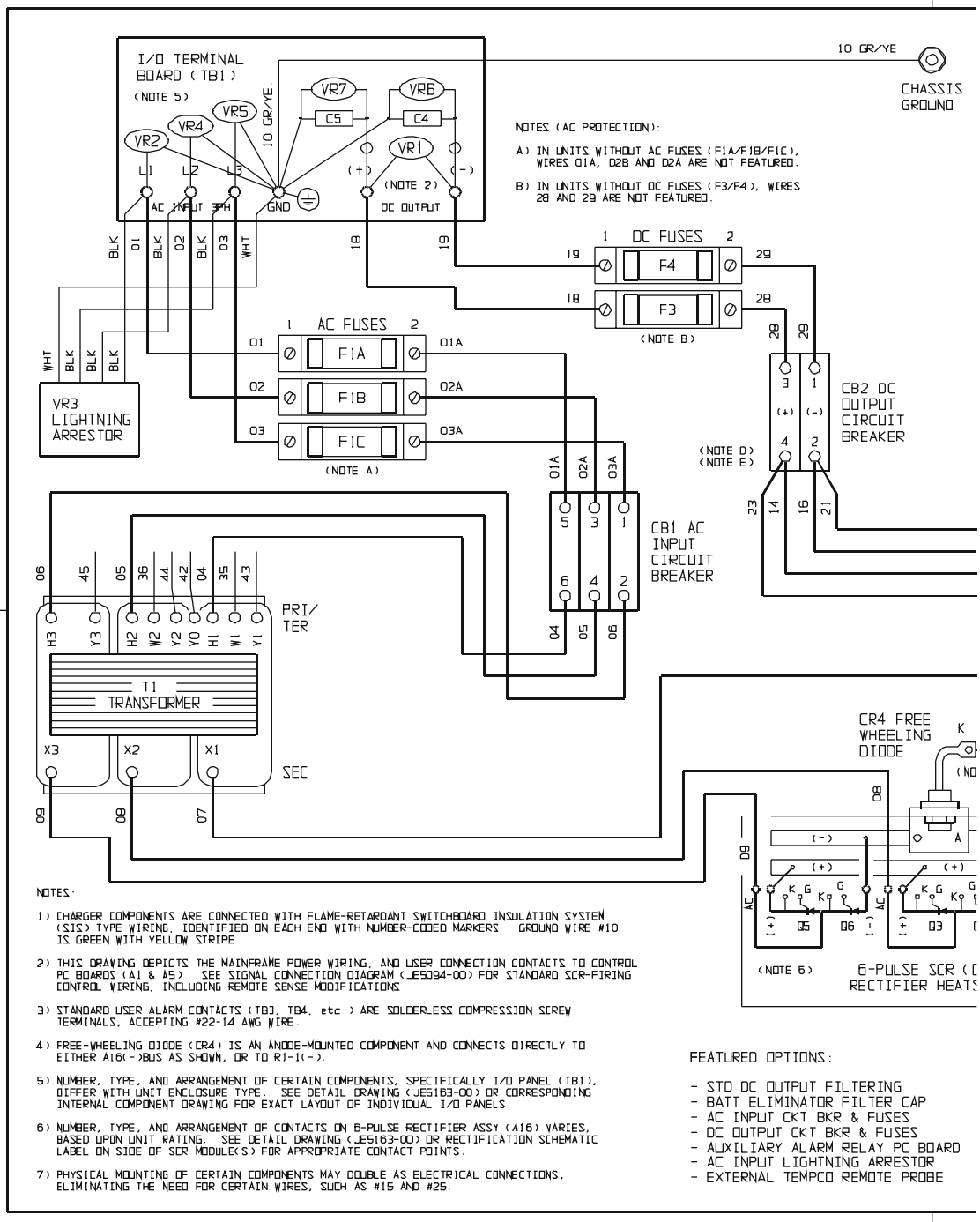


Schematic: AT30 Battery Charger
w/Common Options (**JE5092-99**)



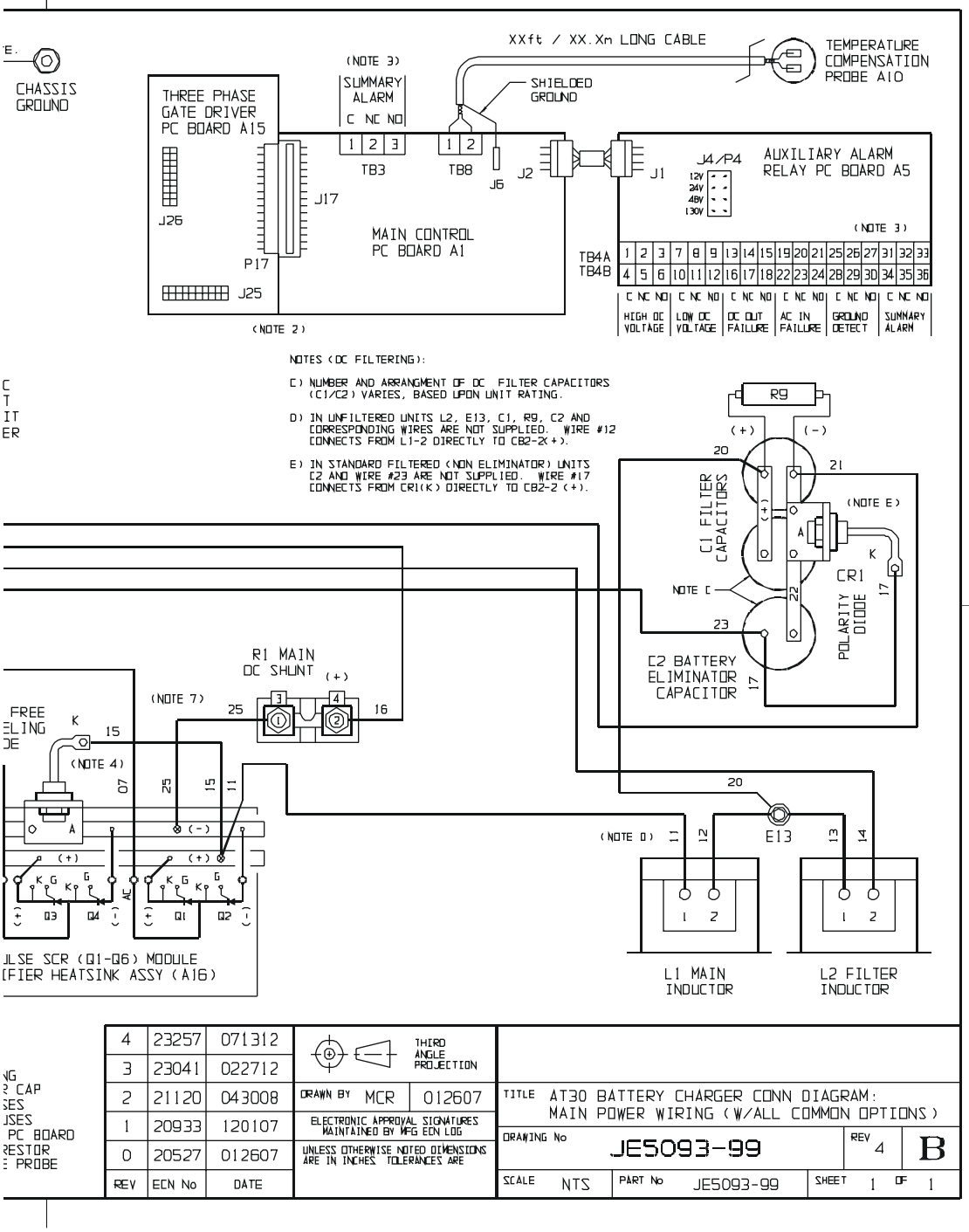
http://www.ATSeries.net/PDFs/JE5092-99.pdf

Connection Diagram: AT30 Battery Charger
Mainframe Power Wiring w/Common Options (**JE5093-99**)



NOTICE This connection diagram (**JE5093-99**) depicts the mainframe power wiring of an AT30 Series battery charger with ALL features and options available from the standard ordering code. Refer to the model number featured on the data nameplate and the supplied **Parts Data Package** report to identify which components are applicable to each individual unit.

Connection Diagram: AT30 Battery Charger
Mainframe Power Wiring w/Common Options (**JE5093-99**)



REV	ECN No	DATE
4	23257	071312
3	23041	022712
2	21120	043008
1	20933	120107
0	20527	012607

THIRD ANGLE PROJECTION

DRAWN BY MCR 012607

ELECTRONIC APPROVAL SIGNATURES MAINTAINED BY MFG ECN LOG

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES. TOLERANCES ARE

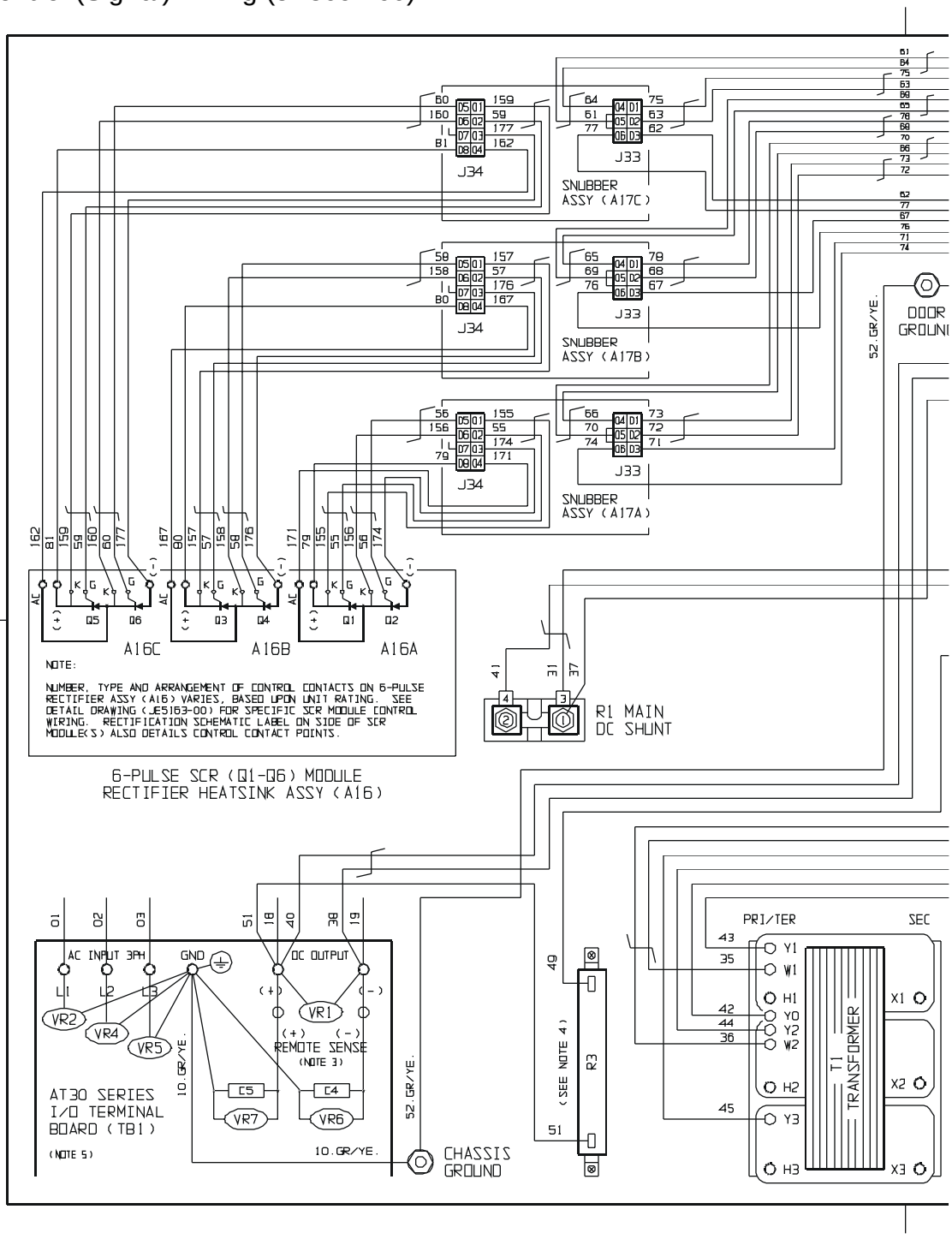
TITLE AT30 BATTERY CHARGER CONN DIAGRAM: MAIN POWER WIRING (W/ALL COMMON OPTIONS)

DRAWING No JE5093-99 REV 4 B

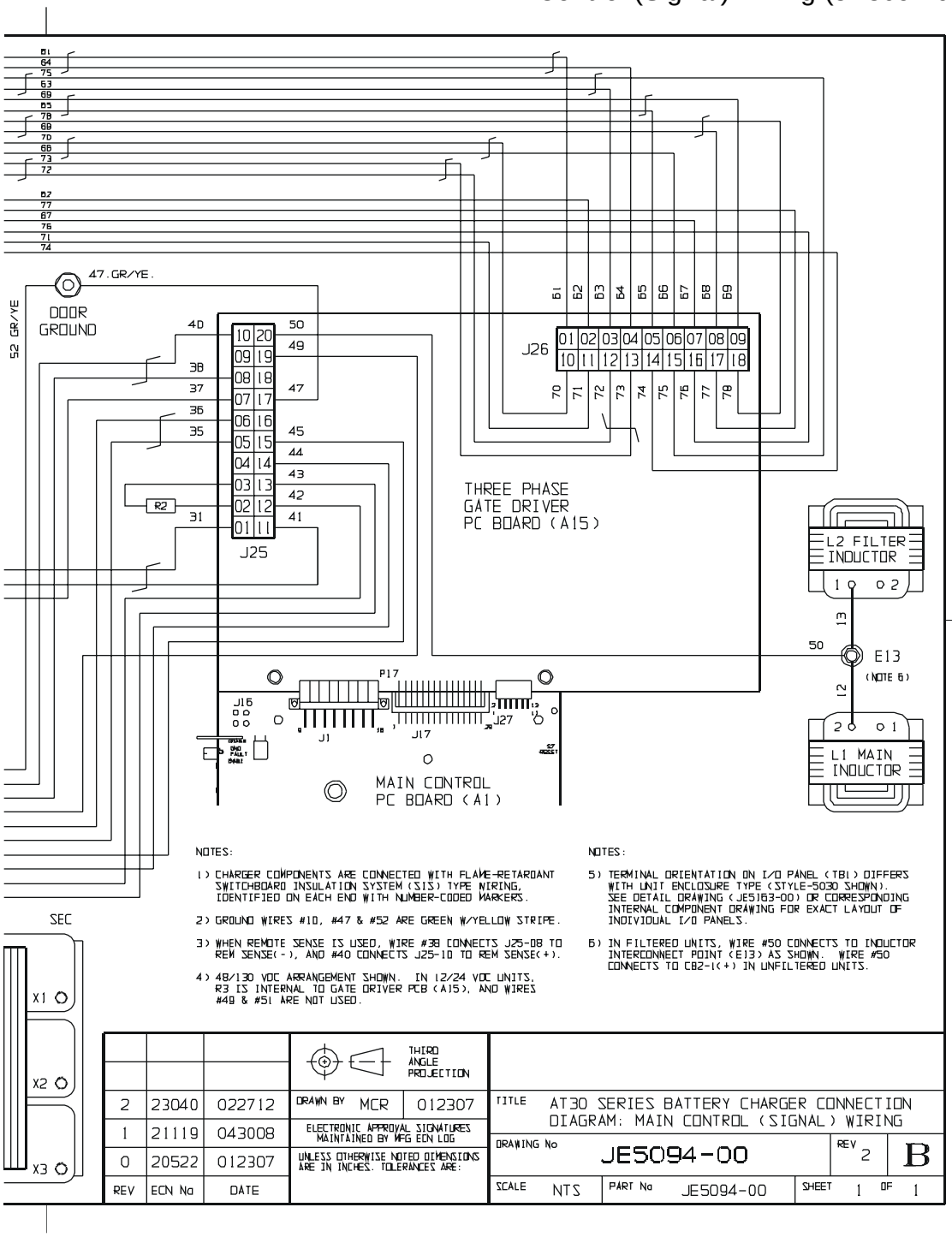
SCALE NTS PART No JE5093-99 SHEET 1 OF 1

http://www.ATSeries.net/PDFs/JE5093-99.pdf

Connection Diagram: AT30 Battery Charger
Control (Signal) Wiring (**JE5094-00**)



Connection Diagram: AT30 Battery Charger
Control (Signal) Wiring (**JE5094-00**)



http://www.ATSeries.net/PDFs/JE5094-00.pdf

Connection Detail: AT30 Battery Charger I/O Panels & Rectifier Assemblies (**JE5163-00**)

FIGURE 1
25-50A RECTIFIER ASSY
(A16) PM5007-10

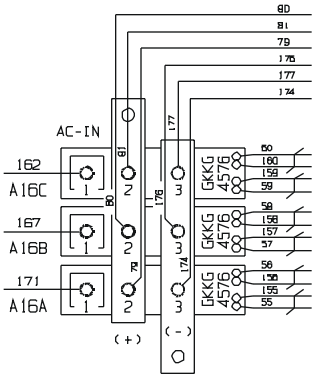


FIGURE 3
75-100A RECTIFIER ASSY
(A16) PM5007-01

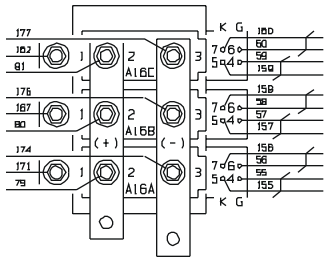
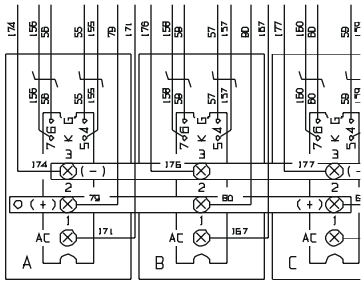


FIGURE 4
125A RECTIFIER ASSY
(A16) PM5007-06



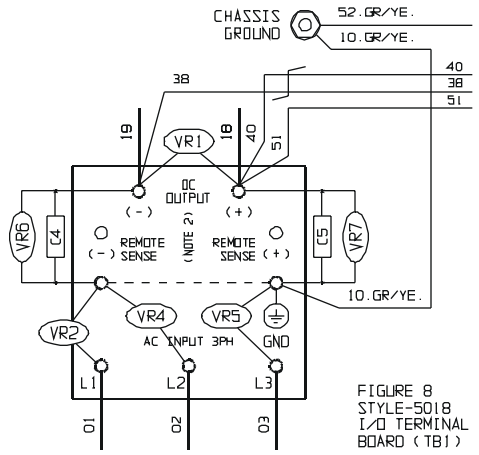


FIGURE 8
STYLE-5018
I/O TERMINAL
BOARD (TB1)

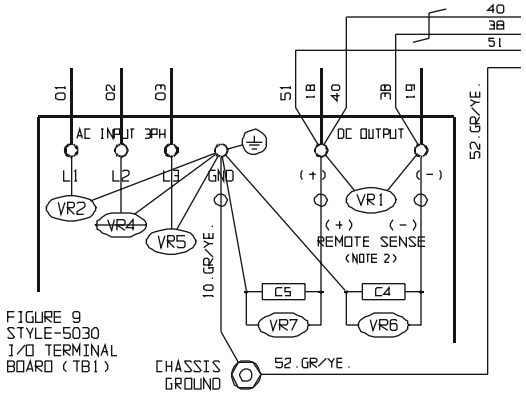


FIGURE 9
STYLE-5030
I/O TERMINAL
BOARD (TB1)

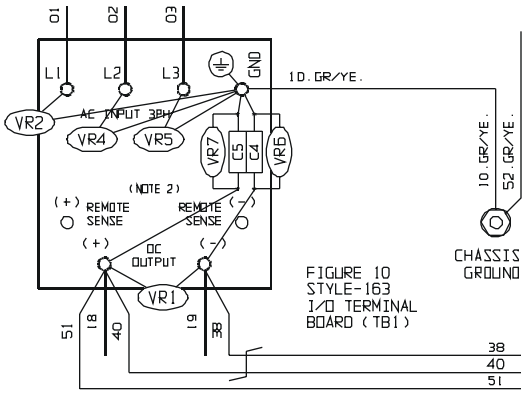


FIGURE 10
STYLE-163
I/O TERMINAL
BOARD (TB1)

NOTES:

1) ALL COMPONENTS ARE CONNECTED WITH FLAME-RETARDANT SWITCHBOARD INSULATION SYSTEM (SIS) TYPE WIRING, IDENTIFIED ON EACH END WITH NUMBER-CODED MARKERS.

2) WHEN REMOTE SENSE IS USED, WIRE #38 CONNECTS TO REMOTE SENSE(-), AND WIRE #40 CONNECTS TO REMOTE SENSE(+).

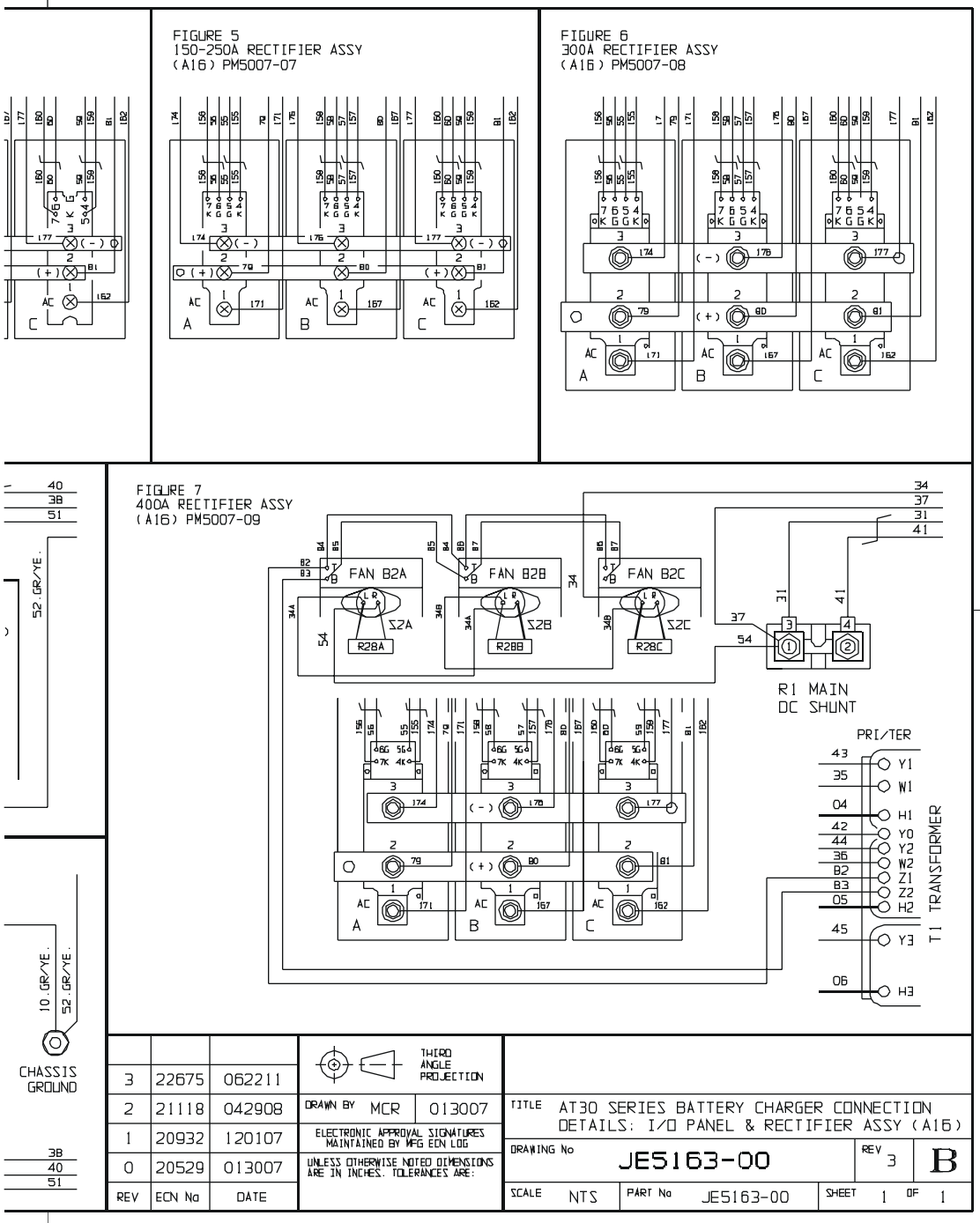
3) I/O PANELS AND RECTIFIER ASSEMBLIES ARE NOT DRAWN TO SCALE.

4) FOR APPROPRIATE RECTIFIER ASSEMBLY, REFER TO THE SUPPLIED PARTS DATA PACKAGE REPORT AND IDENTIFY THE FACTORY PART NUMBER BY CIRCUIT SYMBOL "A16".

5) FOR APPROPRIATE I/O PANEL LAYOUT, REFER TO THE AT30 USER'S MANUAL TO IDENTIFY ENCLOSURE TYPE (STYLE-5018/5030/163).

6) SEE STANDARD DRAWING (JE5094-00) FOR FULL SIGNAL WIRING FROM DISPLAYED COMPONENTS (A16 & TB1) TO CONTROL COMPONENTS (A15, A17x, R1, R3 & T1).

Connection Detail: AT30 Battery Charger
I/O Panels & Rectifier Assemblies (**JE5163-00**)



http://www.ATSeries.net/PDFs/JE5163-00.pdf

APPENDIX D

RECOMMENDED FLOAT AND EQUALIZE VOLTAGES

This table contains suggested values for commonly used batteries. Consult your battery manufacturer's documentation for specific values and settings for your battery type.

Battery Cell Type		Recommended Float Voltage/cell	Recommended Equalize Voltage/cell
Lead-Acid Types	Antimony (1.215 Sp. Gr.)	2.17	2.33
	Antimony (1.250 Sp. Gr.)	2.20	2.33
	Selenium (1.240 Sp. Gr.)	2.23	2.33 - 2.40
	Calcium (1.215 Sp. Gr.)	2.25	2.33
	Calcium (1.250 Sp. Gr.)	2.29	2.33
	Absorbed / Gelled Electrolyte * (sealed lead-acid type)	2.25	*
Nickel-Cadmium (Ni-Cd)		1.42	1.47

* Sealed lead-acid batteries should not be used in ambient temperatures above 95 °F / 35 °C, and should not normally be equalized. Consult your battery manufacturer's documentation for specific equalizing recommendations.

TEMPERATURE COMPENSATION

If your batteries are to see temperature variations during charging, a temperature compensation option (**EJ5033-0#**) is recommended. If this option is not part of your AT30, manual adjustments should be made. Refer to the equation and table below for temperature-adjusted voltages.

temperature-adjusted voltage = charge voltage x K

Temperature (°F)	Temperature (°C)	**K** (Lead Acid)	**K** (Nickel-Cadmium)
35	1.7	1.058	1.044
45	7.2	1.044	1.034
55	12.8	1.031	1.023
65	18.3	1.017	1.013
75	23.9	1.003	1.002
77	25.0	1.000	1.000
85	29.4	0.989	0.992
95	35.0	0.975	0.981
105	40.6	0.961	0.970

COMMUNICATIONS MODULE

ONLINE SUPPLEMENTS

Operating Instructions http://www.ATSeries.net/PDFs/JA0102-04.pdf
Field Installation http://www.ATSeries.net/PDFs/JD5008-00.pdf

OVERVIEW

Your AT30 Microprocessor-controlled Float Battery Charger features provisions for an optional Communications Module which allows user's to remotely monitor and control the charger over a serial connection. This option supports **DNP3 Level 2** and **Modbus** protocols over **RS-232** or **RS-485** half-duplex. With this option installed, industry-standard Supervisory Control And Data Acquisition (**SCADA**) systems will be able to control, monitor, and log the events of the AT30.

Using the Communications Module option, all features of the AT30 front instrument panel display are accessible remotely. Remote battery temperature (°C) monitoring is also available with the Communications Module. This particular feature is not accessible from the standard AT30 front panel display.

Installed from the factory, the AT Series Communications Module (option p/n **EJ5037-0#**), includes a Communications PC Board (A12) with a dc power supply ballast resistor (R29). A special AT Series Communications Module Operating Instructions (**JA0102-04**), and field installation instructions (**JD5008-00**), are also provided for user support. A field retrofit kit (p/n **EJ5037-1#**) for AT Series Communications is also available for AT30s installed and already in use.

An optional Ethernet Gateway interface for AT Series Communication is available for either DNP3 Level 2, or Modbus protocols. Also available is a fiber optic modem kit with interconnection cable. Contact your sales representative to place an order for the AT Series Communication Module and/or accessories. Refer to the table below for ordering information.

Description	Part No.
Installed Communications Option for **12 Vdc** AT30	EJ5037-01
Installed Communications Option for **24 Vdc** AT30	EJ5037-02
Installed Communications Option for **48 Vdc** AT30	EJ5037-03
Installed Communications Option for **130 Vdc** AT30	EJ5037-04
Spare A12 Communications PC Board (**EN5004-00**)	EJ1243-12
Field Kit Communications Module for **12 Vdc** AT30	EJ5037-11
Field Kit Communications Module for **24 Vdc** AT30	EJ5037-12
Field Kit Communications Module for **48 Vdc** AT30	EJ5037-13
Field Kit Communications Module for **130 Vdc** AT30	EJ5037-14
Ethernet Gateway Interface for Modbus AT Comm	EJ5226-0#
Ethernet Gateway Interface for DNP3 L2 AT Comm	EJ5226-1#
Fiber Optic Modem w/Interface for AT Comm	EJ5230-0#

APPENDIX F

FORCED LOAD SHARING

ONLINE SUPPLEMENT

http://www.ATSeries.net/PDFs/JA5054-00.pdf

INTRODUCTION

Multiple battery chargers are sometimes employed in dc power systems to provide redundancy. Two or more chargers of the same voltage rating can be connected in parallel, each of them capable of powering the connected dc load and charging the battery. If a battery charger should fail during normal operation, the parallel charger can continue to supply the entire required dc load current, and maintain charge on the battery.

When two (2) AT30s operate in parallel, they normally will not share the load current equally. Since any two chargers will have slightly different characteristics, one of the two chargers in a system will have a slightly higher dc output voltage, and will therefore assume more of the burden of providing necessary load current. This section describes an optional accessory for the AT30 which ***forces*** units to share dc load equally. The accessory (ordering p/n EJ5126-##) consists of an interconnecting cable to provide such communication, and operating instructions.

SYSTEM REQUIREMENTS

- The forced load sharing feature is designed only to work with two (2) AT30 Series battery chargers. You cannot force load sharing with three (3) or more AT30s.
- Both AT30s must have the same dc voltage & current rating, and have the same dc filtering.
- Both AT30s must have the same ac input source and the same phase rotation.
- Both AT30s must feature **Rev. 6** (or higher) builds of the Main Control PC Boards (A1), and corresponding (Rev. 6 or higher) software programs.
- Both AT30s must use the same the same program version, since the forced load sharing option has not been tested using different program versions in each unit. To view the program version, press the **LAMP TEST** button on the front instrument panel of the AT30. When you release the button, the front panel meter displays the version number for two (2) seconds.
- The interconnecting signal cable length should be no more than 50ft (15m).

INSTALLING THE INTERCONNECTION CABLE

The AT Series forced load sharing accessory is normally supplied by the factory with a standard 15ft (4.6m) interconnection cable). A 25ft (7.6m) long cable and a 50ft (15.2m) long cable are also available. The interconnection cable is terminated at each end with a 6-pin connector that mates with the plastic connector (J4) on lower-right corner of the Main Control PC Board (A1). One end of the cable features an extra jumper in the connector, and should be identified for use with the ***Secondary*** charger. The other end of the cable connects to the ***Primary*** charger. Either AT30 may be selected as Primary or Secondary, but you may wish to choose the unit that is more accessible to be the Primary. The Primary charger controls the dc output voltage of both AT30s.

You may run the interconnection cable through conduit if necessary. However, do not run the cable through the same conduit with power wiring. Do not remove the connectors in order to "fish" the cable through the conduit. Maximum pulling tension is 46 lb. (20.9kg). The cable has a plenum-rated outer jacket, and passes the NFPA 262 flame propagation test. Install the cable between the AT30s, and anchor it in place at both ends before connecting. Connect each end to the Main Control PC Boards (A1), inserting the connector into J4 until it is completely seated.

NOTICE

Power cabling for the battery charger, battery, and dc load interconnection is ***not*** supplied with the AT30 or the AT Series Forced Load sharing option. All user-supplied system wiring should meet National Electric Code (NEC) standards, as well as local/site codes. Confirm polarity of all dc cabling before making connections.

OPERATING THE AT30 WITH FORCED LOAD SHARING

Restore external power connections to both AT30s, and restart according to the normal procedure in the AT30 Operating and Service Instructions. After the AT30s restart, the Primary charger attempts to establish communication with the Secondary. If communication is successful, the AT30s behave as follows:

- The Primary charger displays the message **LS-P** (Load Share, Primary) on the front panel meter, alternating with the normal display of output voltage and current.
- The Secondary charger displays the message **LS-S** (Load Share, Secondary) on the front panel meter, alternating with the normal display of output voltage and current.
- The Primary charger controls all voltage settings for both AT30s. You may adjust any voltage (float, equalize, alarm settings, etc.) at the front panel of the Primary charger. The front panel of the Secondary charger will not allow any settings to be changed.
- If one AT30 loses ac power (or is turned off), the remaining charger returns to independent operation, whether it was originally the Primary or Secondary. For this reason, it is important to set up both AT30s initially for the same operating voltages. If an alarm condition occurs, both AT30s revert to independent operation for the duration of the alarm.
- In the event of a fault in the interconnection, or any other problem with communication, the AT30s return to independent operation, and the front panel on each charger displays the message **E 14**, indicating the fault.
- There is a delay of up to four (4) seconds for the two (2) AT30s to establish forced load sharing communication. If communication is broken (or power is lost for one charger), there is up to a four (4) second delay for the other charger to resume independent operation.
- If you need to interchange the Primary and Secondary chargers, simply reverse the interconnection cable.
- The presence of the interconnection cable (and a proper interconnection) forces the two (2) AT30s into load sharing. Controlling load sharing from the front panel is neither necessary nor possible.
- **⚠ WARNING** Never separate the AT30 from the dc bus while in forced load sharing mode.

WHEN TEMPERATURE COMPENSATION IS INSTALLED

The AT Series forced load sharing feature is compatible with the AT Series external temperature compensation accessory. Both AT30s must have a temperature probe installed, and the probes should be located as close as possible to each other. When AT30s are load sharing, the primary charger will determine the temperature-compensated voltage, and adjust the output accordingly. The voltage displayed by the master and secondary may be different, if either temperature probe is defective or not installed. A slight difference in the displayed voltages may also occur if the two probes are not located in close proximity of each other. See user ***Application Note*** (**JD5003-00**) for further details regarding temperature compensation.

TROUBLE SHOOTING

If the AT Series Forced Load Sharing option is installed, but the output currents of the AT30s are unequal, refer to the following table.

PROBABLE CAUSE	RECOMMENDED ACTION
1. Connection cable missing or installed incorrectly.	1. Ensure that the interconnection signal cable assembly is properly installed, and that the connector for the **Secondary** charger has the jumper as described at the top of page 3.
2. Incorrect connections to ac power sources.	2. Ensure that both AT30s are connected to the same ac supply and that source phase rotation is the same for both chargers.
3. Defective or improper Main Control Board (A1)	3. Replace the Main Control PC Board (A1) in one charger at a time, noting system requirements, to restore correct load sharing operation.

MANUAL SPECIFICATIONS

DOCUMENT NUMBER

The text and graphics contained within this manual are controlled by the battery charger manufacturer's internal part number (**JA5030-00**). The revision level and dates of this manual's text and graphics are listed below. These controls supercede all other available dates. The first two and last two pages 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 and last two pages of this manual refer to the cover artwork only.

DOCUMENT INFORMATION

Document Number:	**JA5030-00**
Revision Level:	**6C**
Engineering Change Number:	**23265**
Electronic Filename:	[JA5030-00.Rev6C.doc]
Last Date Saved:	[10/15/2014 10:28 AM]
Last Date Printed:	[10/15/2014 10:29 AM]

PARTS DATA PACKAGE

Any job-specific customized Parts Data Package report supplied with this battery charger and/or this manual supercedes the information featured in the standard parts list starting on page 62. The data in that particular document is applicable only to the battery charger featuring the same serial number listed on the Parts Data Package report.

DRAWINGS

A customized record drawing package is available for your AT30, featuring a unit-specific drawing list / data nameplate detail, outline drawing, itemized internal component layout, electrical schematic with component ratings, and a full connection diagram. If the standard drawings featured in this manual are not sufficient, please contact your Sales Representative for drawing availability from the battery charger manufacturer.

Any job-specific custom drawings supplied with your AT30 and/or this manual, supercede the standard drawings featured in Appendix C. The standard drawings and corresponding page numbers featured in this section may not be included with custom printed manuals, when job-specific custom drawings are supplied.

ONLINE AVAILABILITY

An unlabeled version of this operating and service instruction manual is available online at http://www.ATSeries.net/PDFs/JA0102-03.pdf. Other related product operating manuals, feature and accessory special instructions, standard drawings (including the ones listed in this manual), field service instructions, and product application notes for the **AT Series** microprocessor-controlled battery chargers and battery charger products are available online at http://www.ATSeries.net/. Saved in Adobe Acrobat Portable Document Format (PDF), they are readily available for downloading and printing.

If revision levels differ between the drawings embedded in this manual and the full online PDF drawings, refer to document with the higher revision level. For document availability of private-labeled manuals and/or standard drawings, please contact your sales representative or visit the web site listed on the **back cover** of this manual.

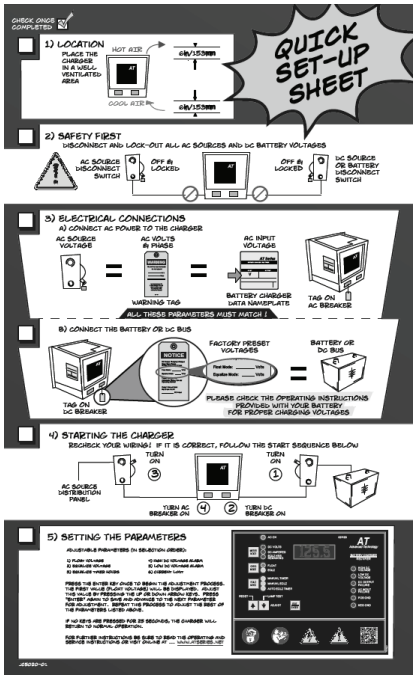
RELATED DOCUMENTS

Doc. No.	Online Hyperlink	Description
JA0102-01	http://www.ATSeries.net/PDFs/JA0102-01.pdf	AT10.1 G1 Manual (unlabeled)
JA0102-02	http://www.ATSeries.net/PDFs/JA0102-02.pdf	AT10.1 G2 Manual (unlabeled)
JA0102-03	http://www.ATSeries.net/PDFs/JA0102-03.pdf	AT30 Manual (unlabeled)
JA0102-04	http://www.ATSeries.net/PDFs/JA0102-04.pdf	AT Comm. Module Manual (unlabeled)
JA0102-05	http://www.ATSeries.net/PDFs/JA0102-05.pdf	AT-DC Dist Panel Manual (unlabeled)
JA5015-00	http://www.ATSeries.net/PDFs/JA5015-00.pdf	AT TempCo Probe Acsy. Instructions
JA5054-00	http://www.ATSeries.net/PDFs/JA5054-00.pdf	AT Forced Load Sharing Instructions
JA5098-00	http://www.ATSeries.net/PDFs/JA5098-00.pdf	AT Latching Alarm Relays Instructions
JA5108-00	http://www.ATSeries.net/PDFs/JA5108-00.pdf	AT Series Battery Open Alarm Instructions
JC5020-00	http://www.ATSeries.net/PDFs/JC5020-00.pdf	AT Series Charger Quick Setup Sheet
EJ5088-XX	http://www.ATSeries.net/PDFs/EJ5088-XX.pdf	AT Series Ground Detection Voltmeter
EJ5130-XX	http://www.ATSeries.net/PDFs/EJ5130-XX.pdf	AT Series Barrier Type Alarm Terminals
EJ5136-XX	http://www.ATSeries.net/PDFs/EJ5136-XX.pdf	AT Series Battery Discharge Alarm
EJ5137-XX	http://www.ATSeries.net/PDFs/EJ5137-XX.pdf	AT Series End Of Discharge Alarm
JA0091-03	http://www.ATSeries.net/PDFs/JA0091-03.pdf	AT30 Style-5018 Rack-Mtg. Instructions
JA0092-02	http://www.ATSeries.net/PDFs/JA0092-02.pdf	AT30 Style-5018 NEMA-2 Drip Shield
JA0092-03	http://www.ATSeries.net/PDFs/JA0092-03.pdf	AT30 Style-5030 NEMA-2 Drip Shield
JA0092-04	http://www.ATSeries.net/PDFs/JA0092-04.pdf	AT30 Style-163 NEMA-2 Drip Shield
JA0108-01	http://www.ATSeries.net/PDFs/JA0108-01.pdf	AT30 St-5018/5030 Cab. Padlock Acsy.
JA5060-03	http://www.ATSeries.net/PDFs/JA5060-03.pdf	AT30 Style-5018 Cabinet Heater Acsy.
JA5060-04	http://www.ATSeries.net/PDFs/JA5060-04.pdf	AT30 Style-5030 Cabinet Heater Acsy.
JA5063-00	http://www.ATSeries.net/PDFs/JA5063-00.pdf	AT30 Style-5018 Wall-Mtg. Instructions
JD0064-00	http://www.ATSeries.net/PDFs/JD0064-00.pdf	Preventative Maintenance Procedure
JD0064-01	http://www.ATSeries.net/PDFs/JD0064-01.pdf	AT Series Charger Start-up Procedure
JD5003-00	http://www.ATSeries.net/PDFs/JD5003-00.pdf	TempCo Probe Application Note
JD5008-00	http://www.ATSeries.net/PDFs/JD5008-00.pdf	AT Comm. Module Field Installation
JD5010-00	http://www.ATSeries.net/PDFs/JD5010-00.pdf	AT Power Res. (R3) Field Installation
JD5011-00	http://www.ATSeries.net/PDFs/JD5011-00.pdf	Ext. Free-Wheeling Diode Application Note
JD5012-00	http://www.ATSeries.net/PDFs/JD5012-00.pdf	Main Ctrl PC Board (A1) Field Installation
JD5015-00	http://www.ATSeries.net/PDFs/JD5015-00.pdf	Style-5018 Aux Alarm Relay Field Install
JD5016-00	http://www.ATSeries.net/PDFs/JD5016-00.pdf	Style-5030 Aux Alarm Relay Field Install
JD5017-00	http://www.ATSeries.net/PDFs/JD5017-00.pdf	Style-163/198 Aux Alarm Relay Field Install
DC5016-00	http://www.ATSeries.net/PDFs/DC5016-00.pdf	AT Series AC Input Current Tables
JD0052-00	http://www.ATSeries.net/PDFs/JD0052-00.pdf	Battery Discharge Dual Operation Note
JD5006-00	http://www.ATSeries.net/PDFs/JD5006-00.pdf	Alt. & Temp. De-Rating Application Note
JD5013-00	http://www.ATSeries.net/PDFs/JD5013-00.pdf	AC Ripple Specification Application Note
JD5032-00	http://www.ATSeries.net/PDFs/JD5032-00.pdf	Ground Fault Detection Application Note
JF5039-00	http://www.ATSeries.net/PDFs/JF5039-00.pdf	AT10.1/AT30 3rd Party Agency Approvals
JF5045-00	http://www.ATSeries.net/PDFs/JF5045-00.pdf	Proper Sizing of Industrial Battery Chargers

QUICK SET-UP

Scan this QR Code…

…for a handy guide which will lead you through a quick setup of the industry's most USER-FRIENDLY battery charger!



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