13. <u>Charge Controller Operation Check</u>

Once the charge device is plugged into the charge controller identify your installation below. Verify proper operation by observing lights on charge controller.

NOTE: Most batteries will not be completely charged when first connected and the charge light should come on when charge controller is first connected. The fully charged light will come on once battery is fully charged.

For solar installations the charge controller is designed to only charge the battery when there is enough sun to do so. If there is no sun then the lights on the charge controller should be “OFF”. This feature reduces the drain on the battery in solar installations.

For AC installations the external power light and charge indication lights are always active.

NOTE: If the ‘Detect” light is on and stays on the battery is not connected to the charge. Verify harness is plugged into the charger.

1. L.E.D. DISPLAY

First 3 seconds upon Charger/Controller powered from Battery or Supplied Power Supply, the Battery Status Light Emitting Diode (L.E.D.) Flashes.

1.1. L.E.D. Description

EXTERNAL POWER ADAPTOR	Illuminates continuously while power from A.C. Power Supply Adaptor is sensed.
SOLAR PANEL	Illuminates continuously while power from Solar Panel is sensed.
DETECTION	If illuminated for longer than 2 seconds check connection on battery.
CHARGING	Continuous or flashing indicates charging – refer to Charge Algorithm Section, for further details.
CHARGED	On continuously when AC present and battery fully charged. Flashes when battery capacity is low.
SYSTEM ERROR	If flashing, the charger has entered Failure Mode. Disconnecting power will reset charger, but if source of failure is not corrected, Failure Mode will occur again.- refer to the following Table to **Decode the Error Type:**

	L.E.D.s (First 4 L.E.D.s from Left)			
	1st	2nd	3rd	4th
Wrong Battery Voltage	Off	Off	Off	Flash
Reverse Battery Connection	Off	Off	Flash	Off
Thermal Runaway Condition	Off	Flash	Off	Off
Charge Time Monitor - 1	Off	Flash	Flash	Off
Charge Time Monitor - 2	Off	Flash	Flash	Flash
Excessive Battery Drain	Flash	Off	Off	Off
Failed Pre-Qualification Test -1	Flash	Off	Off	Flash
Failed Pre-Qualification Test -2	Flash	Off	Flash	Off

2. POSSIBLE REMEDIES TO FIX 'FAILURES'

WRONG BATTERY VOLTAGE
Example: Charger connected to a 24v battery. Reconnect to a battery rated at 12Vdc.
REVERSE BATTERY CONNECTION
Check and correct any reverse battery.
THERMAL RUNAWAY CONDITION
Old Battery - cells, inside battery, age differently. During charging, and over the course of many years of operation, OR, many battery discharges to levels beyond 100% discharged, this error may occur and the battery(s) may have to be replaced.
CHARGE TIME MONITOR – 1 and 2
Battery pack took too long to complete its charge. Possible causes include a load (gate cycling repeatedly for a long period of time) during charging or the battery pack is too large (Many batteries connected in a parallel circuit). Apply the following formula to determine if the Timer may run out due to a large battery:

$$\textbf{Charge Time} = \frac{\textbf{Battery Capacity (AH)}}{\textbf{2}} \times \textbf{1.25}$$

Calculated Charge Time must be less than approximately 108hrs.

Output Amps and Battery Capacity (AH - Ampere-hour) are listed on your battery or contact your battery purchasing source.

Example: Charge time to for a fully discharged 36 AH battery: 36AH / 2 Amps x 1.25 = 22.5 Hrs - ok to use.

EXCESSIVE BATTERY DRAIN
Excessively high number of cycles discharging the battery beyond point of no return. Stop gate, and allow battery time to recharge.

PRE-QUALIFICATION TEST - 1 and 2
During Battery testing, if a battery was previously allowed to discharge to a very low voltage, such as 1 or 2Vdc, the charger puts a low current through the battery to try to get the battery to come back to life. The battery may be taking too long to come back.

OTHER POSSIBLE PROBLEMS
No Power on Charger – Check the transformer Supply Adaptor Plug-in, or the Solar Panel for proper connection.

3. CHARGE ALGORITHM

3.1. PRE-QUALIFICATION TEST STAGE ONE
Charging L.E.D. flashes and applies three battery tests. Further charging is prohibited if a fault is discovered. If a faulty battery is suspect, test with a Load Tester (not supplied). Duration of this stage is dependent on the condition and state of charge of battery and is approximately 45 seconds to 8hrs.

3.2. CONSTANT CURRENT CHARGE STAGE TWO
Charging L.E.D. illuminates constantly indicating that the charger is charging the battery at its full rated output.

3.3. CONSTANT VOLTAGE CHARGE STAGE THREE
Charging L.E.D. illuminates constantly indicating that the charger is charging the battery at a regulated voltage level to top off battery.

3.4. FLOAT CHARGE STAGE FOUR
Charged L.E.D. illuminates constantly. Charger will maintain battery until AC Power is disconnected and can be left connected indefinitely.

3.5. RECYCLE CHARGE STAGE FIVE
While left connected to AC Power and Battery, a new charge cycle is automatically initiated, every 84th day.

4. MAINTENANCE

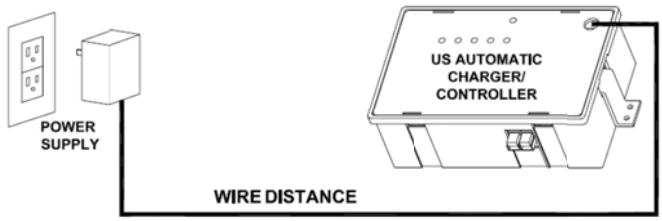
Your new charger requires only a little maintenance. Store in a clean, dry place and occasionally clean the case and cords (while the charger is unplugged) with a slightly damp cloth.

10. SOLAR PANEL INPUT

10.1 The Solar Panel produces a lower powered output than the AC Power Supply Adaptor, which causes the Solar Panel L.E.D. to illuminate when it is connected.

10.2 The Solar Panel needs to be mounted so that it receives full sunlight. Even a small amount of shade or blockage will cause the Solar Panel to Cease charging. Something as tiny as a fingertip shadow will affect the Solar Panel.

11. RECOMMENDED WIRE GAUGE OVER LONG DISTANCE BETWEEN CHARGE DEVICE AND CHARGE CONTROLLER



WIRE DISTANCE AND GAUGE TABLE

See page 16

The wire used must be rated for Direct Burial use, unless in conduit. Wire ran in conduit must be rated for outdoor use. The above Table lists the recommended wire gauge per application length. Using a smaller gauge may impede performance or cause system to malfunction.