NRG INSTRUCTIONS

FAA Obstruction Lighting for NRG Systems TallTowers™

Authors:
Technical Services

TABLE OF CONTENTS

REFERENCES

Federal Aviation Administration Advisory Circular AC 70/7460-1L

Flash Technology's <u>Vanguard Red FTS 371 Product Manual Rev 3</u>

Flash Technology's Return Material Authorization (RMA) Policy

NRG Systems' 80 meter XHD TallTower™ Installation Manual

Federal Aviation Administration Form 7460 Part 1 and 2 Applications

INTRODUCTION

Understanding FAA Lighting Requirement

80 meter meteorological ("met") towers, and generally any structure over 200 feet, require specific obstruction marking for aviation safety by the Federal Aviation Administration (FAA) in the United States. The marking standards and options are covered under FAA Advisory Circular (AC) AC 70/7460-1L.

FAA Filing Process

Tower owners or their representatives will need to complete Form 7460 Part 1 and 2 applications with the FAA to determine how structures will be marked. Tower owners should contact the FAA directly to obtain this application.

NRG Systems' solution for marking temporary met tower structures that is consistent with FAA regulations is paint for day marking and red flashing medium intensity lights (L-864 with L-810) for night marking.

FAA has a third party administered certification program for obstruction lighting systems under AC 150/5345-43F. Administered by Intertek, this certification program provides operational, electric, and environmental standards for specific lighting applications. This is the specification standard for obstruction lighting systems used in the USA. Canada and other countries with aviation standards similar to those used in the USA, but the preferred options for marking structures may differ.

Products that pass this FAA certification testing are given a certificate of conformance and ETL (Electrical Testing Labs) stamp and are then listed in a product specific section of the FAA AC 150/5345-53C addendum. This listing provides evidence of certification under FAA regulations, and it is updated every 30 days.

FAA Functional Requirements

FAA has detailed specifications for PV-solar systems to power obstruction lighting systems under its Engineering Brief No. 76. A critical part of this operational standard requires seven days of minimum operational autonomy with little or no recharge of batteries.

FAA requires a 30 minute resolution of light failures/outages under AC 70/7460-1L Chapter 2. Light outages not resolved in 30 minutes require a Notice to Airmen (NOTAM) to be filed with the FAA flight system for 15 days. At the end of 15 days, the NOTAM expires off the system, unless it is extended by owner or their representative.

The ultimate issue for owners of met structures and wind turbines is regulatory compliance and mitigation of liability risk in the event of an aviation accident with injuries and/or deaths. There is significant financial liability risk should regulatory and safety issues not be addressed properly.

NRG Systems' PV Power Supply Solution

NRG Systems provides an autonomous system of batteries and photovoltaic (PV) panels along with an integrated controller and monitoring system. Our power supply was specifically designed to meet the needs of this fully integrated lighting system.

The PV systems are designed to have 7 days of autonomy without recharge to comply with Engineering Brief No. 76. However, during extended cold temperatures and/or extended cloudy, snow blowing, fogging, etc. the batteries could drain faster. This is why it is essential to have the monitoring service included.

The Customer must complete and include the Site Monitoring Detail provided by Flash Technology or NRG Systems for each of the Covered Service Locations prior to installation. The Argus ON National Operations Center will not be responsible for monitoring a site until the Site Monitoring Detail has been provided. Once the NOC receives a Site Monitoring Detail form and the equipment is installed by the customer and tested by the NOC, Flash Technology will email a Notice of Monitoring confirmation. The Customer assumes ALL monitoring responsibility until receipt of Notice of Monitoring confirmation.

TallTower History

NRG TallTowers™, the original tilt-up tubular towers, were first introduced in 1982 and quickly became the industry standard to quickly and easily get sensors up and into the wind to start measurements. TallTowers are delivered in complete kits, assembled on the ground and then tilted up and secured with guy wires.

The 80-meter XHD is the first NRG TallTower to require FAA lighting per FAA Advisory Circular (AC) AC 70/7460-1L.

Experience Required

Previous experience installing other TallTowers is required for successful installation of FAA obstruction lighting for the 80m XHD TallTowers. If you have no prior experience with TallTower installation, seek assistance from an NRG qualified installer or contact NRG for more information.

Using This Manual

This manual provides general instructions for the installation of the L-864 beacon light, the L-810 mid-level side marker lights, and the PV power supply.

Technical Support

Technical support for installation of the lighting system is provided by NRG Systems Technical Support support@nrgsystems.com Issues related to the monitoring system or individual lighting system components are supported by the light manufacturer, Flash Technology (http://www.spx.com/en/flash-technology/ tel: 615-503-2000 or 888-315-5274).

WARNING AND NOTICES

Notes throughout the document.

Warnings throughout the document.

MATERIALS & TOOLS

In the Kit(s)

Tools required for various tasks

- ¾-inch socket and ratchet
- ¾-inch open end wrench
- 9/16-inch socket
- 9/16-inch open end wrench
- Band cutters
- Chicago grip
- Come-along
- 3mm screw driver
- Wire strippers
- 4 foot iron bar (to screw in anchors) or mechanical equipment

PROCEDURE

INSTALLATION OF LIGHTS AND BRACKETS ON NRG 80M XHD TALL TOWER

Install the L-864 Beacon Light

1) While the tower is lying on the ground, attach the mounting bracket for the L-864 beacon light to the top tube of the tower using four (4) ¼" x ¾" self-drilling screws with a 3/8" nut driver and cordless drill.

2) Line up the 4 corresponding holes on the bracket and beacon light.

3) Attach the L-864 beacon light to the mounting bracket using four (4) ½" – 13 x 1-¼" bolts, (4) ½-inch split washers, (8) ½-inch flat washers, and (4) ½-inch nuts. The flat washer goes under the bolt head, and the bolt is then inserted through the flange of the beacon light and the bracket. Thread another flat washer onto the bolt followed by a split washer, and then the ½-inch nut. Secure the bolt and nut using a 3/4-inch socket and an open-end wrench.

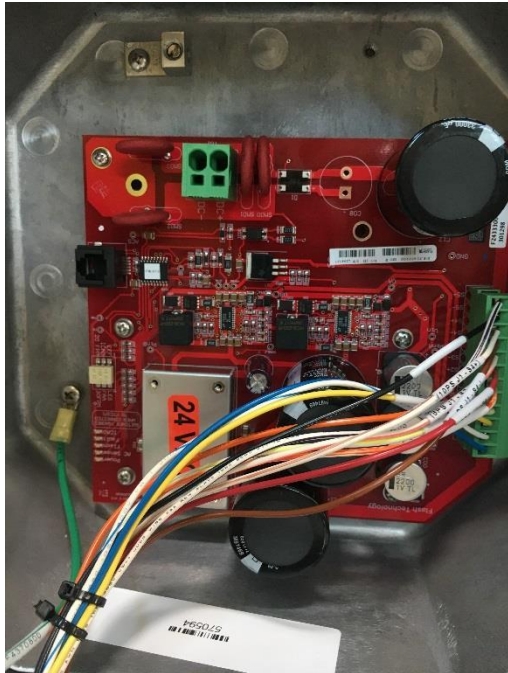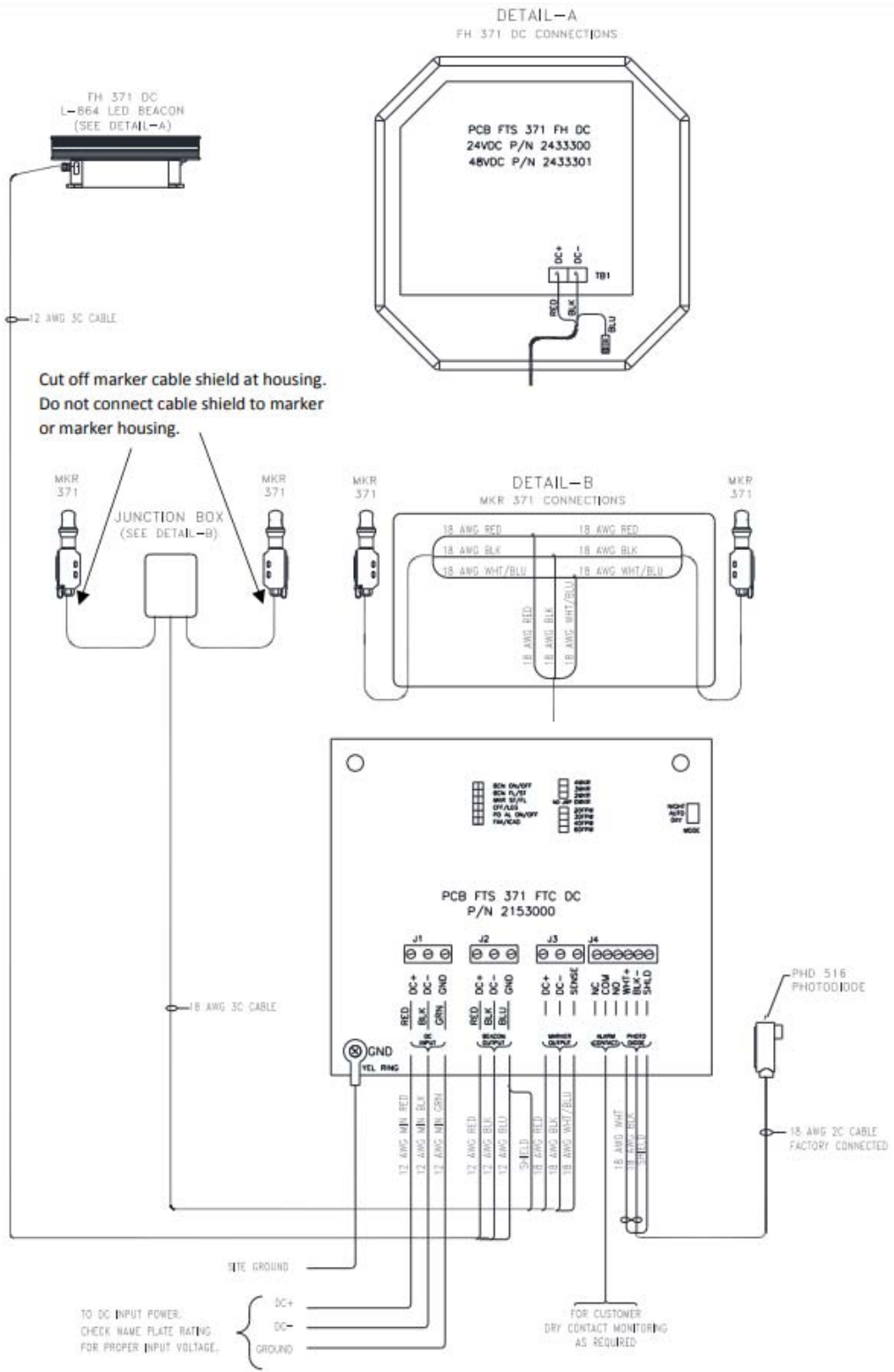4) Connect Cable to Beacon and Secure Cables to Tower

5) Strip the loose end of the 350 foot spool of 18 AWG cable to expose the colored wires. Open the L-864 beacon light, thread the cable through the strain relief, and connect the wires to the corresponding channels of the terminal block: **Red to (+)**, **Black to (-)**, **Grey to (GND) lug**.

Wiring diagram for the FTS 371 DC Type A1
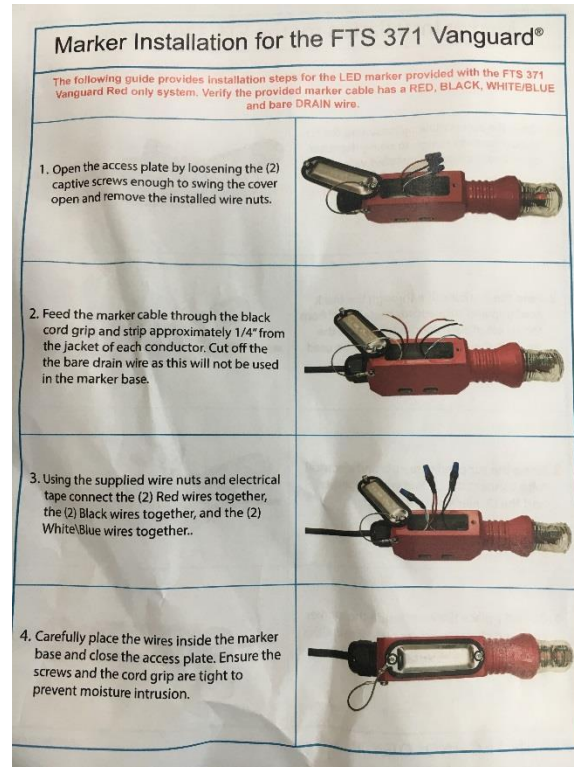
Install the L-810 Mid-Level Side Marker Lights

1) Secure the mid-level junction box to the supplied mounting bracket using four (4) ¼" – 20 x 1-¼" Phillips screws, (4) ¼-inch flat washers, and (4) ¼-inch nylon lock nuts. The flat washer is placed under the head of the screw. The screw is then inserted through the junction box flange and bracket. Secure with a nylon insert nut. Tighten the fasteners using a Phillips head screwdriver and 7/16-diameter open-end wrench to hold the nylon lock nut in place.

2) Cut two (2) 10 foot lengths from the 20 foot spool of 18AWG cable. Strip back the jacket on both ends of each length of cable, and strip back the jacket on each set of the conductors (red, white/blue, and black). The bare drain wire can be cut off. Open each L-810 side marker light, and feed the cable through the threaded connector hole in the base of the light. Connect the colored wires of the cable to the colored wires of the side marker light (**Red to Red, Black to Black, White/blue to White/blue wires can tie together**). Use ¼-inch wire nuts provided and black electrical tape to secure the connections between the wires.

Mid-level wiring instructions (found in box)

Marker Installation for the FTS 371 Vanguard®

The following guide provides installation steps for the LED marker provided with the FTS 371 Vanguard Red only system. Verify the provided marker cable has a RED, BLACK, WHITE/BLUE and bare DRAIN wire.

1. Open the access plate by loosening the (2) captive screws enough to swing the cover open and remove the installed wire nuts.

2. Feed the marker cable through the black cord grip and strip approximately 1/4" from the jacket of each conductor. Cut off the the bare drain wire as this will not be used in the marker base.

3. Using the supplied wire nuts and electrical tape connect the (2) Red wires together, the (2) Black wires together, and the (2) White\Blue wires together..

4. Carefully place the wires inside the marker base and close the access plate. Ensure the screws and the cord grip are tight to prevent moisture intrusion.

3) Carefully push the wires inside of the L-810 light and close using the gasketed cover plate.

   Confirm that the plate and strain relief connections are tight and fully sealed.

4) Once both lights have been wired and sealed with strain relief connectors, attach the junction box with bracket at the midpoint of the tower (40 meter height) using 2 hose clamps. Position the lights on opposite sides of the tower above the junction box. Tighten the two hose clamps to secure the side marker lights.

Junction Box Connections

1) Feed the stripped ends of each side marker light cable up through the two small hole-plugs (strain relief) at the bottom of the junction box.

2) Feed the main 18 AWG 3C cable into the junction box and connect all three sets of cables together (**Red to Red, Black to Black, White/Blue to White/Blue**). Use ¼-inch wire nuts provided and black electrical tape to secure the connections between the wires.

3) The mid-level power cable and beacon power cable can now be run straight down the tower to the base.

(2-3-4) Taping Method

1) Tape the cables to the tower approximately every five feet (1.5 meters) using the recommended 2-3-4 taping method.
2) Wrap two full turns of two inch Scotchwrap™ #50 tape (or equivalent) around the cable and the tower at regular intervals of approximately 5 feet (1.5 meters).

3) Wrap three full turns of one inch Scotchwrap™ Filament #890 tape (or equivalent) over the Scotchwrap™ #50 tape.

4) Wrap four full turns of two inch Scotchwrap™ #50 tape (or equivalent) over the one inch Scotchwrap™ Filament #890 tape (or equivalent).

5) Avoid contact with the guy rings by enforcing slack in the cable over the guy rings. This will avoid damage to the cable by preventing contact with the guy rings.

Another good option is using a piece of hose or plastic tubing to house the cable like conduit over the guyring.

A second junction box is provided that can be used at the bottom of the tower to connect tower lighting and wires from the cabinet. This is not required, but can be used to organize your wiring if you see fit.

The complete Sealtite kit with wire nuts and hardware is located inside of this junction box.

Installation of the PV Power Supply

Unpack the PV Power Supply Components

1) Unpack the components of the **PV power supply, and remove** packaging material. Inspect the system for shipping damage. Report any damage that occurred during shipping to the carrier immediately.

The Zone 1 Power Supply system is shipped with the (3) solar panels detached from the PV power supply enclosure.

2) Remove all shipping restraints and unwrap the system from packaging material as above. The following pages show the installation of a Zone 2 power supply that relate to everything on a Zone 1 except for the extra PV panels installed. Zone 1 PV installation begins on page 26.

Zone 2 Power Supply

System ships with the PV panel already attached. After securing to the ground, the PV panels are adjusted to correct orientation.

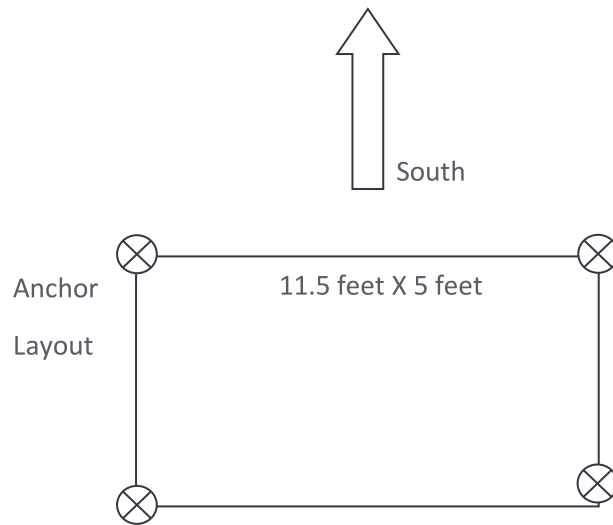1) Remove the PV Power Supply and Baseplate from the Shipping Pallet

2) Remove the bands that secure the PV power supply and baseplate to the shipping pallet.

3) As shown in the picture below, attach a 5/8-inch shackle to each lifting eye on the PV power supply. Locate two (4) foot nylon slings provided in the tower installation kit. Attach a sling to each shackle using a basket hitch. Using a fork truck or other mechanical means, attach a sling to each fork and lift the PV power supply off the shipping pallet and baseplate.

Install the Ground Anchors

1) Use the layout below to mark your anchor points. Screw (4) 6-inch anchors into the ground to create an 11.5' by 5' footprint, leaving the eyes of the anchors two inches above ground in order to fit ¾" shackles around the shaft of the anchors. Depending on the soil type, the anchors may screw in by hand. If the soil type doesn't permit screw-in anchors, please contact NRG for assistance in choosing the proper anchor type.

South

Anchor

Layout

11.5 feet X 5 feet

A large bar or mechanical tool can be used to drive anchors

2) Center the baseplate on the ground between the four anchors.

Anchor the PV Power Supply

1) Remove the slings from the lifting brackets, then unbolt the lifting brackets from the enclosure cabinet. Turn each lifting bracket upside down, and angle each bracket away from the cabinet. Re-bolt the brackets in this upside down position, and attach a shackle and two 10 foot cables to each lifting bracket.

2) Secure the cables to their respective anchors by threading the cable through the ground anchor loop. Reattach the loose end of the cable to the taut cable between the enclosure cabinet and the anchor using three ¼-inch wire rope clips.

3) Tension the cables using the come-along and the Chicago grips provided with the 80m tower by securing the Chicago grip onto the cable about 3.5 feet from the anchor eye. Secure the slack end of the come-along to the shackle on the shaft of the anchor, and secure the other end to the Chicago Grip.

4) Tension the sets of cables diagonal from each other.

Zone 1 Power Supply

Assemble the Solar Panels

> WARNING: The circuit breakers must be turned off prior to wiring the panels to the terminal block!

> WARNING: Verify visually that the circuit breakers are in the "Off" position before making connections to the circuit breakers!

> WARNING: The solar array wires should NOT come in contact with each other or the cabinet!

1) Assemble the solar panel mounting brackets. Install the three solar panels to the mounting brackets.
2) Panels connect to each other, then to the cabinet using the connecting cables. Cabinet is already wired interior, Plug panel cable into connector tied to outside of cabinet:
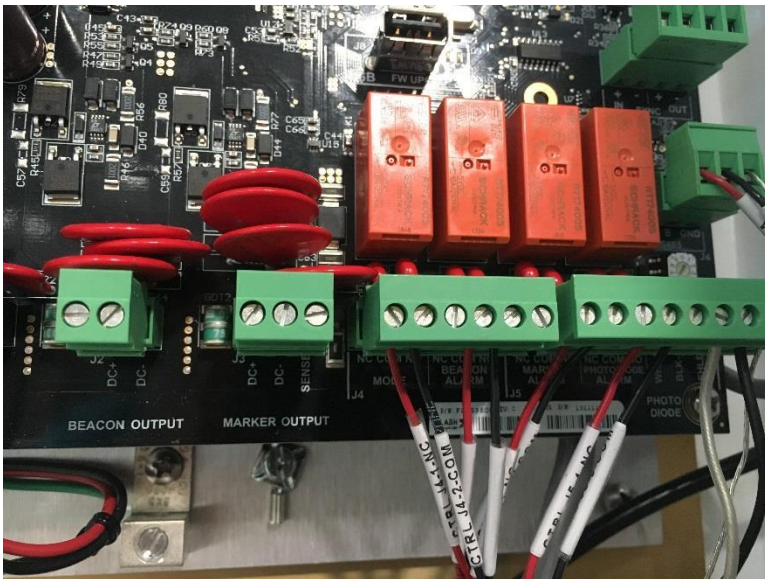
Power Supply Wiring

The Solarcraft power supply is pre-assembled and pre-configured at NRG Systems to house the Flash Lighting FTC board and all of the circuity.

1) If not already connected, the antenna and photo cell need to be connected to the top of the cabinet

2) Both beacon and mid-level light cables feed through the supplied conduit and into the shelter box through the large strain relief on the side of Cabinet. Make sure connections are water tight.
   a) Beacon light will wire to the **Beacon Output** terminals (Pink = DC+, Black = DC-, Grey = GND terminal below).
   b) Mid-level lights with wire to **Marker Output** terminals (Red = DC+, Black = DC-, White/Blue = sensor GND).
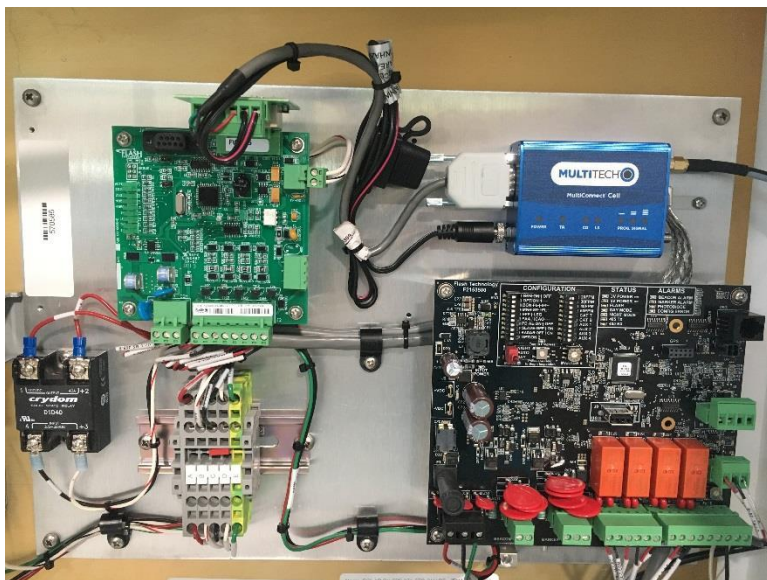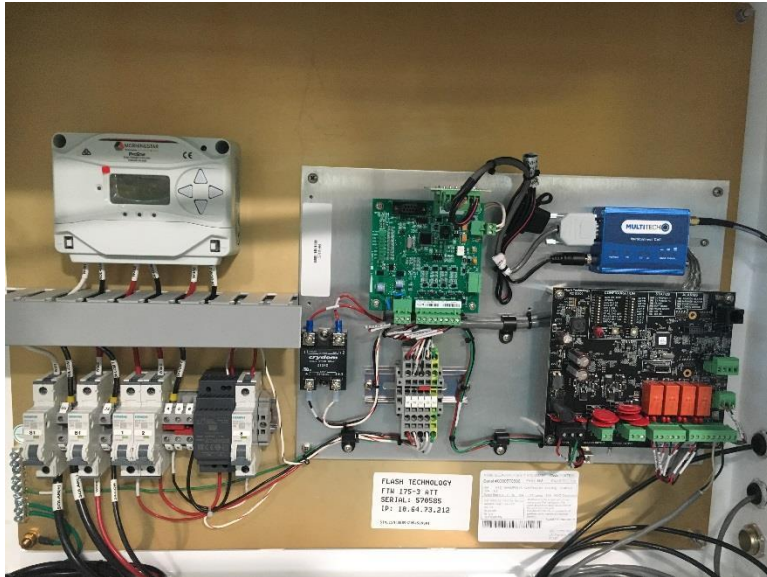
3) Once lights are wired to the correct terminals, the power can be applied to the system.

Here is what the power supply system looks like: The modem, Flash PCB and breakers may be different then what you have used in the past.
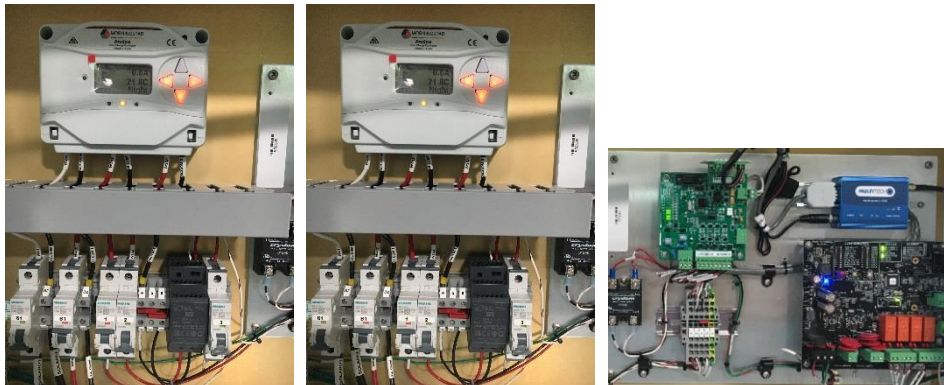
4) Powering the system will be systematic, turning on 1 breaker at a time.
   a) Start with the Second breaker from the left B1 (battery breaker). This connects your controller to the battery bank.

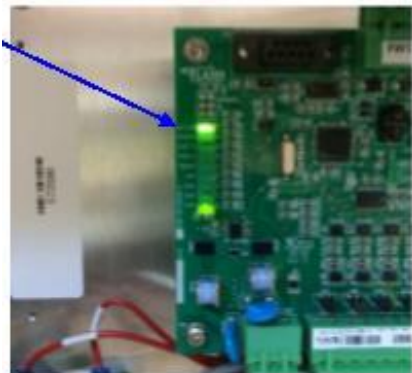   b) Now turn on breaker 1, then 2. You should now see lights on Power Supply.

   c) Turn on breaker 3. Control card and monitoring board should light up.

   d) Turn on the far left (S1) breaker.

The communication card should begin flashing a sequence of green lights eventually lighting the Communication Active light.

5) The system will run through its configuration and attempt to connect to the Flash network. If the light wiring is correct, no red alarm lights should be present.

6) Once the Active light is on, you will need to contact the Flash Technologies call center (1-800-821-5825 Option 7) to verify the communications. Have ready the IP address listed on the white sticker at the bottom of the cabinet.

7) Flash Tech Support will confirm that they see the system and whether it is set up correctly including the account being active.

8) Covering the photo cell with a piece of electrical tape will allow the lights to flash during the day to test.
   a) Confirm that the Beacon light and the mid-level lights are flashing in unison, 30 flashes per minute (fpm).