APPLICATION NOTE NUMBER 19
NRG TROUBLESHOOTING GUIDE

Introduction

This Application Note describes how to troubleshoot NRG battery chargers. Each section demonstrates how to troubleshoot a specific alarm.

Definitions

The following abbreviations are used throughout this guide:

AC – Alternating Current (House Voltage)
DC – Direct Current (Battery Voltage)
DVM – Digital Volt Meter
LED – Light Emitting Diode

Symptom: AC Fail LED Illuminated

AC Fail indicates that the charger is not receiving proper AC voltage.

1. AC Fail Possible Cause 1: AC voltage selection switch does not match actual AC voltage (see Figure 1)

   CHECK: Using a DVM, verify that the AC voltage selector switch matches the voltage range measured at the AC input.

   SOLUTION: Change the selector switch setting if necessary.

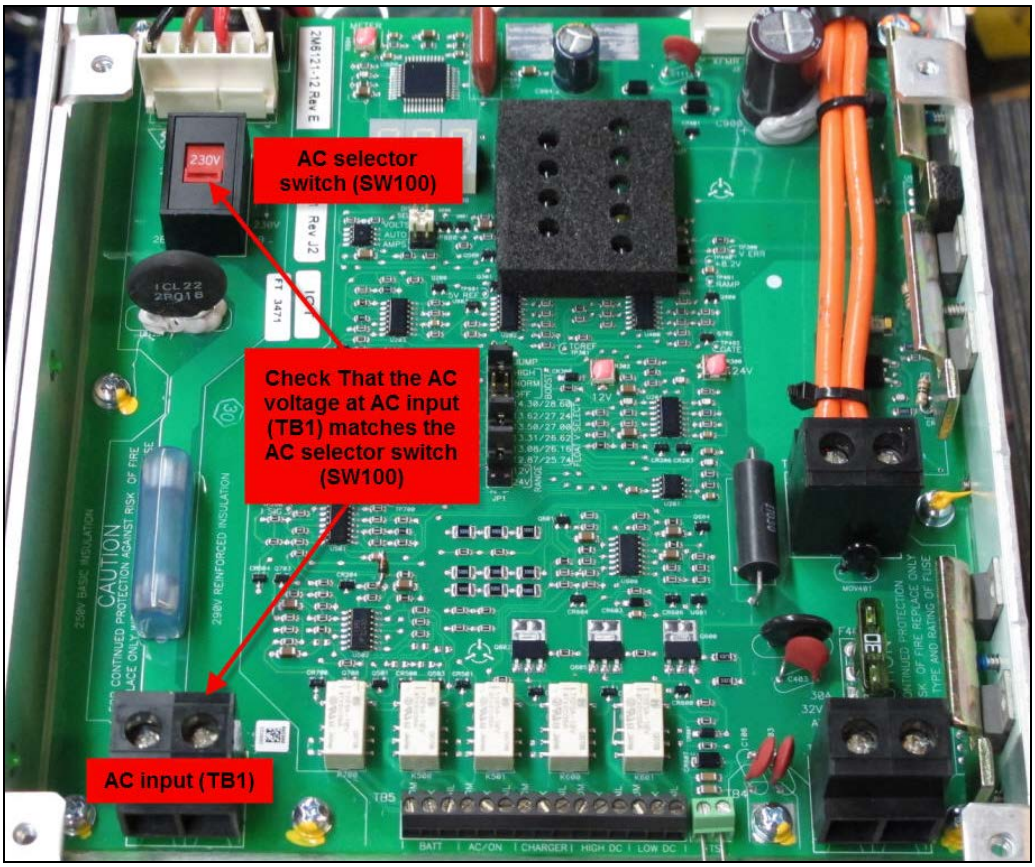

Figure 1

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2. AC Fail Possible Cause 2: Open AC fuse (see Figure 2)

   CHECK: Remove the AC fuse from the charger and verify a short with a DVM in continuity mode.

   SOLUTION: If the fuse is open, replace it with a fast blow AGC 10 Amp fuse for NRG 10 Amp models or a fast blow AGC 15 Amp fuse for NRG 20 Amp models. Do not use a fuse that is larger than recommended.

3. AC Fail Possible Cause 3: Circuit board damage (see Figure 2)

   CHECK: Using a DVM, check AC voltage at connector J1. For 115 VAC input, the voltage measured from Black to Red wires and then Brown to White wires should be approximately 115V each. For 230 VAC input, the voltage measured from Black to White wires should be approximately 208-240 VAC.

   SOLUTION: Replace control circuit board.

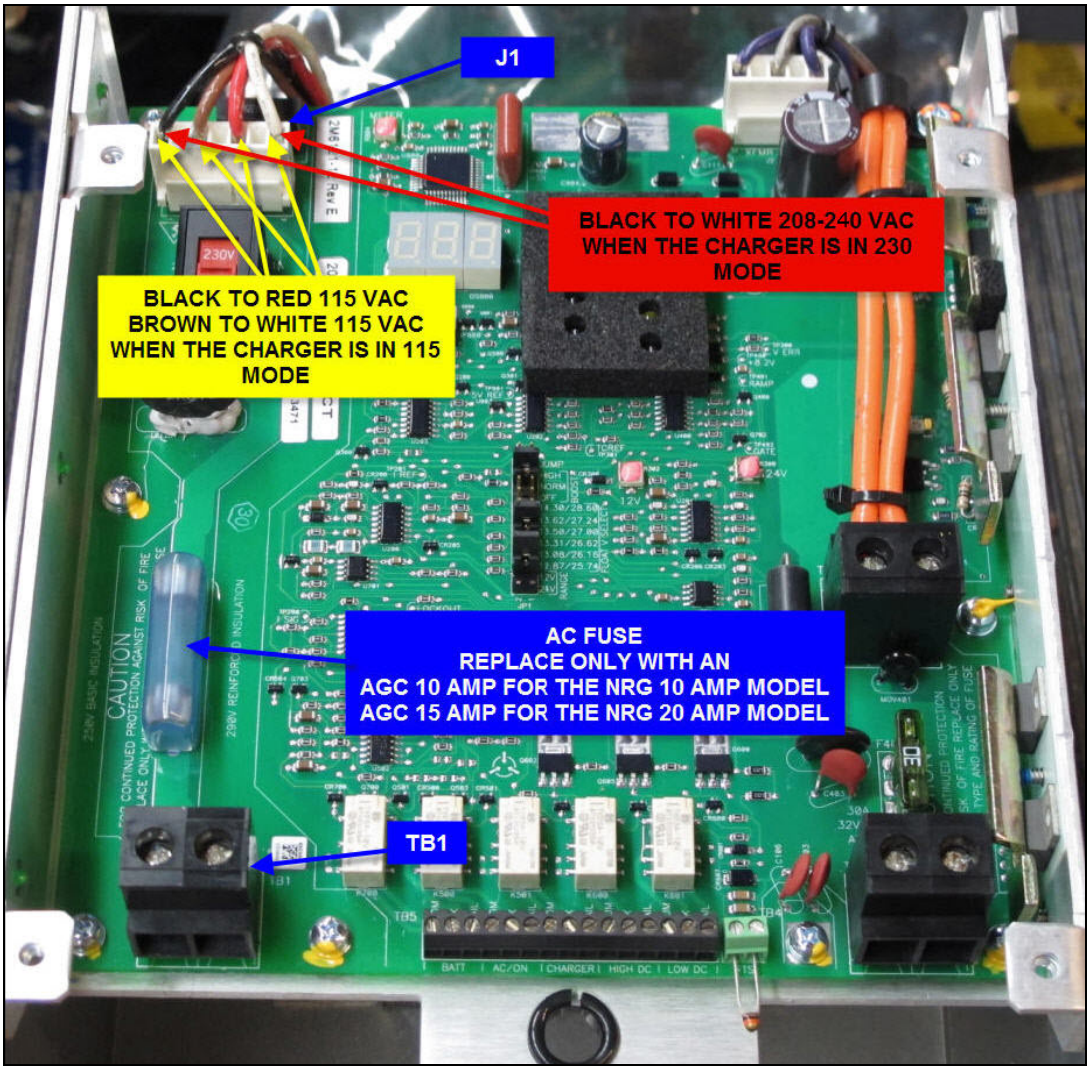

Figure 2

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4. AC Fail Possible Cause 4: Transformer failure (see Figure 3)

CHECK: Using a DVM, check AC voltage at connector J2 and terminal block TB2. The voltage measured across J2 pins 1 and 2 and then across pins 2 and 3 should be approximately 17 VAC each. The voltage measured at TB2 should be approximately 37 VAC.

SOLUTION: If AC voltages are not present at J2 and TB2 and Possible Causes 1, 2 and 3 have already been checked, the transformer should be replaced.

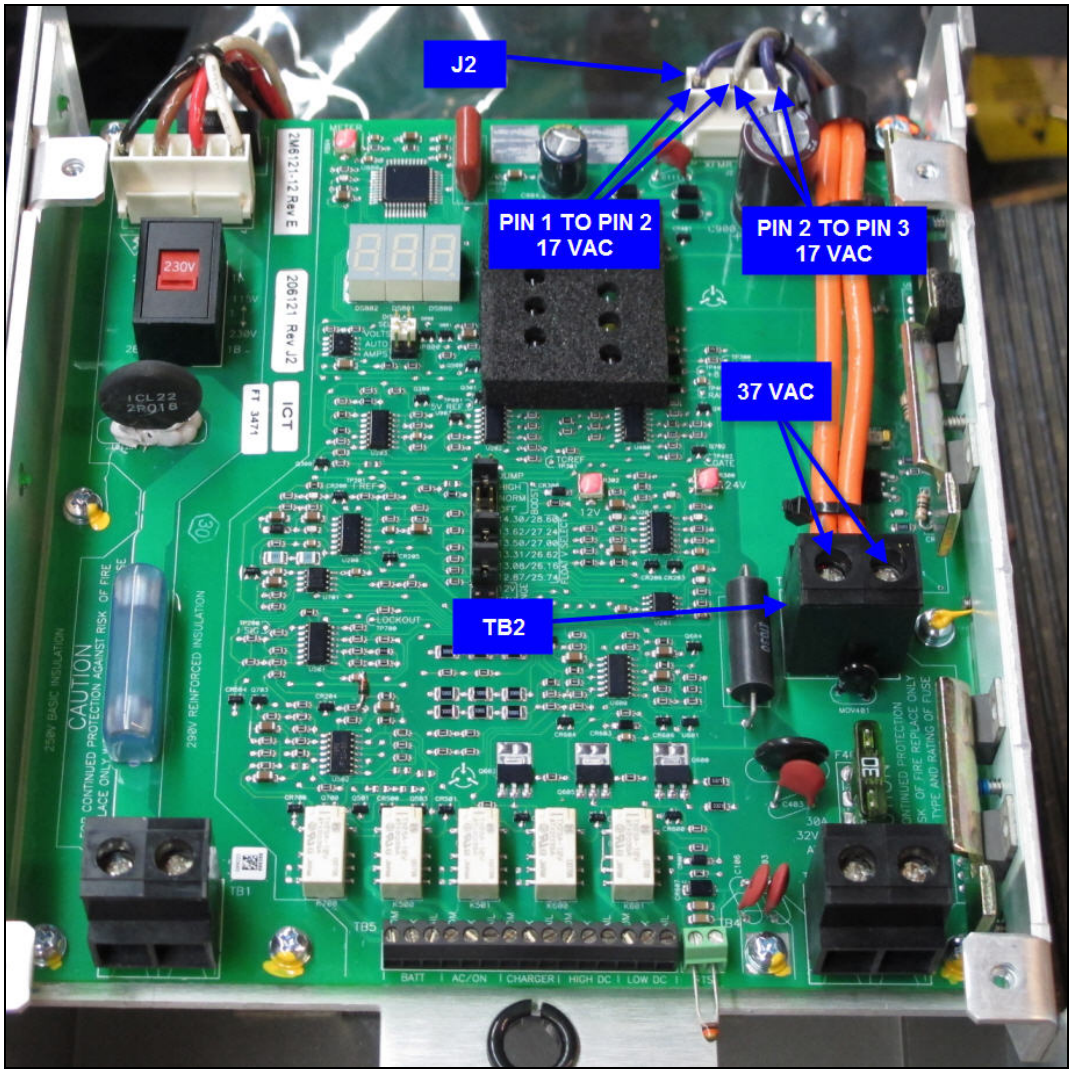

Figure 3

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Symptom: Low DC LED Illuminated

Low DC indicates that the battery voltage sensed by the charger at DC output terminal block TB3 is less than 12 VDC for 12 VDC mode or less than 24 VDC for 24 VDC mode.

1. Low DC Possible Cause 1: Incorrect battery mode setting (see Figure 4)

   CHECK: Using a DVM, measure voltage at DC output terminal block TB3. The Low DC LED will illuminate if the charger is in 24 Volt mode and connected to a 12 volt battery.

   SOLUTION: Move the voltage range jumper at JP1 on the control circuit board to the 12 Volt position.

2. Low DC Possible Cause 2: Discharged or Defective battery (see Figure 4)

   CHECK: With a discharged battery (voltage below 12 or 24 VDC, accordingly), the charger should be operating at full output current (10 amps or greater on 10 amp chargers and 20 amps or greater on 20 amp chargers). Over time, the charger output voltage at terminal block TB3 should increase and the output current should decrease as the battery is recharged.

   Note: With the Boost jumper on JP1 in the "NORM" position, the DC voltage will increase to 6.5% above the Float voltage value before the DC current will start to go down.

   SOLUTION: If the voltage at TB3 does not increase, the battery is defective and should be replaced.

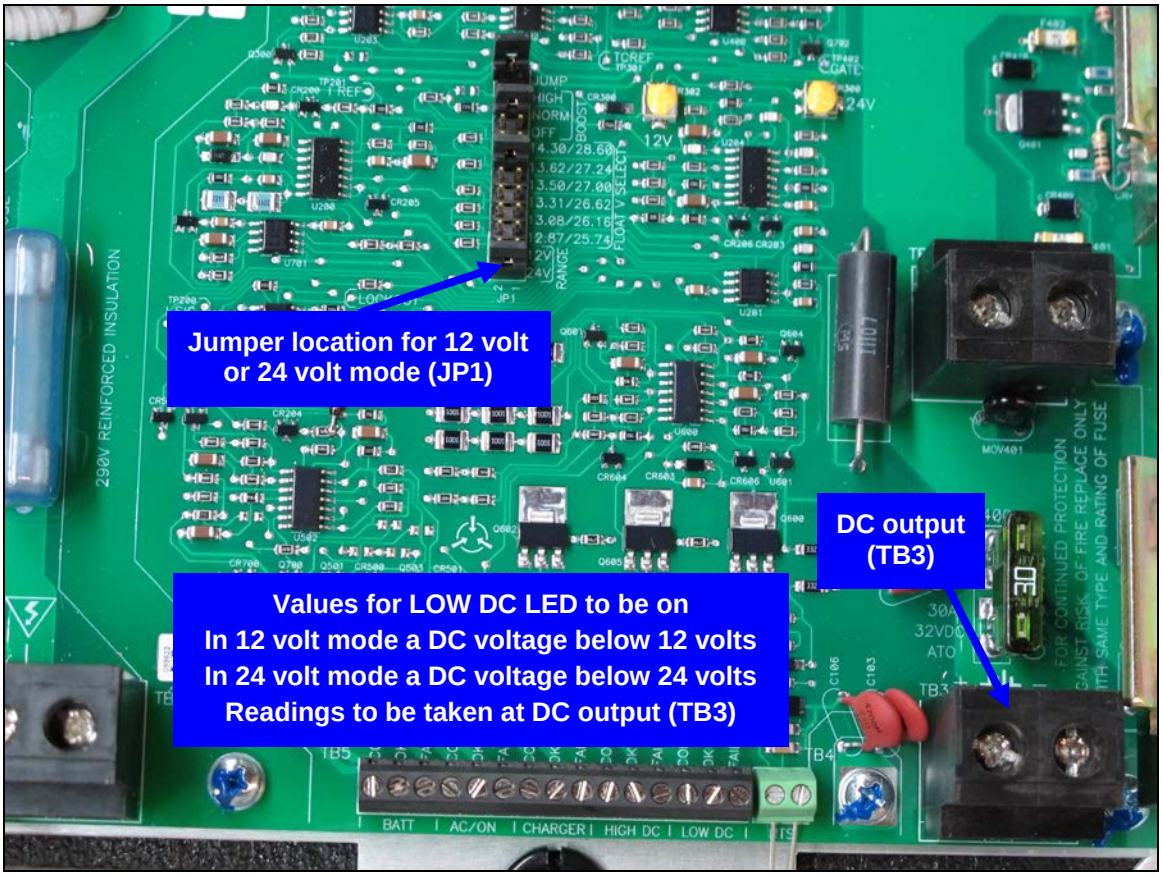

Figure 4

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Symptom: High DC LED Illuminated

High DC indicates that the battery voltage sensed by the charger at DC output terminal block TB3 is higher than 17 VDC for 12 VDC mode or higher than 34 VDC for 24 VDC mode.

1. High DC Possible Cause 1: Incorrect battery mode setting (see Figure 5)

   CHECK: Using a DVM, measure voltage at DC output terminal block TB3. The High DC LED will illuminate if the charger is in 12 Volt mode and connected to a 24 volt battery.

   SOLUTION: Move the voltage range jumper at JP1 on the control circuit board to the 24 Volt position.

2. High DC Possible Cause 2: Secondary charging source (see Figure 5)

   CHECK: The High DC LED will illuminate if there is another charging source in the system that is producing voltages higher than High DC values (voltage above 17 or 34VDC, accordingly).

   SOLUTION: Isolate the external charging source from the charger.

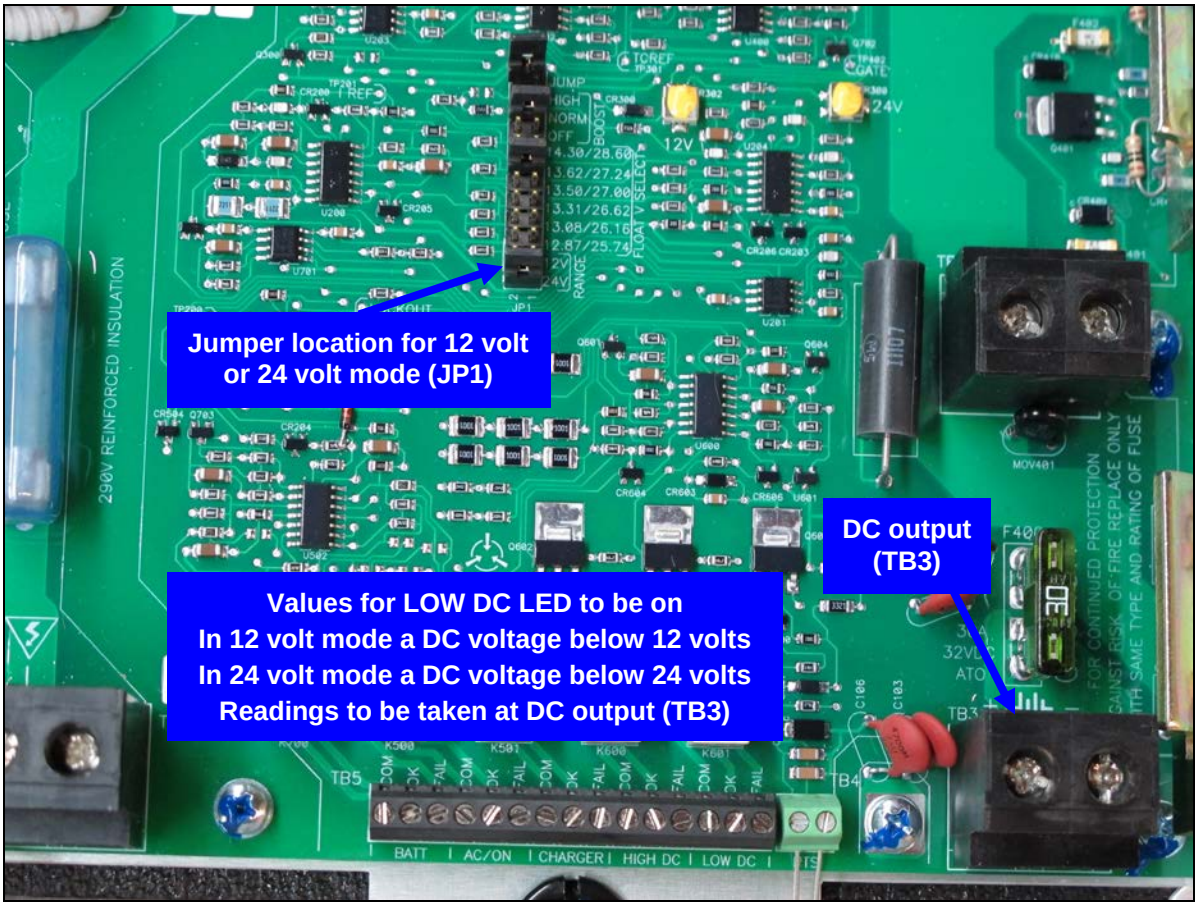

Figure 5

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Symptom: Battery Fault LED Illuminated

Battery Fault indicates that the battery voltage sensed by the charger is incorrect.

1. Battery Fault Possible Cause 1: Open battery (see Figure 6)

   CHECK: Using a DVM, verify that the battery voltage at DC output terminal block TB3 matches the voltage at the battery posts.

   SOLUTION: If the voltage does not match, connect the battery to the charger.

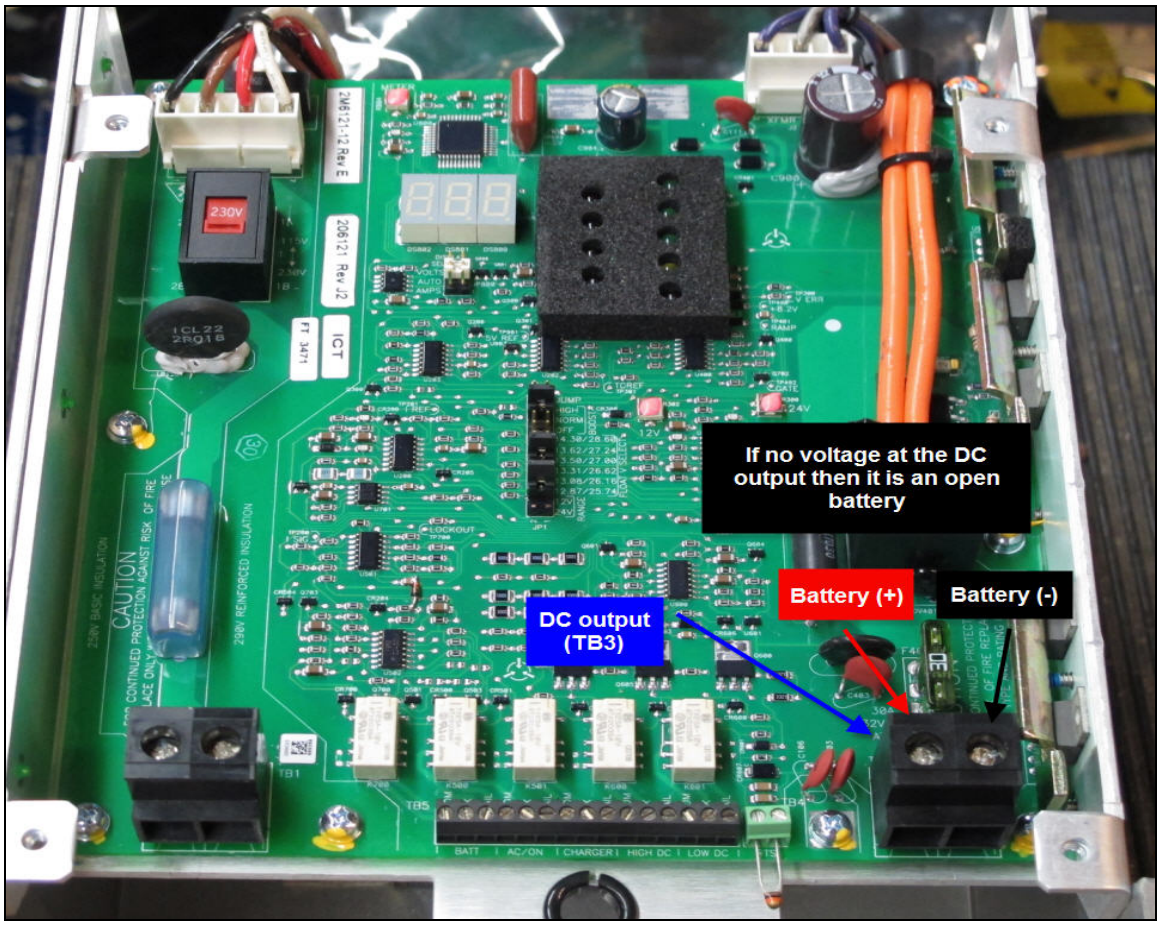

Figure 6

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2. Battery Fault Possible Cause 2: Open DC fuse (see Figure 7)

   CHECK: Remove the DC fuse from the charger and verify a short with a DVM in continuity mode.

   SOLUTION: If the fuse is open, replace it with an automotive style 30 Amp fuse for NRG 10 Amp models or an automotive style 40 Amp fuse for NRG 20 Amp models. Do not use a fuse that is larger than recommended.

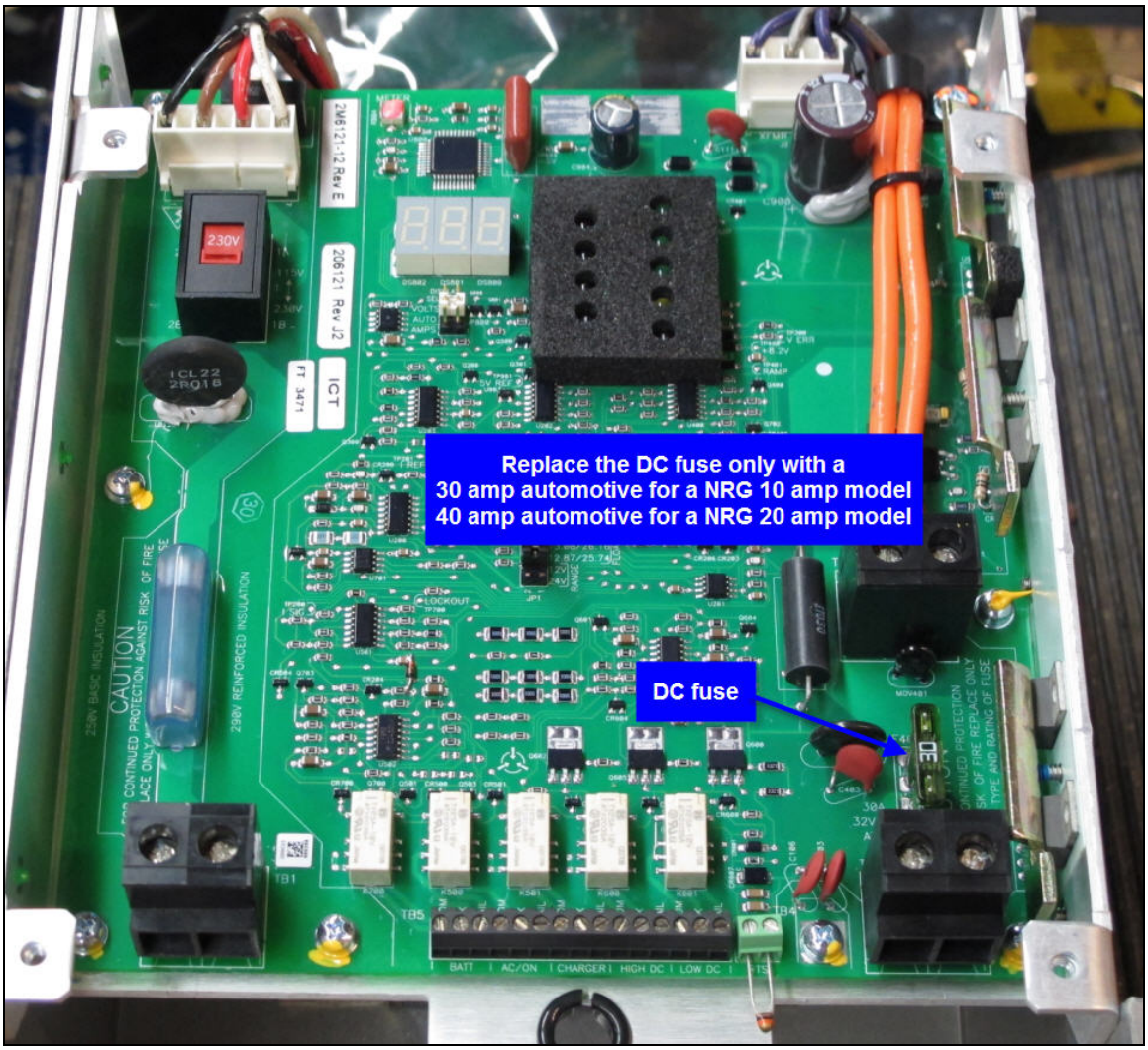

Figure 7

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3. Battery Fault Possible Cause 3: High resistance in battery leads

   CHECK: The Battery Fault LED may flash approximately once every 60 seconds when there is high resistance in the cables to the battery. The most common cause of this problem is cable runs that exceed the proper length for the cable gauge being used. In some cases where the resistance is not too far above maximum, the charger may recover after some time (approximately 10 minutes) and start charging the batteries.

   SOLUTION: Change the cable gauge to properly correspond with the necessary cable length.

4. Battery Fault Possible Cause 4: Defective battery

   CHECK: If the charger is operating at low output voltage and full output current (10 amps or greater on 10 amp chargers and 20 amps or greater on 20 amp chargers) for an extended period of time (more than 24 hours), the battery is likely shorted. If the charger is operating at higher than normal output voltage with no current draw, the battery may have an open cell. If desired, disconnect the charger from the battery while a load is applied to the battery. If the battery voltage drops significantly, the battery is damaged. This can also be tested using a Load Tester.

   SOLUTION: Replace the battery

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5. Battery Fault Possible Cause 5: Discharged battery (see Figure 8)

CHECK: Using a DVM, measure the DC output voltage at terminal block TB3. The Battery Fault LED indicates a discharged battery if the voltage is less than 9 VDC for a 12 volt charger or less than 18 VDC for a 24 volt charger.

SOLUTION: Use the charger's "Jump" feature by placing the spare jumper in the "JUMP" position on JP1 of the control circuit board.

NOTE: See "SENS Application Note 17" appended at back for information regarding the NRG charger Jump feature.

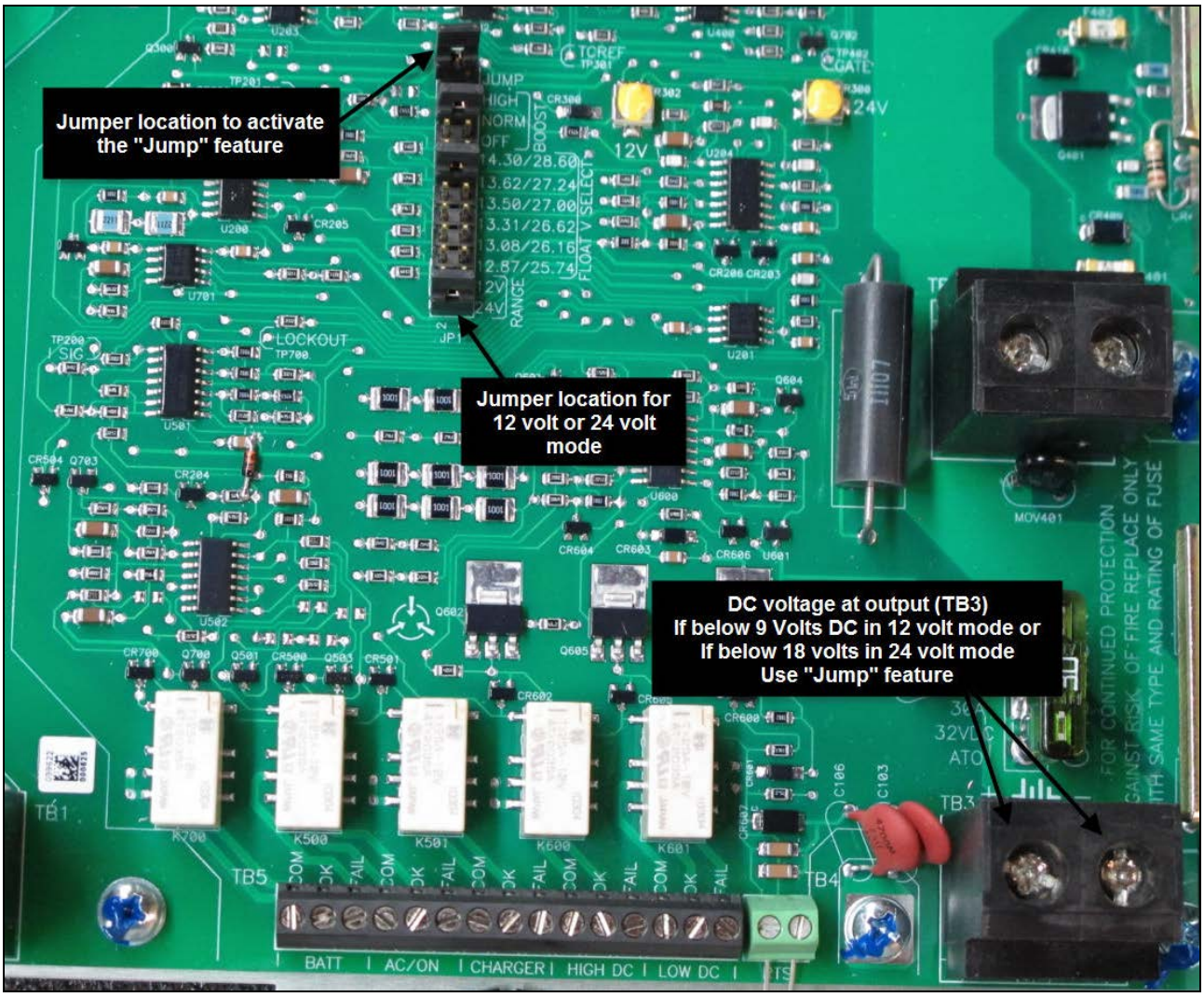

Figure 8

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6. Battery Fault Possible Cause 5: Reverse battery (see Figure 9)

   CHECK: Using a DVM, verify the polarity of the battery at DC output terminal block TB3. Battery (+) should be connected to the left terminal and Battery (-) to the right terminal.

   SOLUTION: Correct battery connection polarity.

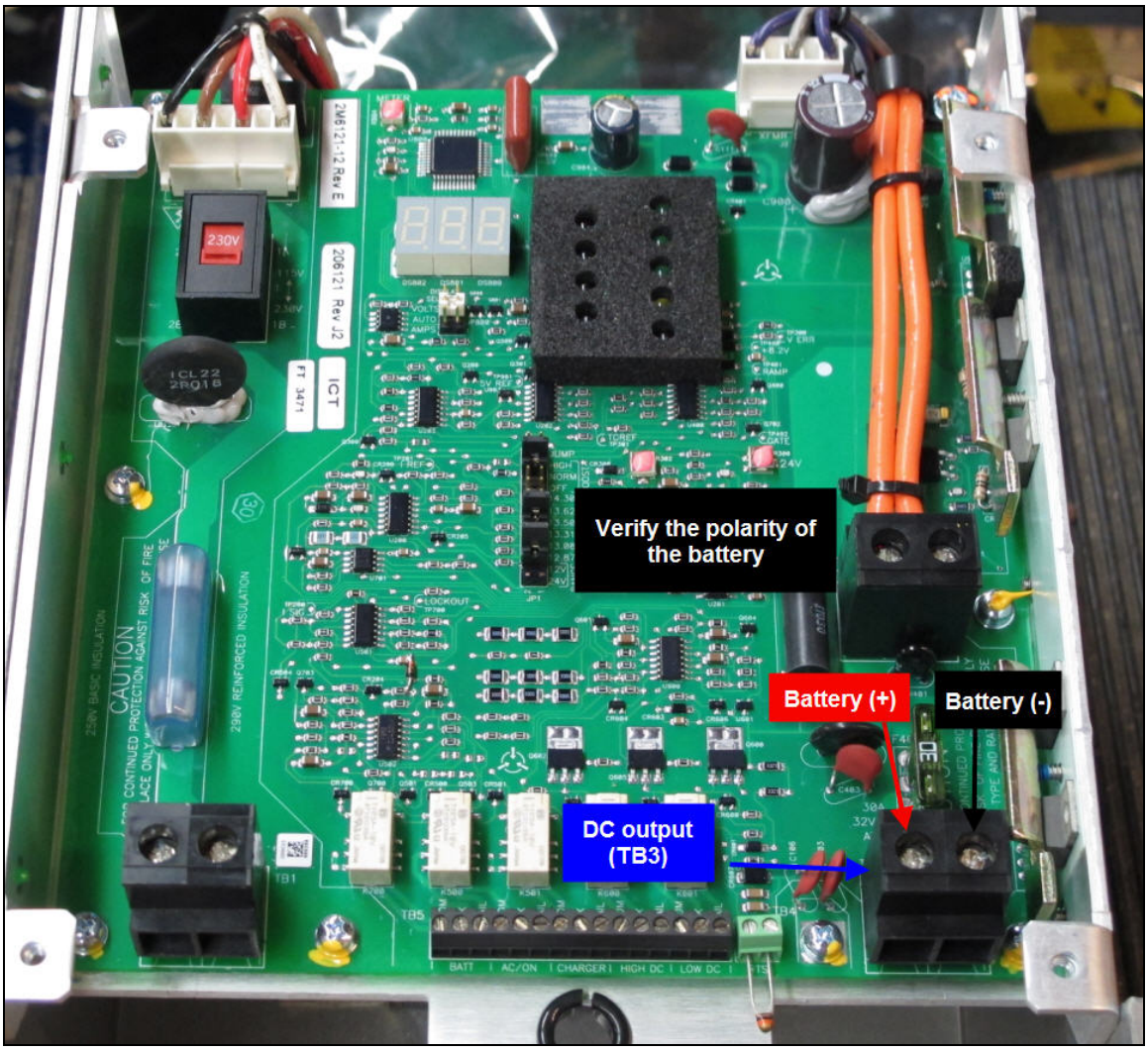

Figure 9

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Symptom: Charger Fail LED Illuminated

Charger Fail indicates the charger is detecting that it should produce output yet is unable to do so.

1. Charger Fail Possible Cause 1: AC voltage produced by transformer is not correct (see Figure 10)

   CHECK: Using a DVM, verify the AC voltage measured at terminal block TB2 is approximately 37 VAC.

   SOLUTION: Replace transformer

2. Charger Fail Possible Cause 2: A loose connection at terminal block TB2 (see Figure 10)

   CHECK: Without AC voltage applied to charger, verify both wires at TB2 are securely attached. Pull on one wire at a time to verify a tight connection.

   SOLUTION: Connect the wires securely to TB2.

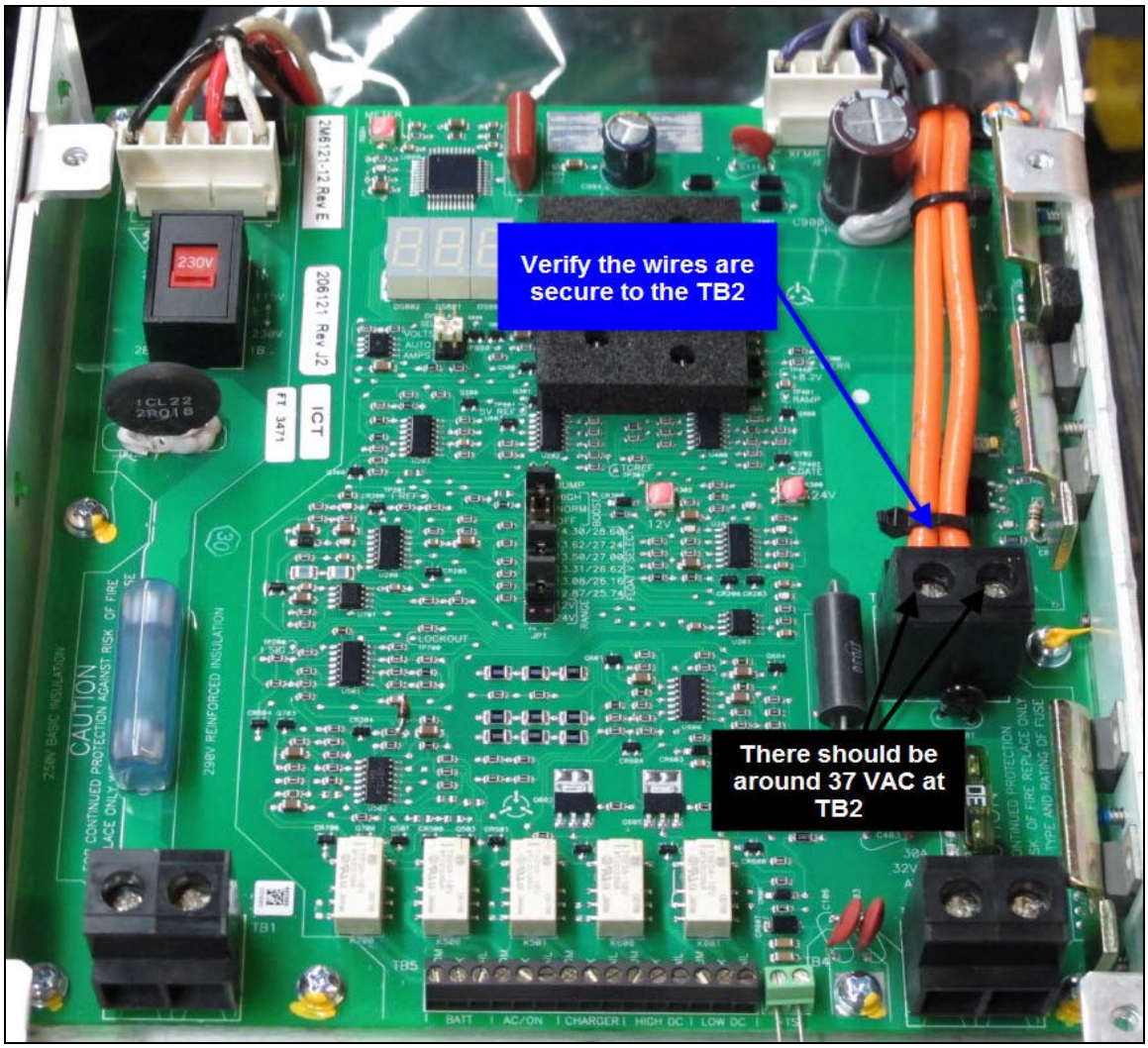

Figure 10

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APPLICATION NOTE NUMBER 17
NRG CHARGER JUMP FEATURE

Introduction

This Application Note describes the function and usage of the JUMP feature included with NRG chargers.

NRG Built-in Protection Features

The NRG charger is equipped with Battery Fault protection such that it automatically checks battery voltage before power-on startup. If battery voltage is either too high or too low, the charger enters a "lockout" period for approximately 10 seconds before attempting an automatic restart. This feature helps identify and protect against reversed polarity of the DC wiring and/or when the battery voltage does not agree with the charger RANGE jumper setting (used to select 12 or 24V, see Figure 1).

The JUMP feature may be used to override this lockout and start charging or commissioning a discharged battery.

What is the JUMP feature?

The JUMP feature allows initial charging/commissioning of nickel cadmium or lead acid batteries supplied from the manufacturer dry and discharged, from a zero charge state. Initial charging/commissioning requires a higher output voltage than normal. By overriding Battery Fault lockout, the JUMP feature allows for (but does not provide) this necessary voltage.

The JUMP feature can also be used when recharging excessively discharged batteries already in service. Please consult the battery manufacturer to determine if the battery can safely be recharged from a discharged state.

How to use the JUMP feature

To initially charge/commission zero charge batteries, place the spare jumper (extra jumper provided with charger) in the JUMP position on JP1 of the charger circuit board (see Figure 1). Operate the charger long enough to retain more than 1.5V/cell for lead acid and 1.0V/cell for nickel cadmium batteries or until the charger returns to FLOAT MODE (FLOAT MODE LED will be green). See SENS Application Note 10 to finish fully commissioning the batteries, as using the JUMP feature alone is not sufficient.

Once the batteries are fully charged, the jumper may be removed or left in the JUMP position permanently. The jumper may remain in the JUMP position permanently to ensure that the charger is able to recharge very low or dead batteries (in the event of a prolonged AC power outage or a generator left unused for an extended period of time). If battery voltage is below 9V (12V system) or 18V (24V system) when AC power is restored and the JUMP feature is not activated, the charger will go into Battery Fault (alarm state that disables charger). In this situation the charger will not charge the batteries. If the JUMP feature is enabled when AC power is restored, the charger will begin charging. Depending on the battery state of charge, the charger may go into Battery Fault and remain so for some period of time (generally 12 – 24 hours) while the batteries are slowly charged. The Battery Fault LED will cycle (approximately once every minute) during this time. Once Battery Fault stops cycling, the charger will return to FLOAT or BOOST MODE as normally demanded.

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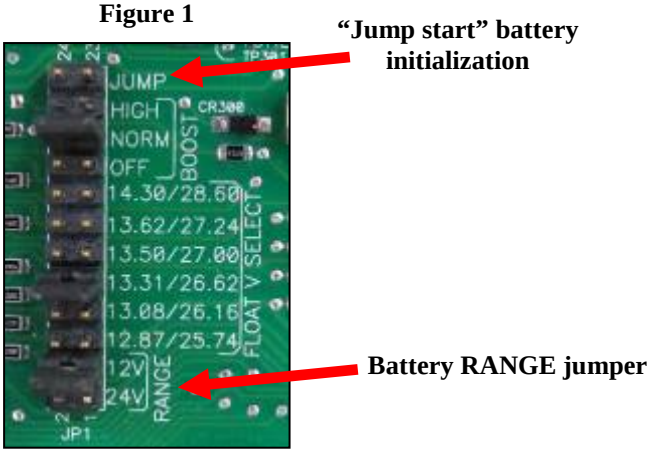
Figure 1



Are there any risks to using the JUMP feature?

As described above, leaving the JUMP feature enabled permanently works well, but only when a charger is correctly set for a 12V or 24V application. The JUMP feature disengages the battery voltage interlock, which senses correct battery voltage (12 or 24V) based on the RANGE jumper setting (see Figure 1). Using the JUMP feature increases the risk of accidentally overcharging 12V batteries with 24V settings (in the event that a 24V battery is replaced with a 12V battery or the charger is moved to a 12V application). Thus, leave a jumper in the JUMP position only if the voltage setting for the charger is definite and not likely to change.

WARNING:

INCORRECT CHARGE VOLTAGE WILL
ACCELERATE GENERATION OF EXPLOSIVE GASES,
INCREASING THE RISK OF FIRE OR EXPLOSION.

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