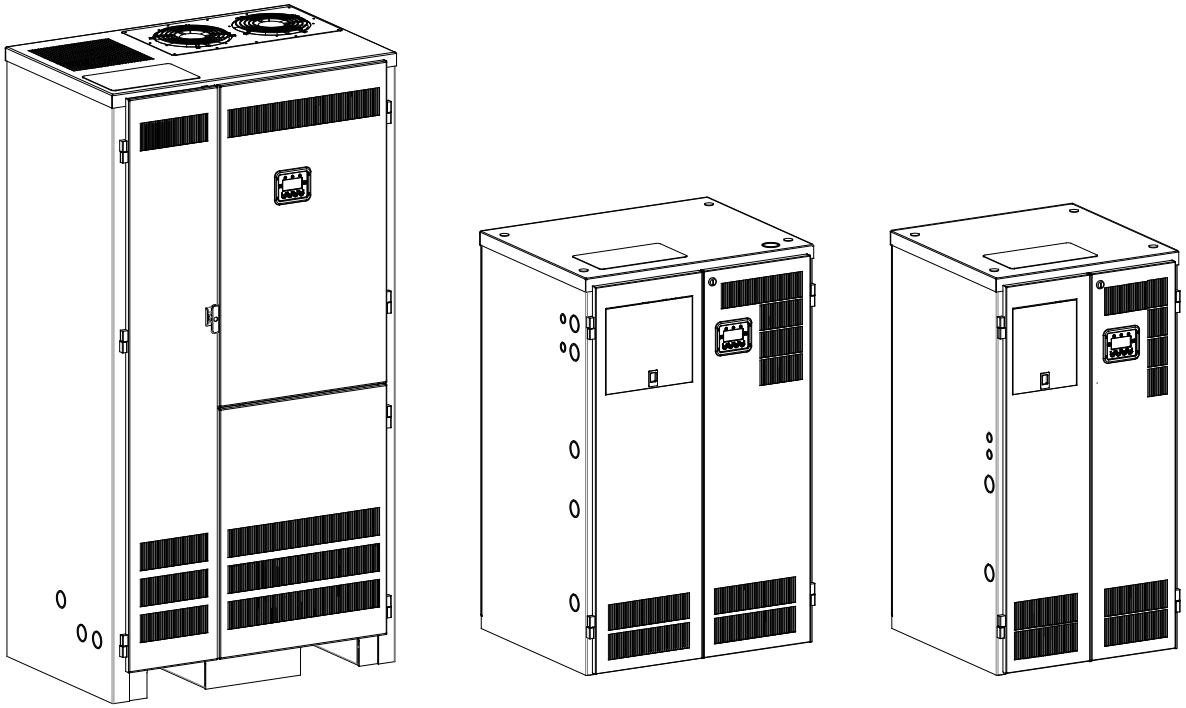
MYERS
EMERGENCY POWER SYSTEMS

Illuminator™ System Series Hypernova

5 kVA/kW – 60 kVA/kW

Installation Guide



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115893E - System Installation Manual

This unit contains LETHAL VOLTAGES. All repairs and service should be performed by AUTHORIZED SERVICE PERSONNEL ONLY! There is NO USER SERVICEABLE PARTS inside this unit.

IMPORTANT SAFEGUARDS

When using electrical equipment, you should always follow basic safety precautions, including the following:

1. **READ AND FOLLOW ALL SAFETY INSTRUCTIONS.**
2. **Do not install the system outdoors.**
3. **Do not install near gas or electric heaters or in other high-temperature locations.**
4. **Use caution when servicing batteries. Depending on battery type, batteries contain either acid or alkali and can cause burns to skin and eyes. If battery fluid is spilled on skin or in the eyes, flush with fresh water and contact a physician immediately.**
5. **Equipment should be mounted in locations where unauthorized personnel will not readily subject it to tampering.**
6. **The use of accessory equipment not recommended by Manufacturer may cause an unsafe condition and void the warranty.**
7. **Do not use this equipment for other than its intended use.**
8. **Qualified service personnel must perform all servicing of this equipment.**

SAVE THESE INSTRUCTIONS

The installation and use of this product must comply with all national, federal, state, municipal, or local codes that apply. If you need help, please call Service.

C A U T I O N

READ ENTIRE MANUAL AND REVIEW ALL DOCUMENTATION BEFORE ATTEMPTING SYSTEM INSTALLATION!

FOR SERVICE OR INSTALLATION INFORMATION:
TELEPHONE: (610) 868-5400 (24 HR. HOTLINE)
FAX: (610) 954-8227

FOR YOUR PROTECTION....

PLEASE COMPLETE AND RETURN WARRANTY REGISTRATION CARD IMMEDIATELY.

Table of Contents

CHAPTER 1

SAFETY WARNINGS

Read the following precautions before you install the Emergency Lighting Inverter.

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS. This manual contains important instructions that you should follow during installation and maintenance of the system and batteries. Please read all instructions before operating the equipment and save this manual for future reference.

DANGER

This system contains **LETHAL VOLTAGES**. AUTHORIZED SERVICE PERSONNEL should perform all repairs and service **ONLY**. There is **NO USER SERVICEABLE PARTS** inside the Emergency Lighting Inverter.

WARNING

- Do not install the system outdoors.
- Do not install near gas or electric heaters or in other high-temperature locations.
- Use caution when servicing batteries. Battery acid can cause burns to skin and eyes. If acid is spilled on skin or in the eyes, flush with fresh water and contact a physician immediately.
- Equipment should be mounted in locations where it is not readily subjected to tampering by unauthorized personnel.
- The use of accessory equipment not recommended by the manufacturer may cause an unsafe condition.
- Do not use this equipment for other than intended use.
- Only qualified service personnel (such as a licensed electrician) should perform the system and battery installation and initial startup. Risk of electrical shock.

CHAPTER 2

INTRODUCTION

Please read this manual thoroughly before operating your safety system. Keep this manual and the system User's Guide in the folder mounted inside the unit's door.

WARNING

Only qualified service personnel (such as a licensed electrician) should perform the system and battery installation and initial startup. Risk of electrical shock exists.

Please record your unit's part number, serial number, and model number below. You can find these numbers on the labels on the inside of the system's right door.

Part Number _____

Serial Number _____

Model Number _____

CHAPTER 3

BEFORE INSTALLING THE UNIT

Installation Dimensions and Clearances

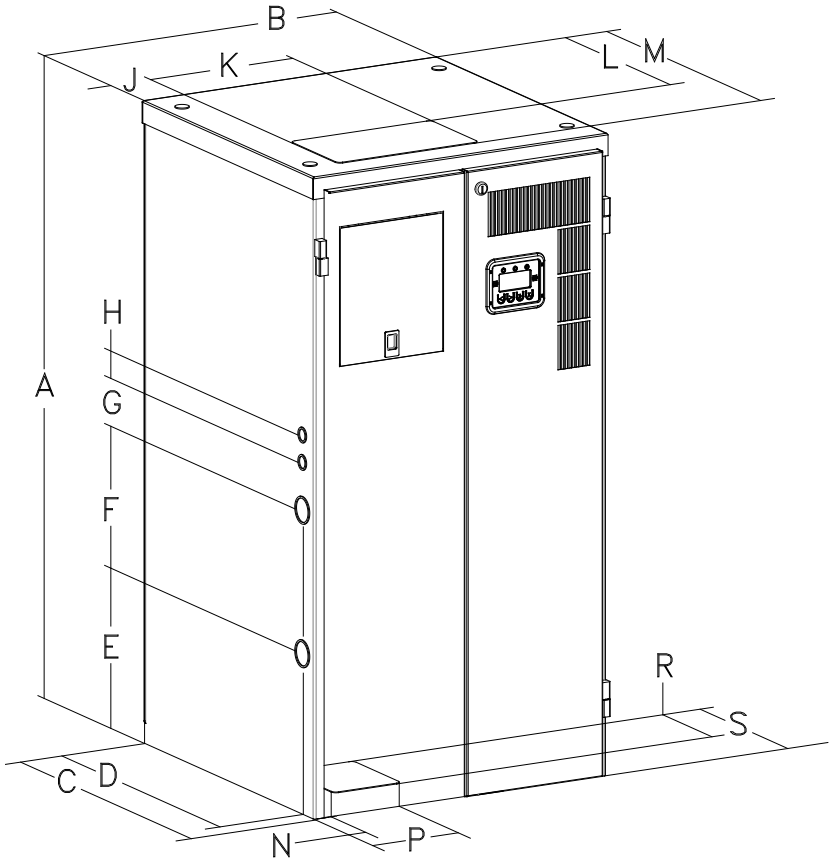

Figure 3.1

Table 3.1 Dimensions: 5-10kW, 90m runtime (3.75-7.5kW, 120m runtime)

Unit	Height (A)	Width (B)	Depth (C)	(D)	(E)	(F)	(G)	(H)
Electronics Cabinet	47" (119.4 cm)	24" (61.0 cm)	25" (64.0 cm)	22.5" (57.2 cm)	11.8" (30.0 cm)	10.5" (26.7 cm)	3.5" (8.9 cm)	2" (5.1 cm)

Table 3.1 Dimensions: 5-10kW, 90m runtime (3.75-7.5kW, 120m runtime)

Unit	(J)	(K)	(L)	(M)	(N)	(P)	(R)	(S)
Electronics Cabinet	3.5" (8.9 cm)	11.3" (28.7 cm)	15.5" (39.4 cm)	21.5" (54.6 cm)	2.3" (5.8 cm)	7.3" (18.5 cm)	2.8" (7.1 cm)	7" (17.8 cm)

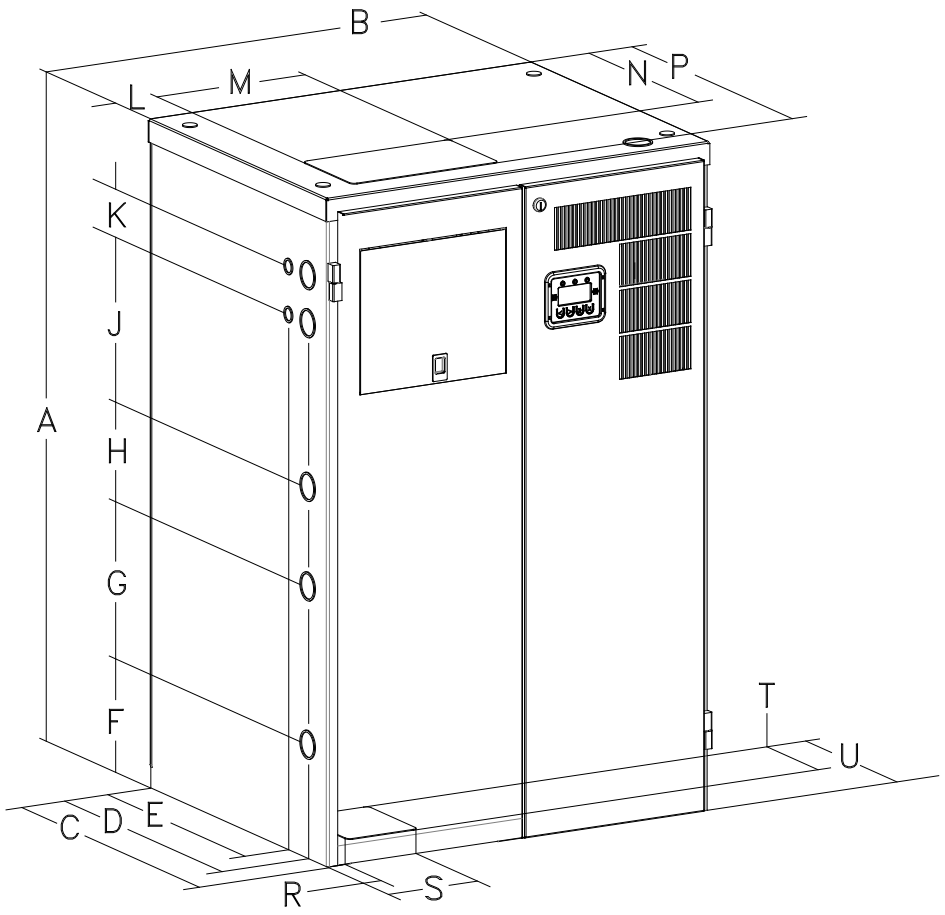

Figure 3.2

Table 3.2 Dimensions: 12.5-16.7kW, 90m runtime (9.3-12.5kW, 120m runtime)

Unit	Height (A)	Width (B)	Depth (C)	(D)	(E)	(F)	(G)	(H)
Electronics Cabinet	47" (119.4 cm)	30" (76.2 cm)	25" (64.0 cm)	21.5" (54.6 cm)	19" (48.3 cm)	8" (20.3 cm)	11.1" (28.2 cm)	7" (17.8 cm)

Table 3.2 Dimensions: 12.5-16.7kW, 90m runtime (9.3-12.5kW, 120m runtime)

Unit	(J)	(K)	(L)	(M)	(N)	(P)	(R)	(S)	(T)	(U)
Electronics Cabinet	11.5" (29.2 cm)	3.4" (8.6 cm)	3.5" (8.9 cm)	11.3" (28.7 cm)	15.5" (39.4 cm)	21.5" (54.6 cm)	2.4" (6.1 cm)	7.3" (18.5 cm)	6" (15.2 cm)	7" (17.8 cm)

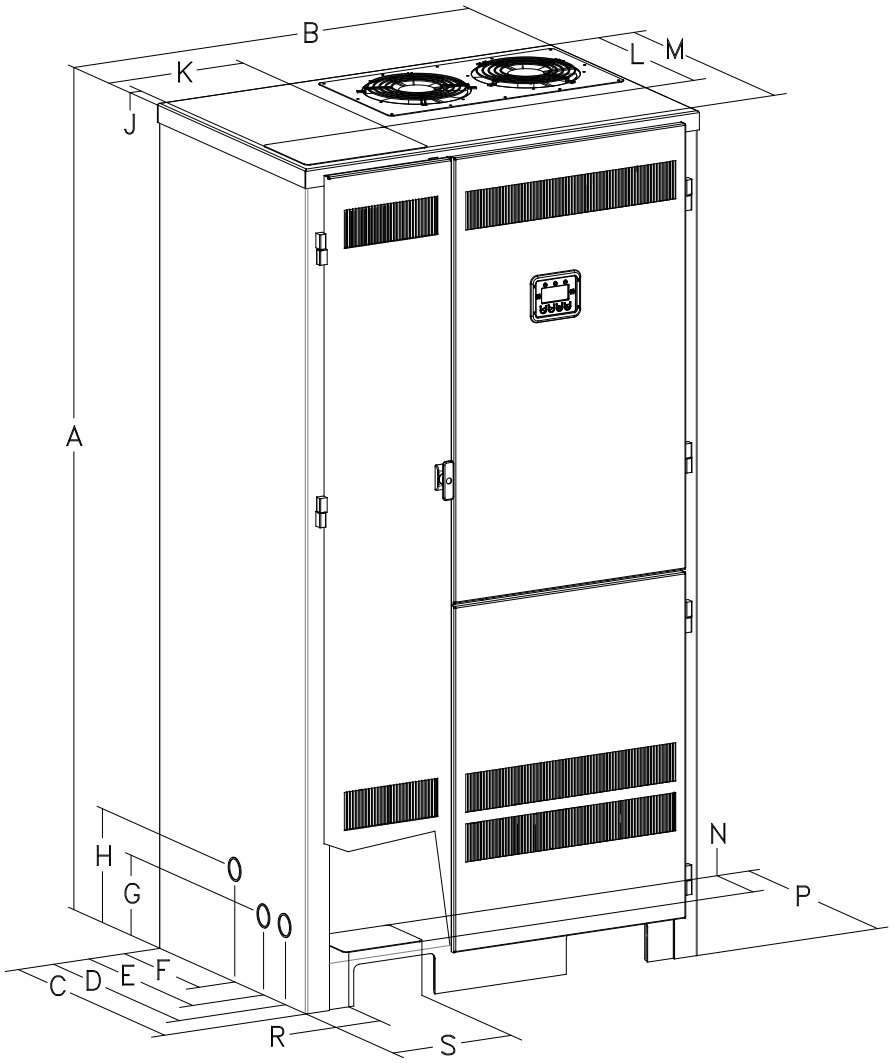

Figure 3.3

Table 3.3 Dimensions: 25-50kW, 90m runtime (16.7-50kW, 120m runtime)

Unit	Height (A)	Width (B)	Depth (C)	(D)	(E)	(F)	(G)	(H)
Electronics Cabinet	72" (182.9 cm)	37.5" (95.3 cm)	25" (64.0 cm)	20.9" (53.1 cm)	17.4" (44.2 cm)	12.6" (32.0 cm)	6.8" (17.3 cm)	9.6" (24.4 cm)

Table 3.3 Dimensions: 25-50kW, 90m runtime (16.7-50kW, 120m runtime)

Unit	(J)	(K)	(L)	(M)	(N)	(P)	(R)	(S)
Electronics Cabinet	1.2" (3.0 cm)	12" (30.5 cm)	16.2" (41.1 cm)	23.2" (58.9 cm)	5.5" (14.0 cm)	7.6" (19.3 cm)	5.3" (13.5 cm)	12" (30.5 cm)

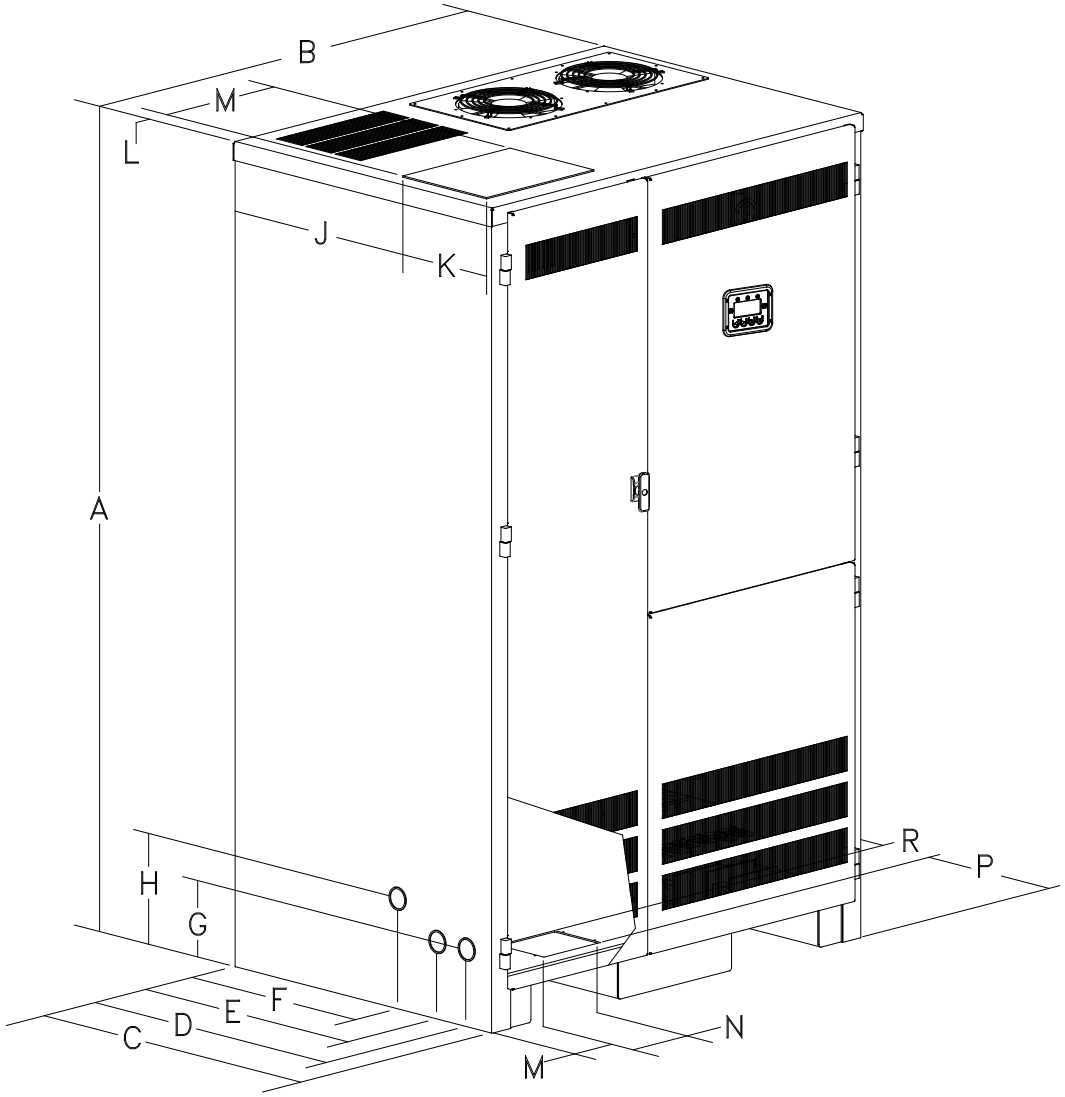

Figure 3.4

Table 3.4 Dimensions: 60kW, 90m runtime

Unit	Height (A)	Width (B)	Depth (C)	(D)	(E)	(F)	(G)	(H)
Electronics Cabinet	72" (182.9 cm)	44" (112.0 cm)	31" (79.0 cm)	27.75" (70.5 cm)	24.25" (62.6 cm)	19.5" (49.5 cm)	6.75" (17.2 cm)	9.5" (24.1 cm)

Table 3.4 Dimensions: 60kW, 90m runtime

Unit	(J)	(K)	(L)	(M)	(N)	(P)	(R)
Electronics Cabinet	22.65" (57.5 cm)	7" (17.8 cm)	1.15" (2.9 cm)	8.5" (21.6 cm)	6.75" (17.2 cm)	1.8" (4.6 cm)	5.5" (14.0 cm)

Table 3.5 Required Clearances

Sides	Top	Front
0" (0.0 cm)	12" (30.5 cm)	39" (100.0 cm)

Table 3.6 Conduit Knockouts

All
1 ¾" / 2" (4.45 cm / 5.09 cm)

Location Guidelines

Keep the following guidelines in mind when choosing the location for your system and batteries:

- Verify that the environment meets the requirements in “Storage and Operating Environment” on page 11. The environment can affect the reliability and performance of both the unit and the batteries.
- Install any separate battery cabinets as close as possible to the unit to reduce the cost of DC wiring and to improve battery performance. We recommend no clearance between the unit and the battery cabinet; in other words, the battery cabinet should be next to (against) the right side of the unit (when you face the front of the unit). If you must place the battery cabinet away from the unit, you must supply the proper length, gauge, and type of battery cables, and you must make sure the installation meets the applicable NEC requirements.

- Choose a permanent location for the unit and any battery cabinets. Attempting to move them after you have installed the batteries can damage the batteries and the cabinet.

CAUTION

Do not move the unit or the battery cabinet after you install the batteries. If you do, the unit or battery cabinet and batteries may be damaged.

If the room is equipped with a sprinkler system, the unit must be provided with sprinkler proof covers.

The system should be connected to the emergency generator, if available.

This equipment is heavy. Refer to Tables 3.7 and 3.8 when you choose a site to make sure that the floor can support the weight of the system, the batteries, any separate battery cabinets, and any other necessary equipment.

Table 3.7 System Weight [in lbs. (kg)] for 90-Minute System Models

	90-Minute System Models											
	5kw	7.5kw	10kw	12.5kw (S)	12.5kw (C)	16.7kw (S)	16.7kw (C)	25kw	33.2kw	37.5kw	50kw	60kw
Inverter	485 (220)	485 (220)	590 (268)	640 (290)	640 (290)	640 (290)	640 (290)	1150 (522)	1150 (522)	1360 (617)	1360 (617)	1460 (663)
Battery Cabinet(s) with Standard SLC Batteries	1245 (565)	1485 (674)	1725 (782)	2175 (987)	2400 (1089)	2775 (1259)	2800 (1270)	4750 (2155)	5550 (2517)	7125 (3232)	8325 (3776)	11,100 (5034)
Battery Cabinet(s) without Batteries	285 (129)	285 (129)	285 (129)	375 (170)	400 (181)	375 (170)	400 (181)	750 (340)	750 (340)	1125 (510)	1125 (510)	1500 (681)

Table 3.8 System Weight [in lbs. (kg)] for 120-Minute System Models

	120-Minute System Models											
	3.75kw	5.63kw	7.5kw	9.38kw (S)	9.38kw (C)	12.5kw (S)	12.5kw (C)	18.8kw	24.9kw	28.1kw	37.5kw	50kw
Inverter	485 (220)	485 (220)	590 (268)	640 (290)	640 (290)	640 (290)	640 (290)	1150 (522)	1150 (522)	1360 (617)	1360 (617)	1360 (617)
Battery Cabinet(s) with Standard SLC Batteries	1245 (565)	1485 (674)	1725 (782)	2175 (987)	2400 (1089)	2775 (1259)	2800 (1270)	4750 (2155)	5550 (2517)	7125 (3232)	8325 (3776)	11100 (5035)
Battery Cabinet(s) without Batteries	285 (129)	285 (129)	285 (129)	375 (170)	400 (181)	375 (170)	400 (181)	750 (340)	750 (340)	1125 (510)	1125 (510)	1500 (680)

Receiving and Moving the Unit and the Batteries

Systems weigh several hundred pounds; separate battery cabinets are also heavy (see Table 3.7 & 3.8; ask your sales representative for additional information). Make sure you are prepared for these weights before you unload or move the unit or the batteries. Do not install any batteries until you have permanently installed the unit and any battery cabinets and connected all conduit and wiring.

Storage and Operating Environment

Make sure you store and install the system in a clean, cool, dry place with normal ventilation for human habitation and level floors.

Storage Temperature

Store the batteries (in the system or battery cabinet) at -18 to 40°C (0 to 104°F). Batteries have a longer shelf life if they are stored below 25°C (77°F). Keep stored batteries fully charged. Recharge the batteries every 90–180 days. The system or battery cabinet without batteries may be stored at -20 to 70°C (-4 to 158°F).

Ventilation

The air around the unit must be clean, dust-free, and free of corrosive chemicals or other contaminants. Do not place the system or batteries in a sealed room or container.

Operating Temperature

System can operate from 20° to 30°C (68° to 86°F) and up to 95% relative humidity. The batteries' service life is longer if the operating temperature stays below 25°C (77°F).

Batteries

The temperature should be near 25°C (77°F) for optimum battery performance. Batteries are less efficient at temperatures below 18°C (65°F), and high temperatures reduce battery life. Typically, at about 35°C (95°F), battery life is half of what it would be at a normal temperature of 25°C (77°F). At about 45°C (113°F), battery life is one-fourth of normal.

Make sure that heaters, sunlight, air conditioners, or outside air vents are not directed toward the batteries. These conditions can make the temperature within battery strings vary, which can cause differences in the batteries' voltages. Eventually, these conditions affect battery performance.

If the batteries are not in the system, remember that the batteries should be installed as close as possible to the unit to reduce DC wiring costs and improve battery performance.

Do not allow tobacco smoking, sparks, or flames in the system location because hydrogen is concentrated under the vent cap of each cell of the battery. Hydrogen is highly explosive, and it is hard to detect because it is colorless, odorless, and lighter than air.

Every type of battery can produce hydrogen gas, even sealed maintenance-free batteries. The gas is vented through the vent caps and into the air, mainly when the unit is charging the batteries. The batteries produce the most hydrogen when maximum voltage is present in fully charged batteries; the batteries do not produce hydrogen during float charging. The amount of current that the charger supplies to the batteries (not the battery ampere-hour) determines how much hydrogen is produced.

High Altitude Operation

The maximum operating elevation is 3000m (10,000 ft) without derating. Required derating on output power is 4% per 300m (1000ft) above 3000m (10,000ft).

CHAPTER 4

INSTALLATION OVERVIEW

Figure 4.1a through 4.1d shows typical installations of systems.

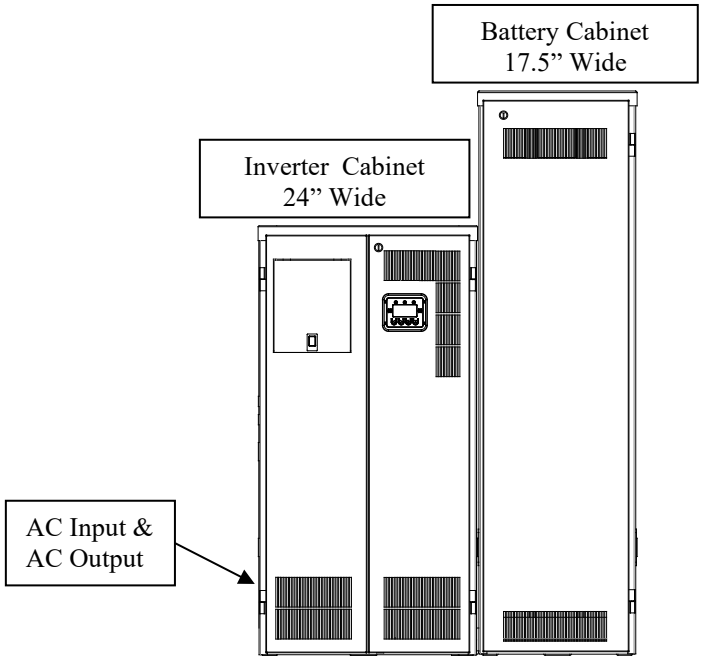

Figure 4.1 Typical Hardwired Installation – 5.0KW to 10.0KW Standard Systems

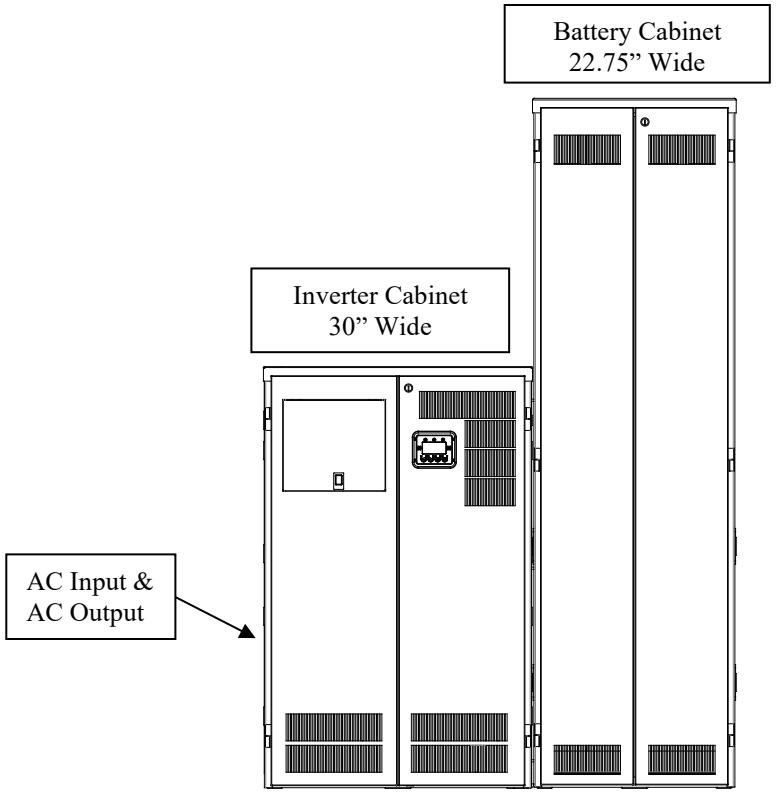

Figure 4.2 Typical Hardwired Installation – 12.5KW to 16.7KW Standard Systems

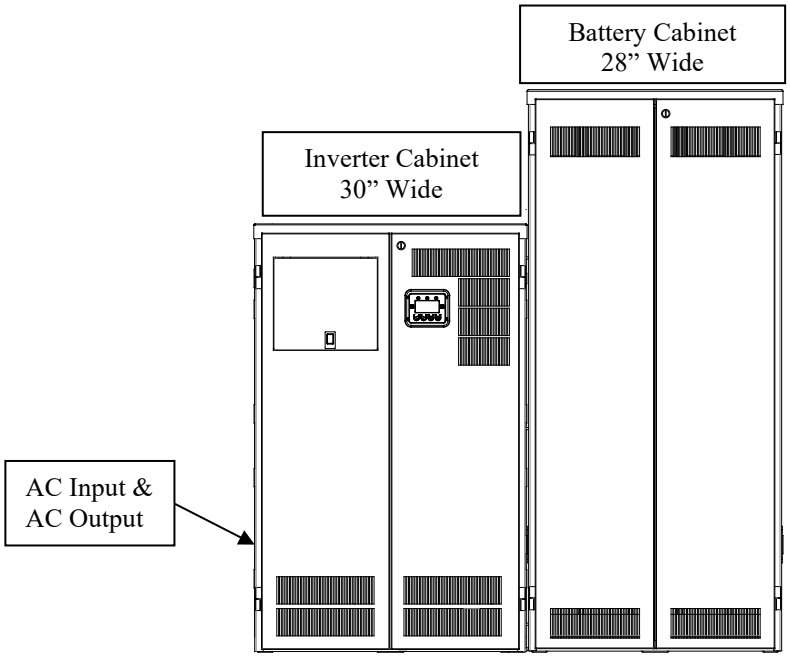

Figure 4.3 Typical Hardwired Installation – 12.5KW to 16.7KW Custom Systems

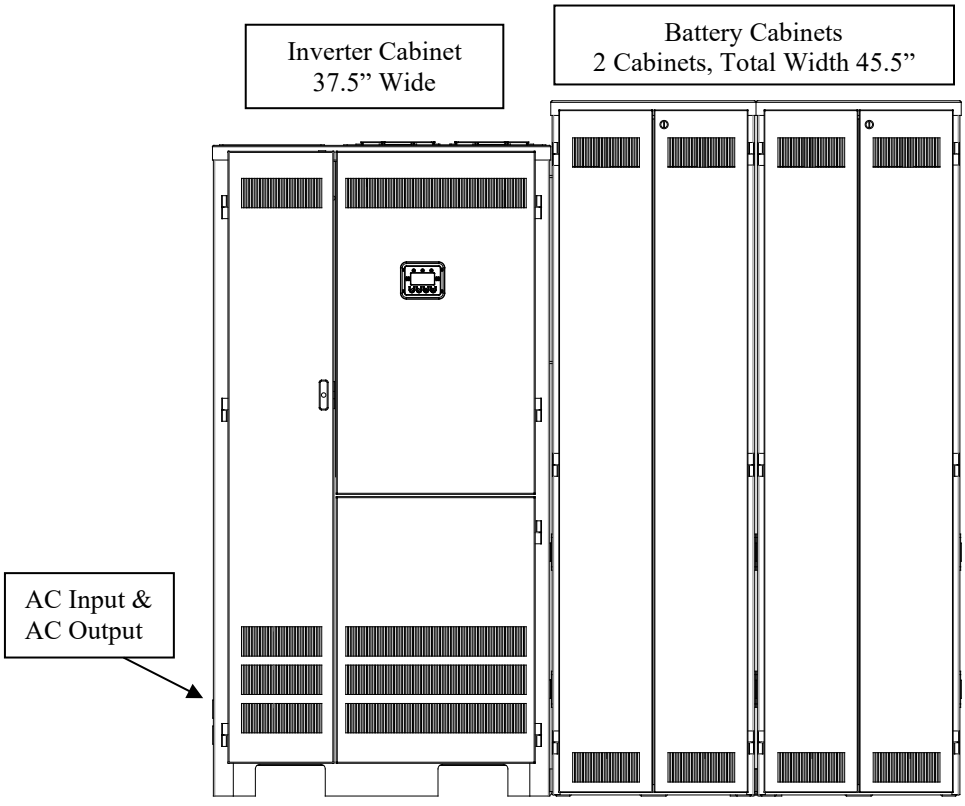

Figure 4.4 Typical Hardwired Installation – 25.0KW to 33.2KW Standard Systems

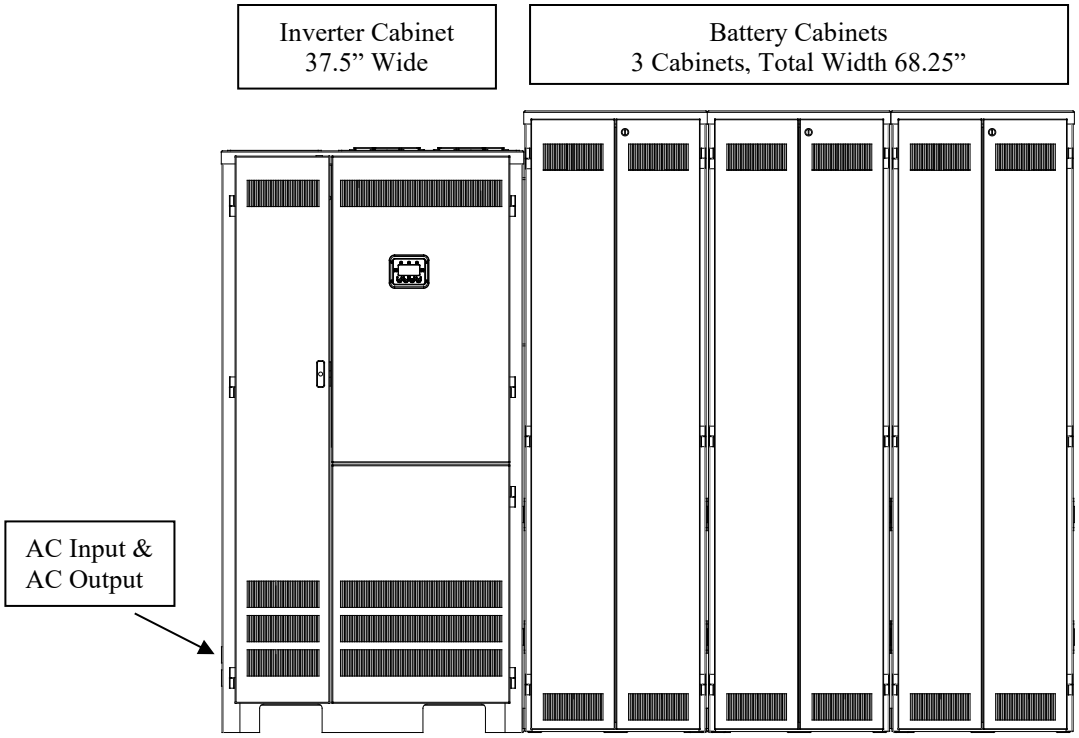

Figure 4.5 Typical Hardwired Installation – 37.5KW to 50.0KW Standard Systems

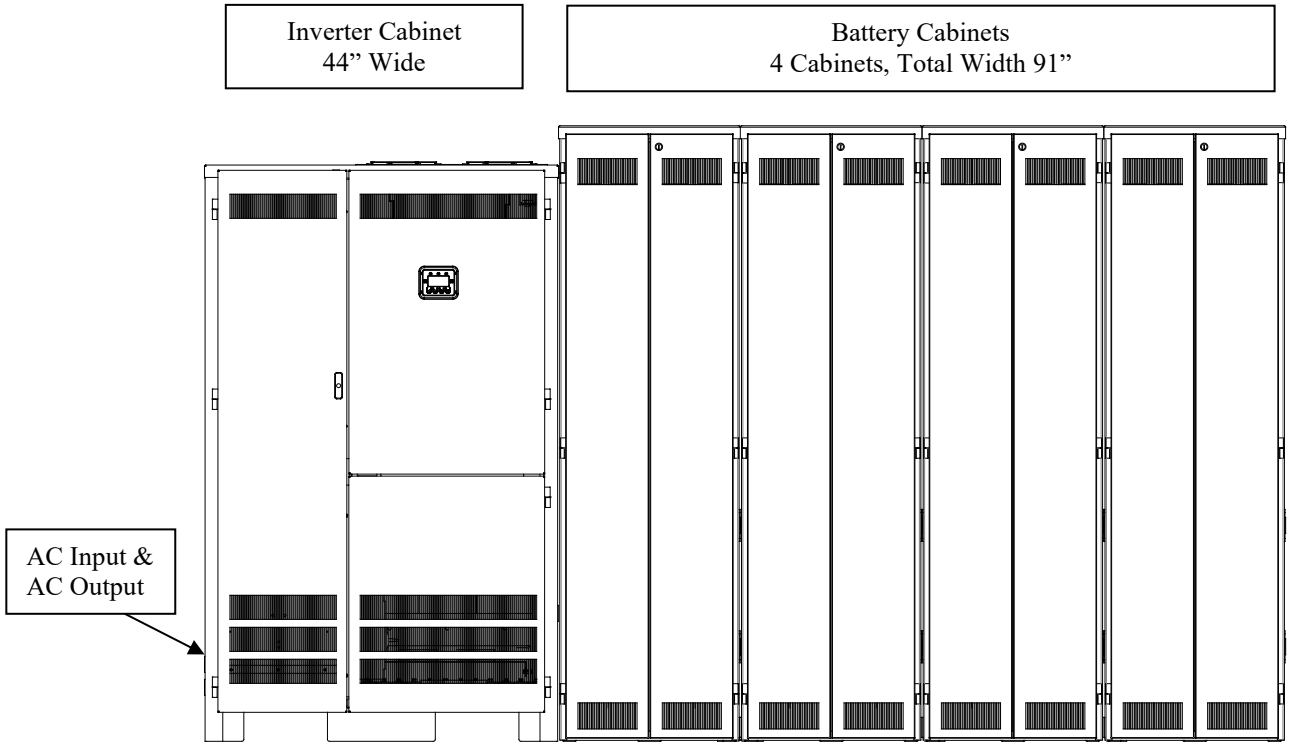

Figure 4.6 Typical Hardwired Installation – 60.0KW Standard Systems

CHAPTER 5

AC INPUT & AC OUTPUT INSTALLATION

WARNING

Only qualified service personnel (such as a licensed electrician) should perform the AC installation. Risk of electrical shock exists.

Read the following cautions before you continue.

CAUTION

- Unit contains hazardous AC and DC voltages. Because of these voltages, a qualified electrician must install the system, AC line service, and batteries. The electrician must install the AC line service according to local and national codes and must be familiar with batteries and battery installation.
- Before you install, maintain, or service the unit, always remove or shut off all sources of AC and DC power and shut off the system. You must disconnect AC line input at the service panel and turn off the Installation Switch (S1), the Main AC Input Circuit Breaker (CB1), the Main DC Circuit Breaker or Fuse, and the Battery Cabinet Fuse(s) to make sure the unit does not supply output voltage.
- Whenever AC and/or DC voltage is applied, there is AC voltage inside the unit; this is because the unit can supply power from AC line or from its batteries. To avoid equipment damage or personal injury, always assume that there may be voltage inside the unit.
- Remove rings, watches, and other jewelry before installing the AC wiring. Always wear protective clothing and eye protection and use insulated tools when working near batteries. Whenever you are servicing an energized unit with the inside panel open, electric shock is possible; follow all local safety codes. TEST BEFORE TOUCHING!
- To reduce the risk of fire or electric shock, install the unit and its batteries in a temperature and humidity-controlled indoor area free of conductive contaminants. See page 11 for operating environment specifications.

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1. Open the unit's doors. Make sure the installation switch and the input circuit breaker are off, and the main battery circuit breaker is off or main battery fuse removed inside the unit.
2. Look at the ID label on the inside right door. Write down the following information:

   Input Voltage: _____
   Output Voltage: _____
3. Now, make sure the input and output voltages are what you need.

   The Input must be a 4 wire three phases – Neutral must be connected.

Does the input voltage available for the system at the AC service panel match the input voltage shown on the unit's ID label?

Service Panel Voltage = _____ Input Voltage ___*Yes* /___No

- Does the output voltage on the ID label match the voltage your loads (protected equipment) need?

  Load Voltage = _____ Output Voltage ___Yes/___No

  If you answered NO to either of the preceding questions, **call SERVICE**.

4. Now, use the information you wrote down in Step 2 to find the correct circuit breaker for the service panel that is for your system.

Table 5.1 Recommended Circuit Breaker for Maximum Input Current

System	Input Voltage (Vac)	Max. Current	Recommended Circuit Breaker
5 KW	120 / 208	19.6	25
5 KW	277 / 480	8.5	15
7.5 KW	120 / 208	29.4	40
7.5 KW	277 / 480	12.8	15
10 KW	120 / 208	39.2	50
10 KW	277 / 480	17.0	25
12.5 KW	120 / 208	49.0	60
12.5 KW	277 / 480	21.3	30
16.7 KW	120 / 208	65.5	80
16.7 KW	277 / 480	28.4	35
25 KW	120 / 208	98.0	110
25 KW	277 / 480	42.6	60
33.2 KW	120 / 208	130.2	150
33.2 KW	277 / 480	56.6	70
37.5 KW	120 / 208	147.1	175
37.5 KW	277 / 480	63.8	80
50 KW	120 / 208	196.1	225
50 KW	277 / 480	85.1	100
60 KW	277 / 480	102.1	110

**** WARNING: THE EXTERNAL INPUT CIRCUIT BREAKER PROTECTING THE SYSTEM MUST BE A "MOTOR START", DELAYED TRIP TYPE IF INPUT AUTO OR INPUT ISOLATION TRANSFORMER WAS ADDED TO THE SYSTEM. THIS IS DUE TO MAGNETIC INRUSH CURRENT DRAWN DURING APPLICATION OF AC POWER. CONSULT FACTORY.**

5. Write down the circuit breaker value that applies to your system from Table 5.1:
6. Now, look at Table 5.2 below, and use the notes below to find the proper gauge wire or the recommended circuit breaker recorded in step 5.

Table 5.2 Recommended Minimum Wire Sizes

Read These Important Notes!	For this Input Circuit Breaker Size...	Use this Size 90°C Copper Wire	
		AWG	mm^2
This table lists the AWG and mm2 wire size for each circuit breaker size. The minimum recommended circuit breaker sizes for each model and voltage application are listed in Table 5.1. The temperature rating of conductor must not be less than 90° C wire. Based on the ampacities given in of the National Electrical Code, ANSI/NFPA 70 Table 310.15(B)(16) (CEC Table 2) and NEC Article 220 (CEC Section 4). Circuit conductors must be the same size (ampacity) wires and equipment-grounding conductors must meet NEC Table 250.122. Code may require a larger wire size than shown in this table because of temperature, number of conductors in the conduit, or long service runs. Follow local code requirements.	10, 15, 20	12	3.31
	25, 30	10	5.26
	35, 40, 45	8	8.36
	50, 60	6	13.30
	70, 80	4	21.15
	90, 100	2	33.62
	110	1	42.11
	125	1/0	53.49
	150, 175	3/0	67.43
	225	4/0	74.40

7. The input circuit breaker in the input service panel provides the means for disconnecting AC to the unit. Only authorized persons shall be able to disconnect AC to the unit; see NEC 700.20-21 (CEC Section 46). If you are using the input circuit breaker to disconnect AC, you must make sure that only authorized persons have control of the circuit breaker panel to meet the requirements of NEC 700.20 (CEC Section 46).

8. Read the following caution before removing conduit knockouts.

CAUTION

To prevent electrical shock or damage to your equipment, the Installation Switch (S1), the Main AC Input Circuit Breaker (CB1), and the circuit breaker at the input service panel should all be turned off. The Main DC Battery Fuse should be removed or Main Battery Circuit Breaker should be off, and the external DC Disconnect Fuse(s) (if you have one) should be removed.

9. Remove knockouts for AC Input and AC Output in the top or left side of the system. AC input conductors and AC output conductors must be installed in separate conduits, and emergency and non-emergency output circuits must be installed in separate conduits.

CAUTION

Do not drill the cabinet; drill filings may damage the unit and keep it from operating. If you need larger knockouts, use a chassis punch to punch out the appropriate knockout. Do not create additional knockouts**.**

10. Install the conduit. You must run the AC input service conductors and AC output conductors through separate conduits. Emergency output conductors and non-emergency output conductors must also be run through separate conduits. Emergency output circuits shall be installed in dedicated conduit systems and not shared with other electrical circuits as described in NEC 700.10 (CEC Section 47-108).

The next step explains where to make the AC connections to the system.

INSTALLING AC INPUT WIRES:

11. Connect AC utility from the service panel to the system's terminal block labeled **"INPUT"**.

Phasing must be clockwise Rotation – i.e. Phase B lags Phase A.

Connect each Line (hot) wire to each of the input block positions marked **"Line"**, connect the Neutral (common) wire to the input block marked **"Neutral"** and the ground wire to the compression lug next to the input terminal block.

After making the input connections, if your system is supplied with one or more AC input EMI suppression cores, install them by snapping each core around all input wires: line A, B, C, neutral, and ground. Position the core(s) around the wires near the cabinet wall near the point where the wires pass into the conduit. You may use cable ties to hold the core(s) in place if needed.

INSTALLING AC OUTPUT WIRES:

*****IF EXTERNAL MAINTENANCE BYPASS IS REQUIRED, SEE DEVIATION DRAWING FOR WIRING OF LOAD OUTPUT.***

12. Connecting load wires without system distribution circuit breakers – connect load wires to the system's terminal block labeled **"OUTPUT"**. Repeat as in step 11.

13. Connecting load wires with distribution circuit breakers – connect load wires directly to the circuit breakers and the neutral wires to the neutral bar.

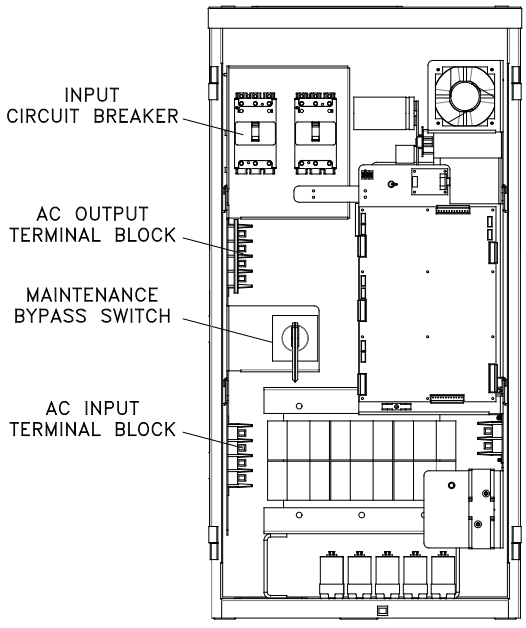


Figure 5.1 AC Input and Output Locations
5.0KW to 10KW Inverter Cabinet

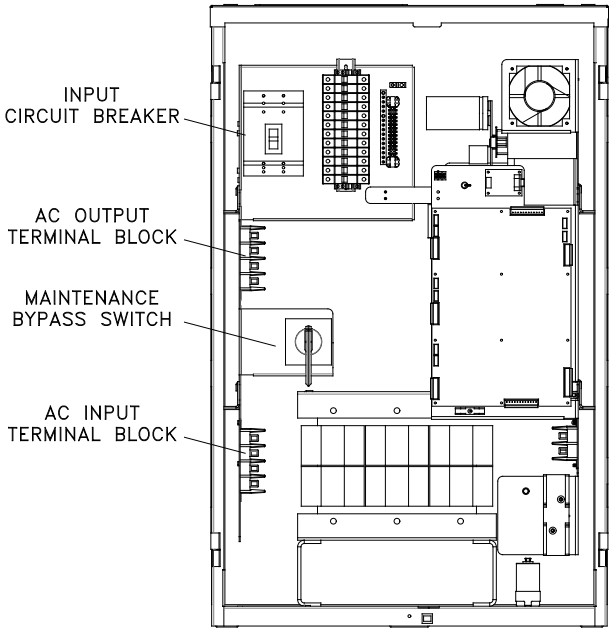


Figure 5.2 AC Input and Output Locations
12.5.KW to 16.7KW Inverter Cabinet

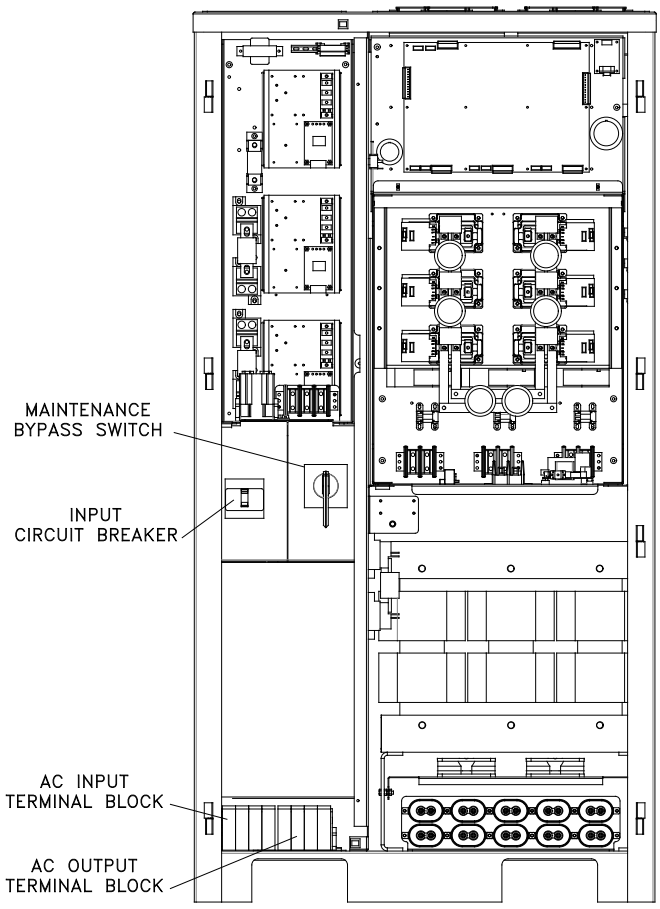


Figure 5.3 AC Input and Output Locations
25.0KW to 50KW Inverter Cabinet

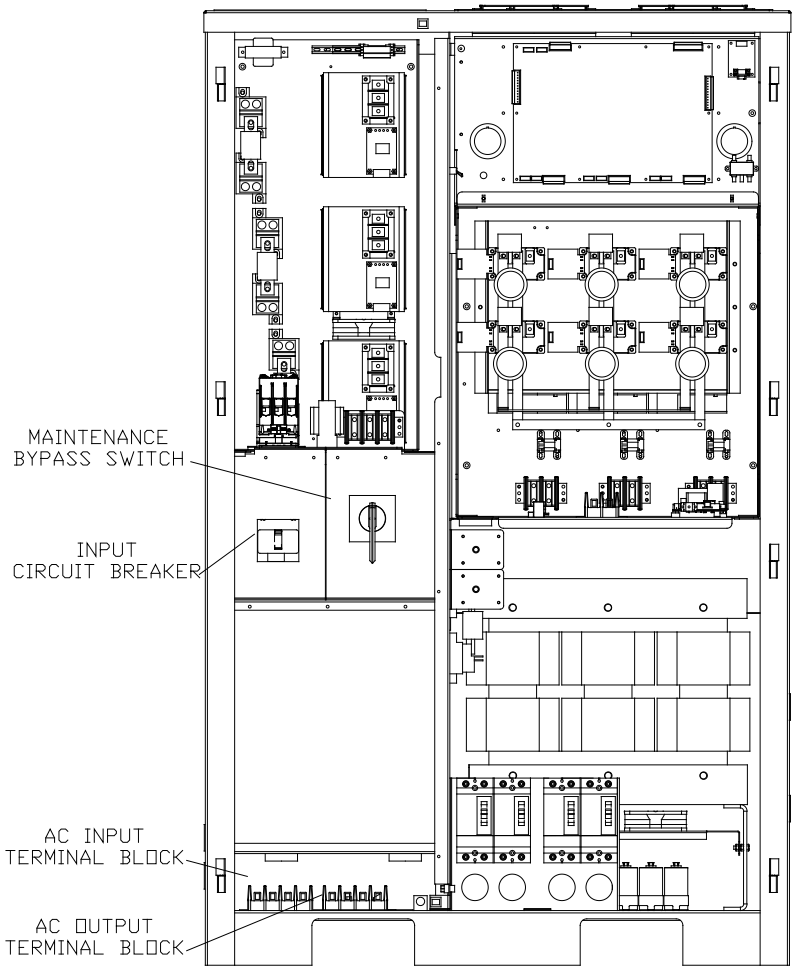


Figure 5.4 AC Input and Output Locations
60KW Inverter Cabinet

CHAPTER 6

INSTALLING BATTERIES AND DC WIRING

WARNING

Only qualified service personnel (such as a licensed electrician) should perform the battery and DC wiring installation. Risk of electrical shock exists.

This section explains how to install system batteries, fuses, and cables. An electrician who is familiar with battery installations and applicable building and electrical codes should install the batteries.

WARNING

The batteries that will need to be installed in this system could cause you harm or severely damage the electronics if proper precautions are not followed. Batteries connected in series parallel configuration could produce lethal voltages with unlimited current. All batteries should be inspected for damage prior to installation. Never install a battery that is leaking electrolyte. Battery terminals should be cleaned with a wire brush to remove any oxidation. All tools should be insulated. Rubber gloves and safety glasses are recommended. **IN THIS SYSTEM BATTERY NEGATIVE IS TIED TO GROUND INSIDE THE INVERTER.** This means that the battery cabinet and shelves are at ground potential as soon as negative connections are made to the batteries. It is strongly recommended to make all negative connections to the batteries the last step to prevent any chance of shorting battery positive to ground. With the Battery Cabinet fuse(s) removed and the Main DC Breaker turned off or Main DC Fuse removed, make connections to battery positive first, working your way towards battery negative. Leave individual strings of batteries open at the last battery negative until all batteries are installed. Then connect each string's negative.

Safety Instructions

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS
This section contains important instructions that a qualified service person should follow during installation and maintenance of the system and batteries. ONLY a qualified service person should work with the batteries.

CAUTION

Full voltage and current are always present at the battery terminals. The batteries used in this system can produce dangerous voltages, extremely high currents, and a risk of electric shock. They may cause severe injury if the terminals are shorted together or to ground (earth). You must be extremely careful to avoid electric shock and burns caused by contacting battery terminals or shorting terminals during battery installation. Do not touch uninsulated battery terminals.

A qualified electrician familiar with battery systems and required precautions must install and service the batteries. Any battery used with this unit shall comply with the applicable requirements for batteries in the standard for emergency lighting and power equipment, UL 924. Cabinets are design to be used with, and batteries must be replaced with, manufacturer battery number BAT-CG12105X, BAT-CG12150X OR BAT-CG12180X,or a manufacturer approved equivalent. See the battery wiring diagram that came with the battery cables. If you substitute batteries not supplied by manufacturer, the unit's UL listing is void and the equipment may fail. Installation must conform to national and local codes as well. Keep unauthorized personnel away from batteries.

The electrician must take these precautions:
Wear protective clothing and eyewear. For battery systems >48vdc, wear rubber gloves and boots. Batteries contain corrosive acids or caustic alkalis and toxic materials and can rupture or leak if mistreated. Remove rings and metal wristwatches or other metal objects and jewelry. Don't carry metal objects in your pockets where the objects can fall onto the batteries or into the system or battery cabinet.

Tools must have insulated handles and must be insulated so that they do not short battery terminals. Do not allow a tool to short a battery terminal to another battery terminal or to the cabinet at any time. Do not lay tools or metal parts on top of the batteries, and do not lay them where they could fall onto the batteries or into the cabinet.

Install the batteries as shown on the battery-wiring diagram provided with the system. When connecting cables, never allow a cable to short across a battery's terminals, the string of batteries, or to the cabinet.

Align the cables on the battery terminals so that the cable lug does not contact any part of the cabinet even if the battery is moved. Keep the cable away from any sharp metal edges.

CAUTION

Install the battery cables so the battery cabinet or the system doors cannot pinch them.

External battery cabinet chassis ground (or earth) must be connected to the system's chassis ground (or earth). The ground conductor must be insulated. If you use conduit, this ground conductor must be routed in the same conduit as the battery conductors.

Where conductors may be exposed to physical damage, protect conductors in accordance with the National Electrical Code (NEC).

If you are replacing batteries or repairing battery connections, follow the procedure in the system user's Guide to shut down your system and remove both AC and DC input power.

Before Installing the Batteries

Tools

CAUTION

Always use insulated tools when you work with batteries. Always torque connections to the manufacturer's recommendations.

When you work with system batteries, you need the following tools. The tools must be insulated so they do not short battery terminals to the cabinet. Wear the safety equipment required by local code whenever the doors are open and whenever you are working on batteries. Other tools may be necessary for optional batteries.

- Digital volt-ohm meter
- 7/16" socket wrench
- 3" extension socket
- Ratchet
- Wire brush
- Electrical tape
- Conductive grease or petroleum jelly
- Brush (to apply grease or petroleum jelly to terminals)
- 7/16" open end wrench
- Safety equipment required by local codes
- Torque wrench calibrated in inch-pounds or Newton-meters
- Safety glasses with side shields

Battery Voltage (vdc)

Models	5k	7.5k	10k	12.5k	16.7k	25k	33.2k	37.5k	50k	60k
Battery Volts	144v	144v	144v	180v (S) 240v (C)	240v	240v	240v	240v	240v	240v

Battery Cable Sizing

The battery cable or wire used varies. For the 100 AH battery (BAT-CG12105X) the size is 6 AWG (13.30 mm^2), for the 150 AH battery (BAT-CG12150X) the size is 4 AWG (21.15 mm^2), and for the 180 AH battery (BAT-CG12180X), the size is 2 AWG (33.6 mm^2). This is because the battery string current varies with battery type.

If the battery cabinets must be more than two feet (0.6 meters) from the main inverter cabinet, you may need to install larger battery cables between the battery cabinets and the system. Using long cable runs and larger diameter cables require a modified installation of the system; call SERVICE if you did not order the longer, larger-diameter cable with the system.

DC Disconnect

Systems have a Main Battery Fuse (F1) or Main Circuit Breaker inside the electronics cabinet; this fuse or breaker lets you remove DC power from the batteries. Systems also have a fuse on each battery string located in the battery cabinets.

Installing and Connecting the Batteries

Battery Wiring Diagram

You should have received a battery-wiring diagram with your system. This battery-wiring diagram shows how you should install the batteries, and make terminal and fuse/breaker connections. Use the diagram as you follow the steps below.

Location

Before you start installing the batteries, you must install the system and battery cabinets in their permanent location. If you have not already done this, see “Location Guidelines” on page 10 to choose a location.

CAUTION

To prevent damage to your equipment, do not move the system or separate battery cabinets after the batteries are installed.

To make sure a location is acceptable for the system, review the requirements in Chapter 3.

Connecting the Cabinets

Wherever conductors may be exposed to physical damage, you must protect the conductors in accordance with the NEC. This includes battery cables between the system and a separate battery cabinet and cables between battery cabinets (if you have more than one).

We recommend routing the battery cable through the chase nipples. The battery cables shipped with the unit are designed for an installation with the battery cabinet immediately to the right of (touching) the system.

If the cabinets must be farther apart, we recommend that you use conduit (cables not included). Install the conduit for the battery cables according to local or national codes. If you are using conduit, you must substitute your own cables for the cables shipped with the unit as you follow the battery installation instructions. Remember that the terminal blocks supplied with the unit and battery cabinets accept up to 2/0 AWG (67.4 mm^2) wire. If code requires a larger size cable, you must use cable splices. Perform the splices when the instructions describe terminations at the terminal blocks. Use the correct type, length, and gauge of cable; make sure your installation meets all applicable electrical codes.

Installing the Battery Cables between Cabinets

You must pull the battery cables and the equipment-grounding conductor through the connecting nipple or through the conduit between the electronics unit and the battery cabinet(s).

NOTE *If you are using conduit, you must supply the correct length, gauge, and type of battery cables.*

Refer to the battery-wiring diagram to identify the battery cables you use to connect the electronincs cabinet to the battery cabinet(s). If your unit has more than one battery cabinet use the battery-wiring diagram to identify which cables connect to each battery cabinet. Pull the cables through the connecting nipple or conduit. Do not connect any cables at this time.

Making the Equipment Ground Connection

Each battery cabinet ground (or earth) must be connected to the system's chassis ground. You can make this connection at the ground terminals inside the system and the battery cabinet as follows.

CAUTION

All grounding conductors should be insulated. If you are using non-insulated grounding conductors, take special care to make sure that the grounding conductors cannot accidentally contact live wires or the batteries.

In the system, find the ground compression lug labeled **"GROUND"**. This terminal is next to the AC terminal blocks.

1. You must supply the equipment-grounding conductor that connects the system to the nearest (or only) battery cabinet. Strip 0.5" (1.3 cm) of insulation from each end of the equipment-grounding conductor. Then, connect one end of the conductor to the ground lug in the system.
2. At the battery cabinet's ground lug. Connect the end of the grounding conductor to this lug.
3. If the unit has two battery cabinets, you must supply the grounding conductor that connects the cabinets. Strip 0.5" (1.3 cm) of insulation from each end of this grounding conductor. Connect one end to the ground lug in the first battery cabinet, and connect the other end to the matching ground lug in the next battery cabinet. Repeat this step if you have more than two battery cabinets.

NOTE *When you connect a separate equipment-grounding conductor directly to building steel, use the knockouts that are already on the unit. Do not make a knockout anywhere on the cabinet where there is not already a knockout.*

Electronics Cabinet Battery Connections

Do not connect any battery cables at this time. In the following procedure, you should only make connections to the electronics cabinet's fuse block, terminal block or circuit breaker. In some systems the first battery cabinet wiring may be already connected in the inverter electronics cabinet. The remaining wires will be located in the battery interconnect kit inside the battery cabinet. Use the battery-wiring diagram shipped with the battery cables as you follow these steps.

1. Find the positive battery cable (red wire) pulled between the electronics cabinet and the battery cabinet. At the ends of the cable, strip off 0.5" (1.3 cm) of insulation. Now, look at the battery-wiring diagram. Notice that this cable is connected from the positive position of the battery terminal block inside the electronics cabinet to the outside of the fuse block inside of the battery cabinet. Insert the positive (+) cable into fuse block and into the terminal block. Tighten the connections as shown on the battery-wiring diagram.

2. Find the negative battery cable pulled between the electronics cabinet and the battery cabinet. At the bare end of the cable, strip off 0.5" (1.3 cm) of insulation. Now, look at the battery-wiring diagram. Notice that this is connected from the negative position of the fuse terminal block or circuit breaker inside the electronics cabinet to a battery inside of the battery cabinet. Insert the negative (-) cable into the terminal block and insulate the other end that is in the battery cabinet. Tighten the connection as shown on the battery-wiring diagram.

3. Repeat step 1 and 2 for each additional battery string (See battery layout drawing for quantity of battery strings).

Fuse

All systems come with a fuse for each battery string to protect the system. The battery-wiring diagram shows the fuse location; a label inside the battery cabinet shows the fuse size. The system itself has a main DC fuse or main circuit breaker. At each battery cabinet, find the cable that is connected to the other end of each fuse block. Insert the cable (red wire). Tighten the connection as shown on the battery-wiring diagram.

Repeat this step for each cabinet.

In the Electronics cabinet verify that the main battery fuse is removed or the main battery circuit breaker is off, and the fuse(s) in the battery cabinet(s) are removed before connecting the batteries.

Arranging the Batteries

NOTE *As you arrange the batteries, you must be wearing the required safety equipment.*

Arrange the batteries in the cabinet or the system only as shown in the battery-wiring diagram. This arrangement is designed to maximize airflow around the batteries. The cabinets are designed so that battery cases should never touch. Air should be free to circulate. Clean the entire surface of all battery terminals with the wire brush before you install the batteries to create good contact points.

Load the batteries into the system or battery cabinet(s). Starting with the bottom shelf, load one shelf at a time.

CAUTION

Never install the batteries in an airtight enclosure.

Connecting the Cables Between Batteries

When you make battery terminal connections, use the torque wrench to tighten the battery terminal connections securely. You can find out what torque value to use by finding the battery number on the front of the battery. Then, use Table 6.1 to find the torque value for that battery.

Table 6.1 Battery Torque

Battery Type	Torque
BAT-CG12105	Torque to 120 in lbs. (13.6 Nm)
BAT-CG12105A	Torque to 120 in lbs. (13.6 Nm)
BAT-CG12105B	Torque to 55 in lbs. (6.5 Nm)
BAT-CG12105E	Torque to 100 in lbs. (11.3 Nm)
BAT-CG12105G	Torque to 100 in lbs. (11.3 Nm)
BAT-CG12105H	Torque to 110 in lbs. (12.4 Nm)
BAT-CG12105I	Torque to 120 in lbs. (13.6 Nm)
BAT-CG12205	Torque to 120 in lbs. (13.6 Nm)
BAT-CG12205B	Torque to 60 in lbs. (6.8 Nm)
BAT-CG12150B	Torque to 90-100 in lbs. (10.2-11.3 Nm)
BAT-CG12180A	Torque to 90-100 in lbs. (10.2-11.3 Nm)

Now, follow these steps to connect the cables:

1. Using the battery-wiring diagram, determine which batteries belong to each battery string.
2. Clean the cable connectors with the wire brush before you make the battery connections. Torque all battery terminal connections to the value shown for your battery in Table 6.1.

NOTE *As you carry out the following step, use these guidelines:*
If you are using conductive grease, apply a thin coating of high-temperature conductive grease on each post and every cable connector before you assemble and torque the connection to slow corrosion.
If you use nonconductive grease like petroleum jelly, do not apply any grease before you make the connections and torque them. Instead, make the connection first; then, torque it to the value shown in Table 6.1. After you make the connection, apply a coating of the nonconductive grease to the hardware at the battery terminals.

3. In each battery string, connect the battery tie straps between the batteries as shown in the battery-wiring diagram (positive terminal to negative terminal).
4. Connect the battery cables from one shelf to the next as shown on the battery-wiring diagram.
5. Connect the fuse block to the positive of the battery (red wire) as shown on the battery-wiring diagram.

CAUTION

Hazardous voltage is present! System batteries are high current sources. These batteries can produce dangerous voltages, extremely high currents, and a risk of electric shock.

6. Install only the battery cabinet fuse(s). Next, use the voltmeter to check the DC voltage between the positive (+) position on the battery block inside the electronics cabinet and the unconnected battery negative terminal. This voltage should be approximately the battery voltage record on the unit ID label. If it is greater than + or – 10%, review the battery wiring diagram. Correct any wiring errors and recheck the DC voltage; do not go on until your measurement is within + or – 10%. If the measurement is too high and you cannot find the cause of the problem, call SERVICE.

CAUTION

If you do not verify that voltage and current direction are correct, the equipment may fail.

Connecting the Negative Battery Cable(s) to the Battery String(s)

Remove the insulation from the cable that was put on in step 2 of “Electronics cabinet battery block connections”. Connect the cable to the battery (-) negative. Repeat this step for systems with multiple strings.

Replacing the Batteries

CAUTION

A battery can present a risk of electrical shock and high short circuit current. A qualified electrician familiar with battery systems should service the batteries.

Review all the safety instructions at the beginning of this chapter before you replace any batteries.

Use the Same Quantity and Type of Battery

CAUTION

You must use the same quantity and type of battery. Substituting batteries not supplied by manufacturer voids the UL listing and may cause equipment damage.

To ensure continued superior performance of your system and to maintain proper charger operation, you must replace the batteries in the system or battery cabinets with the same number of batteries. These batteries must be the same types as the original batteries. The replacement batteries should have the same voltage and ampere-hour rating as the original batteries.

Handle Used Batteries with Care!

Assume that old batteries are fully charged. Use the same precautions you would use when handling a new battery. Do not short battery terminals or the battery string with a cable or tool when you disconnect the batteries! Batteries contain lead. Please dispose of old batteries properly.

CAUTION

Do not dispose of batteries in a fire because the batteries could explode. Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.

Dispose of Batteries Properly

CAUTION

Batteries contain lead. Many state and local governments have regulations about used battery disposal. Please dispose of the batteries properly.

CHAPTER 7

TURNING ON THE SYSTEM AND SETTING PARAMETERS

Several parameters in the system software determine when and how your system conducts the automatic monthly and annual tests. Refer to “Program Functions” in the “Front Panel Display” chapter of the system user’s Guide for a description of each test.

Starting the Unit

Before you can set the parameters, you must start the system.

CAUTION: HAZARDOUS VOLTAGES – ONLY QUALFIED SERVICE PERSONNEL SHOULD PERFORM PROCEDURE.

1. Verify that the installation switch located on the inverter chassis is in the (OFF) position and the main DC circuit breaker is (OFF) or main DC fuse is removed. Verify that AC input circuit breaker is (OFF). Install all battery cabinet fuses.
2. Press and hold the DC Pre-charge switch located on the inverter chassis (see Figure 7.1, 7.2, 7.3, 7.4) for 10 seconds, and then install the main battery fuse, or if the unit is equipped with a main battery circuit breaker close it to the (ON) position. If a large flash occurs or if the circuit breaker trips, the batteries are not connected properly. Call service immediately.
3. Energize the Mains AC input by turning (ON) the unit’s input circuit breaker (see Figure 5.1, 5.2, 5.3, 5.4) and/or the Distribution Panel breaker located upstream from the inverter.
4. Turn the installation switch to the (ON) position. The Front Panel display should now be illuminated and a slight hum should be heard from the inverter transformer. The unit is now charging and the output should be energized.

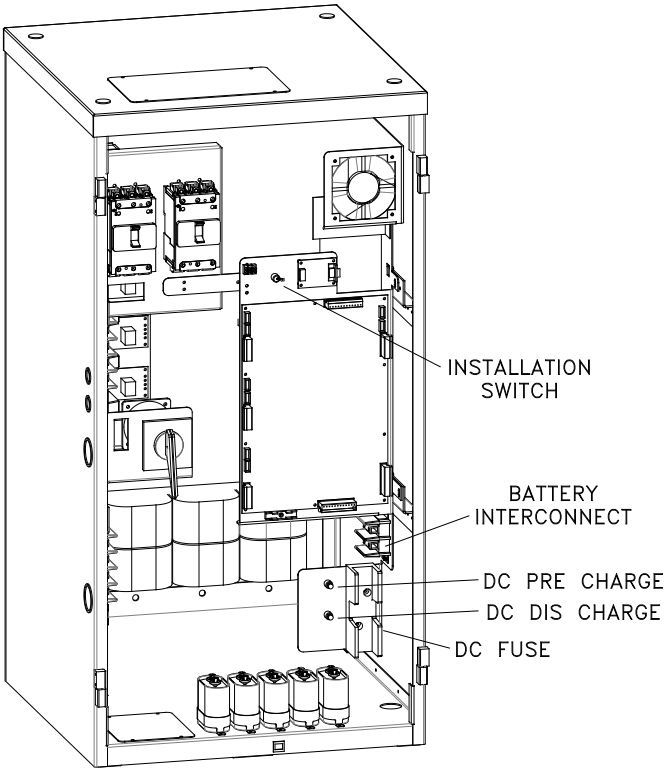


Figure 7.1 Battery Fuse, DCPre-charge Switch & Installation Switch (5KW – 10KW)

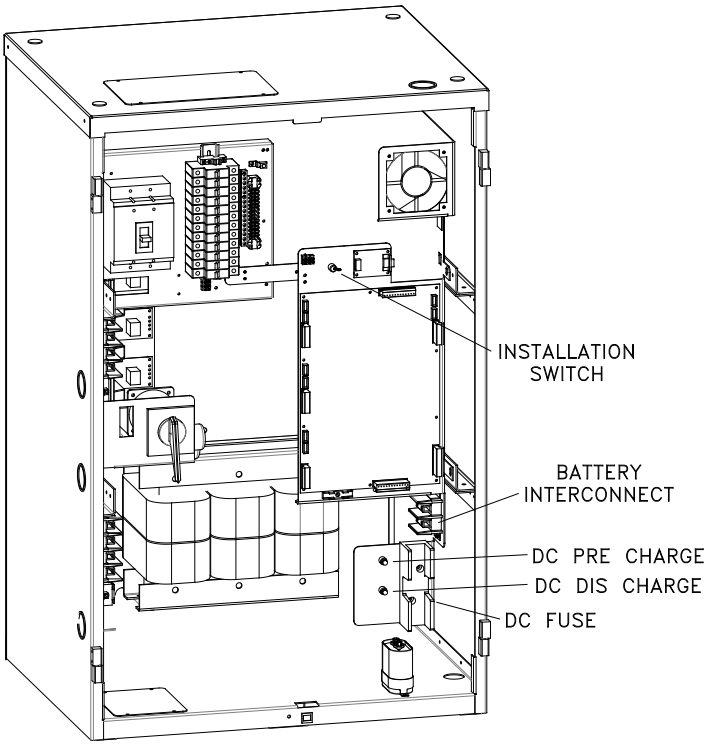


Figure 7.2 Battery Fuse, DC Pre-charge Switch & Installation Switch (12.5KW – 16.7KW)

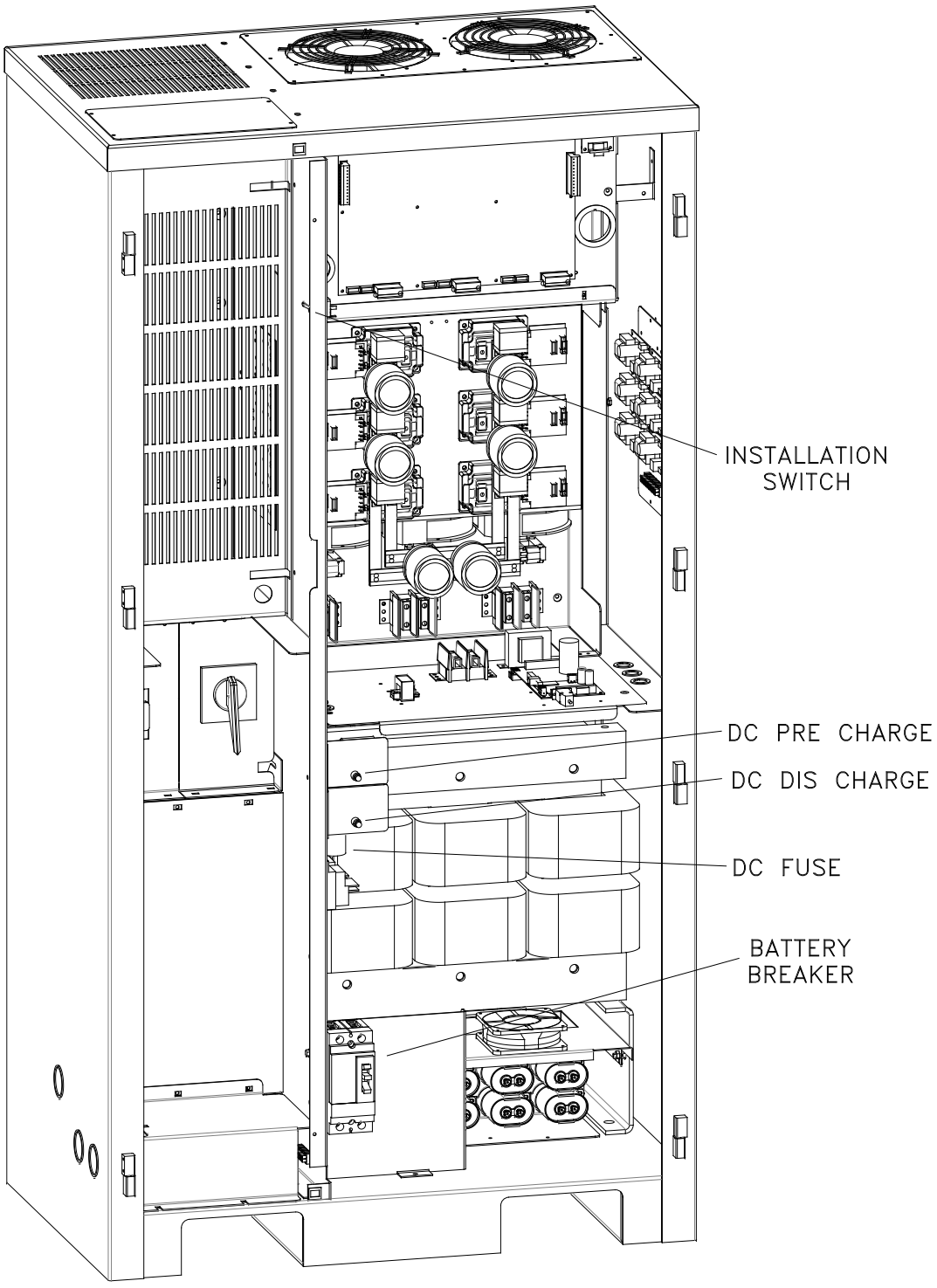


Figure 7.3 Battery Fuse, DC Pre-charge Switch & Installation Switch (25KW - 50KW)

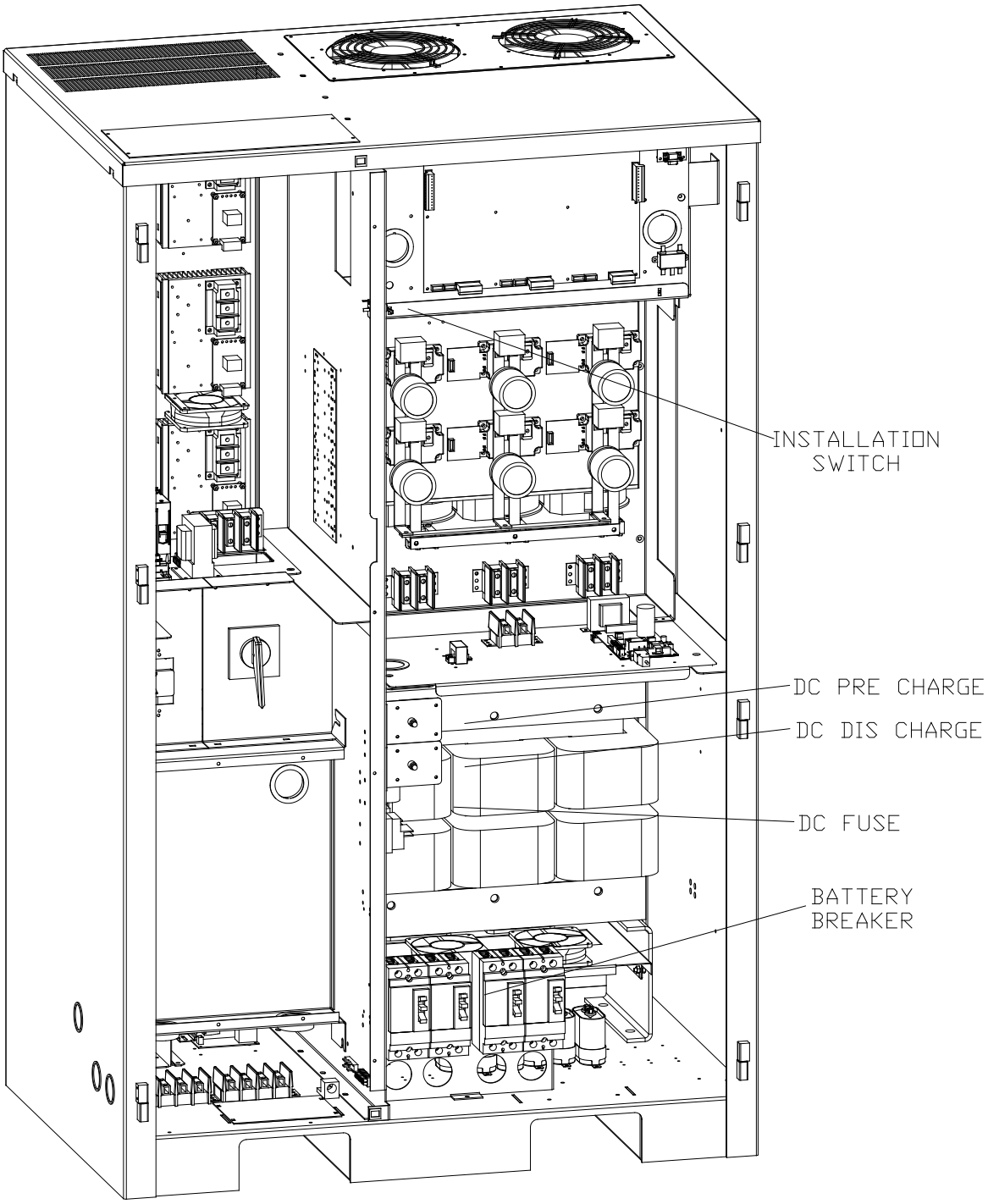


Figure 7.4 Battery Fuse, DC Pre-charge Switch & Installation Switch (60KW)

FRONT PANEL DISPLAY

The Front Panel Display assembly consists of an OLED display and a 4-button keypad. The 4 buttons can navigate through all the menus by using the left and right arrow keys, the ENTER and the ESCAPE.

The default menu will scroll between the Identification/Date-Time screen, the Status Screen, and the Meter screens. To view the other menu options from the default screen, press the **ENTER** key, and then press the left or the right arrow key to go to the desired menu.

The Menu's available are Meter, System Status, System Setup, Log View, Maintenance, Unit Info, and Alarms/Faults.

Once the desired menu has been reached, press the **ENTER** key to gain access to this menu. Once into the menu, use the left or right arrow key to scroll to different functions within the menu. Press the **ENTER** key again to gain access to the desire function. To exit, press the **ESCAPE** key until the desired level has been reached. (See figure 7.5)

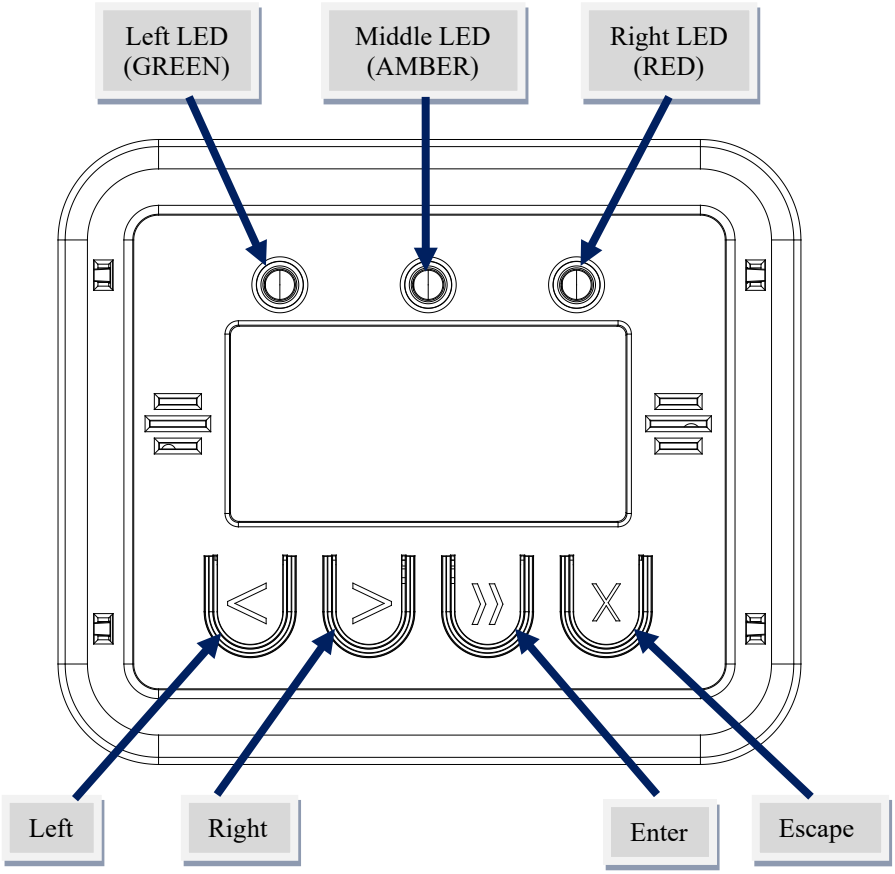


Figure 7.5 Front Panel Display

LED Function

The inverter Front Panel Display (FPD) features three LEDs: A green LED (on the left), an amber LED (in the middle), and a red LED (on the right). One LED (and only one LED) will always be on. The following table describes the meaning behind each of the LEDs:

Table 7.1 Keypad Functions

LED Color (position)	Meaning
GREEN (left)	There are no alarms, and the inverter is running the load on utility power.
AMBER (middle)	There are no alarms, but the inverter is running the load on battery power.
RED (right)	There are one or more active alarms asserted. Refer to 'Alarms' screen (below) for more information.

Control Panel Keypads

Table 7.2 Keypad Functions

Key Name	Description
LEFT (<)	This key functions as Left scroll key.
RIGHT (>)	This key functions as Right scroll key.
ENTER (»)	Pressing this key will view menus.
ESCAPE (x)	Pressing this key will exit out of menus and return to the Identification/Date-Time screen.

Meter

To get to the Meter functions from the default screen, press the **ENTER** key, scroll to the METER menu using the left or the right arrow key, then press the **ENTER** key again. Use left or the right arrow key to view the Meter function desired.

Table 7.3 Meter Functions

Function	Description
Input Voltage	Measures the AC Input Voltage to the Inverter for each phase.
Output Voltage	Measures the AC Output Voltage from the Inverter for each phase.
Output Current	Measures the AC Output Current from the Inverter for each phase.
Battery Current	Measures the DC Battery Current. When in charge mode, the current will be positive. When in Inverter mode, the current will be negative.
Battery Voltage	Measures DC Battery Voltage.
Output Power	Indicates the AC Wattage of the Inverter output total and for each phase.
Battery Power	Indicates the total DC Watts (Battery Power) the Inverter is processing.
Ambient Temperature	Measures the internal ambient temperature inside the system.
Operating Days	Indicates the total days the system has been on-line.
Inverter Runtime	Indicates the total minutes the system has run on inverter.

System Status

To get to the System Status from the default screen, press the **ENTER** key, scroll to the SYSTEM STATUS heading using the left or the right arrow key, then press the **ENTER** key again. If there are more than 3 statuses present, use left or the right arrow key to scroll through all.

Indicates the Status of the machine – AC Present, Battery Charging, System Ready, On Battery Power, and any Alarms/Faults present.

System Setup

To get to System Setup from the default screen, press the **ENTER** key, scroll to the SYSTEM SETUP menu using the left or the right arrow key, then press the **ENTER** key again. Use left or the right arrow key to view the System Setup functions.

Set Date
The parameters are Year, Month, and Day.
To change any of the parameters, use the left or right arrow key depending on if you want to increase or decrease. Once the parameter is correct, press the **ENTER** key and the next parameter can be changed.

Set Time
The parameters are Hour and Minute. The 24-hour standard is used so 2:00 PM would be 14 hours. Use the left or right arrow key to change the parameters and the **ENTER** key to scroll between parameters.

Config Buzzer
For audible buzzer the parameter is Enabled/Disabled. Use the left or right arrow key to change the setting and the **ENTER** key to save. WARNING: disabling the buzzer will disable audible notification when the inverter transfers to battery power or when there is an inverter alarm or fault. The default buzzer setting is enabled; once the system is shut down, the default setting is reactivated upon restart.

Config Setpoints
Available configurable setpoint values are Battey Voltage, Ambient Temperature, Input Voltage, Max Runtime, Load Reduction, and Max Current. To change the number, press the **ENTER** key and then use the left or right arrow key. Once the desired number is reached, press the **ENTER** key and this will return to the top-level menu.

Battery Voltage – Battery bank Low and Near Low values in Volts DC.

Table 7.4 Near Low Battery Fault Chart

DC Voltage	Near Low Battery
144VDC	130VDC
180VDC	162VDC
240VDC	216VDC

Ambient Temperature – Internal high temperature setpoint in Degrees Centigrade.

Input Voltage – Utility Low and High value setpoints in Volts AC.

Max Runtime – Elapsed time the inverter may run in emergency mode, setpoint in minutes.

Load Reduction – This will automatically generate an alarm when the system output current is 10 percent higher or lower than the setpoint number, set in Amps AC.

Max Current – This will automatically generate an alarm when the system output current is higher than the setpoint number, set in Amps AC. Depending on the duration and severity of the overcurrent event, the inverter may shut down to protect the electronics.

Log View

To get to the Log menu from the default screen, press the **ENTER** key, scroll to the LOG VIEW menu using the left or right arrow key, then press the **ENTER** key again. Use the left or right arrow key to view the type of log desired, and the press the **ENTER** key for more information. Available logs are Alarm, Event, and Test.

The Alarm Log creates a new log every time an alarm becomes active. The number of alarms that can be captured in the Alarm Log is 75. The format is first in is first out so; alarm number one is the most recent alarm. Each Alarm Log entry indicates the Log Number, Alarm type, Date, and Time of the alarm.

The Event Log captures data and creates a new log every time there is a transfer from utility power to battery power. The number of events that can be captured in the Event Log is 75. The format is first in is first out so; event number one is the most recent event. Each Event Log entry indicates the Log Number, Event type, Date, and Time of the event on Page 1. Press the ENTER key again to view Page 2, with Output Voltage logged for each phase. Press the ENTER key again to view Page 3, with Output Current logged for each phase. Press the ENTER key again to view Page 4, with Ambient Temperature and Event Duration.

The Test Log captures data and creates a new log every time an automatic monthly or yearly test occurs. The number of tests that can be captured in the Test Log is 75. The format is first in is first out so; test number one is the most recent test. Each Test Log entry indicates the Log Number, Monthly or Yearly test type, Date, and Time of the test on Page 1. Press the ENTER key again to view Page 2, with Output Voltage logged for each phase. Press the ENTER key again to view Page 3, with Output Current logged for each phase. Press the ENTER key again to view Page 4, with Ambient Temperature and Test Duration.

Maintenance

To get to the Maintenance menu from the default screen, press the **ENTER** key, scroll to the MAINTENANCE menu using the left or right arrow key, then press the **ENTER** key again. The display will prompt for a password.
****** The password is left arrow, right arrow, left arrow, and right arrow. ******

Once the password is entered, use the left or right arrow key to view the specific Maintenance setting desired, and the press the ENTER key for more information. The user has access to change the following settings: Self Test, Monthly Test, Yearly Test, Factory Setup, and Clear Logs.

Self Test
This will manually perform a 1-minute self test, causing the inverter to run on battery power.

Monthly Test
The parameters are Day, and Time in Hour and Minute. The 24-hour standard is used so 2:00 PM would be 14 hours.
To change any of the auto monthly test parameters, use the left or right arrow key depending on if you want to increase or decrease. Once the parameter is correct, press the **ENTER** key and the next parameter can be changed.

Yearly Test
The parameters are Month, Day, and Time in Hour and Minute. The 24-hour standard is used so 2:00 PM would be 14 hours.
To change any of the auto yearly test parameters, use the left or right arrow key depending on if you want to increase or decrease. Once the parameter is correct, press the **ENTER** key and the next parameter can be changed.

Factory Setup
An additional password is required to access the Factory Setup functions, and only the factory is authorized to have this password.

Clear Logs
This permanently clears all previous Alarm, Event, and Test Log records.

Unit Info

To get to Unit Info from the default screen, press the **ENTER** key, scroll to the UNIT INFO heading using the left or right arrow key, then press the **ENTER** key again.

Indicates Current Software Revision Level of the front panel display.

Alarms/Faults

To get to Alarms/Faults from the default screen, press the **ENTER** key, scroll to the ALARMS/FAULTS heading using the left or right arrow key, then press the **ENTER** key again.

The alarm/fault menu displays all active alarms and faults. If there are none active, the display screen will indicate no alarms or faults.

Keypad Setup Mode

The Front Panel features a Setup Mode where you can do the following:

- See the firmware version of the Front Panel Display.
- Disable or Re-enable the buzzer on the Front Panel display. WARNING: disabling the buzzer will disable audible notification when the inverter transfers to battery or when there is an inverter alarm.
- Disable or Re-enable the “soft button guides”, which are symbols that hover over the buttons (on the bottom of the display screen, next to their respective buttons) when the buttons are touched, to guide the User on which button is which. The button guides are very helpful when the Lighting Inverter is in a dark room where the symbols engraved on the buttons are difficult to see but may be disabled if the Lighting Inverter is always in a bright room and hiding the button guides from the screen is aesthetically preferred.
- Soft reset the Front Panel display, as a troubleshooting step in case of a software issue.

Setup Mode is entered (and also exited) by holding down the RIGHT (>) and ENTER (») keys together for 3 seconds at any time.

When in Setup Mode, navigate as follows:

- Use the LEFT (<) and RIGHT (>) keys to toggle the currently selected setting.
- Use the ENTER (») and ESCAPE (x) keys to navigate back and forth between setting.

Completing the Installation

Close the doors and lock the cabinet(s). You have finished installing the system. Follow the steps in the Startup and Warranty Validation form to test the installation and startup the system for the first time. After you complete this form, return it to the manufacturer to validate the warranty.

Keep the System Installation Guide and the User's Guide in the folder attached to the inside of the system door.

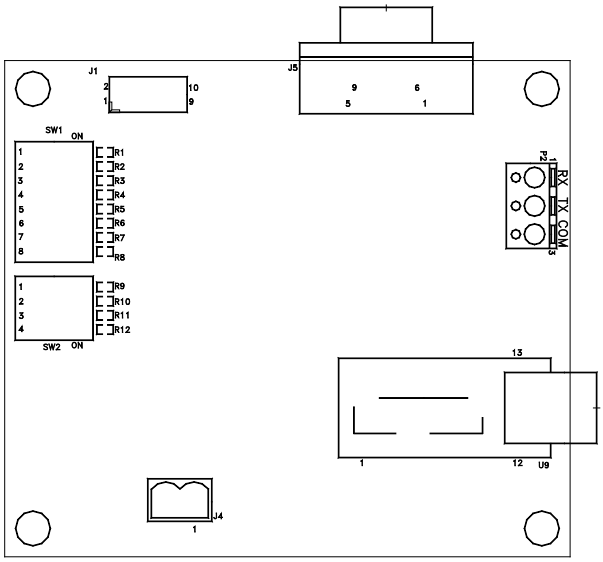
Notes:

PART II – OPTIONS MANUALS

BACNET COMMUNICATION OPTION MANUAL

THREE PHASE

EMERGENCY LIGHTING CENTRAL INVERTER



Myers Emergency Power Systems
44 South Commerce Way, Bethlehem, PA 18017
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SECTION 1

BACnet Communication Option Board

The BACnet Communication Option Board for the three phase Series C Emergency Lighting Central Inverter has two internal connections, the RS232 communication bus and the input power. There are two external connections, a RS485 output connector and a USB connection that is the computer interface. For detailed operation on the protocol and commands for the computer interface see Section RS-232 Communications. There are also two dip jumpers that setup the baud rate and address. See Figure 1 for locations of the connections. **Note: The Meter Panel/BACnet switch on the cabinet door must be set to BACnet and left on BACnet to communicate with the BACnet board.**

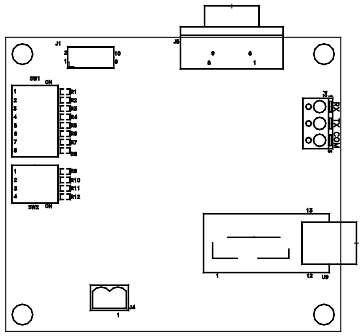


Figure 1 – Outline of BACnet Communication Board.

SECTION 2

Description of Operation

EBI acts as a simple B-ASC server device. It supports a total of 112 Analog Inputs (AI), 67 Binary Inputs (BI) and 3 File (FI) objects. EBI is a full MS/TP master device. The MS/TP MAC address is configurable via seven DIP switches, or optionally using a soft-configured MAC address. EBI supports baud rates of 9600, 19200, 38400, 57600 and 115200. The device requires external network biasing and termination resistors when it is used as an end-of-line device. The MS/TP transceiver is optically isolated and the isolated ground is provided along with + and - EIA-485 terminations.

You may configure the Device Object_Name and Object_Identifier and Max_Master by writing to the appropriate Device object properties.

The built-in objects have a mostly fixed configuration of Object_Names, engineering units and state text. AI objects have only required properties. BI objects include fixed Inactive_Text and Active_Text property values, as well as all required properties. Objects BI52 through BI67 correspond to input and output contact statuses. The Object_Name property for these 16 objects are writable.

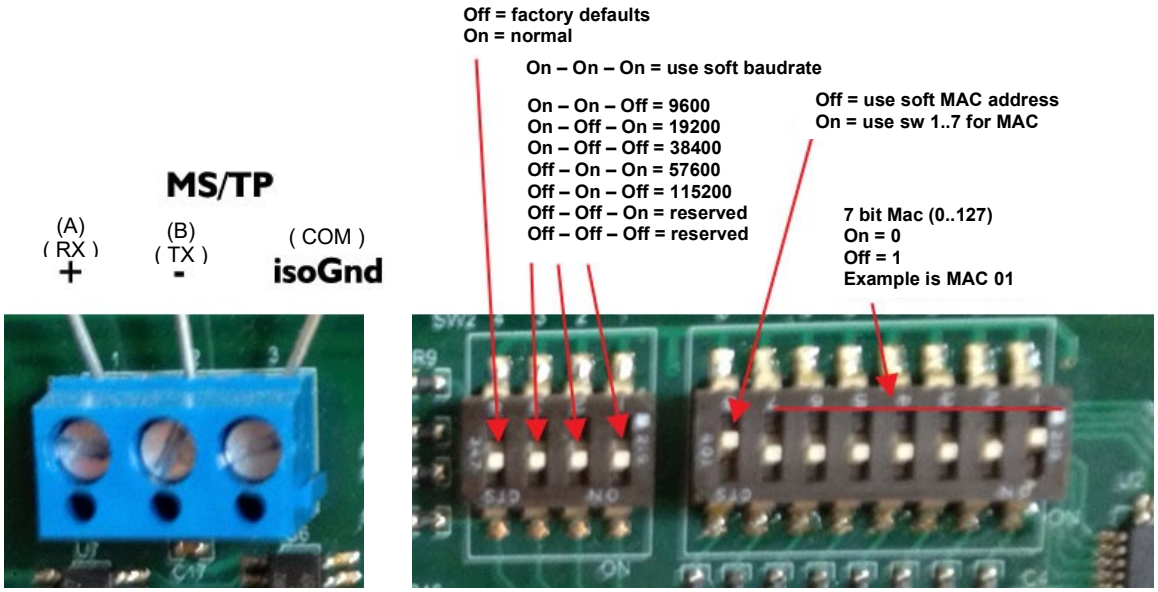
File objects include a writable Archive property. Files are used to access one of three dynamic logs of Alarms, Tests and Events.

SECTION 3

Settings

There are two objects, AV1 and AV2 that will allow the software to change the Baudrate and MAC address respectively. If SW2 is in the ON-ON-ON-ON position upon reset or power on the baud rate can be changed by writing to AV-1; Present_Value through BACnet. The AV1 is not in effect when the right three switches are in any other position than ON. If SW1, switch 8 is in the OFF position upon reset or power on the MAC address can be changed by writing to AV-2; Present_Value through BACnet. The AV2 is not in effect when switch 8 is in the ON position.

Termination, Baudrate and MAC Address:



Factory Defaults:

device.Object_Name	EBI
device.Object_Identifier	Device 560000
device.Max_Master	127
device.MACaddress	01
device.Baudrate	38400
device.Description	
device.Database_Revision	1
BI52.Object_Name	Input Contact Status 1
…	
BI58.Object_Name	Input Contact Status 8
BI59.Object_Name	Output Contact Status 1
…	

BI67.Object_Name	Output Contact Status 8

SECTION 4

Object Summary

objectID	object name	notes
AI1	INPUT VOLTAGE PHASE A	VAC
AI2	INPUT VOLTAGE PHASE B	VAC
AI3	INPUT VOLTAGE PHASE C	VAC
AI4	OUTPUT VOLTAGE PHASE A	VAC
AI5	OUTPUT VOLTAGE PHASE B	VAC
AI6	OUTPUT VOLTAGE PHASE C	VAC
AI7	OUTPUT CURRENT PHASE A	A AC
AI8	OUTPUT CURRENT PHASE B	A AC
AI9	OUTPUT CURRENT PHASE C	A AC
AI10	BATTERY VOLTAGE	V
AI11	AMBIENT TEMPERATURE	°C
AI12	OUTPUT VA (TOTAL)	VA
AI13	OUTPUT VA PHASE A	VA
AI14	OUTPUT VA PHASE B	VA
AI15	OUTPUT VA PHASE C	VA
AI16	SYSTEM DAYS	days (0..65535)
AI17	UPS RUN TIME	min (0..65535)
AI25	BATTERY CURRENT	A DC
BI1	SYSTEM READY STATUS	1=ready
BI2	AC LINE PRESENT STATUS	1=present
BI3	BATTERY CHARGING STATUS	1=charging
BI4	BATTERY POWER STATUS	1=battery power
BI5	THREE AC PHASES PRESENT	1=3 phases present
BI24	Input not Present	0=normal 1=alarm
BI26	Battery Low	0=normal 1=alarm
BI28	High Ambient Temperature	0=normal 1=alarm
BI32	Overload	0=normal 1=alarm
BI33	Overload Shutdown	0=normal 1=alarm
BI39	Input Voltage Low	0=normal 1=alarm
BI40	Input Voltage High	0=normal 1=alarm
BI43	Battery Charger	0=normal 1=alarm
BI44	Inverter Failure	0=normal 1=alarm
BI45	Near Low Battery	0=normal 1=alarm
BI46	Load Reduction	0=normal 1=alarm
FI1	AlarmLog	
FI2	EventLog	
FI3	TestLog	

SECTION 5

Protocol Implementation

Vendor Name:	**Myers Power Products, Inc.**
Product Name:	**EBI**
Product Model Number:	**PCB404303P00**
Applications Software Version:	**v2.00**
Firmware Revision:	**v1.05**
BACnet Protocol Revision:	**12**

BACnet Standardized Device Profile (Annex L)

EBI is capable of supporting the B-ASC profile and lower.

BACnet Interoperability Building Blocks Supported (Annex K)

DM-DDB-B, DM-DCC-B, DM-DOB-B,DM-TS-B, DM-RD-B, DS-RP-B, DS-WP-B

Segmentation Capability

EBI does not support segmentation.

Standard Object Types Supported

No object types may be dynamically created or deleted.
EBI supports the following object types:
Analog Input, Binary Input, Device and File.
Optional Properties Supported:

Device	OBJECT_NAME	writable	32 chars
	OBJECT_IDENTIFIER	writable	
	DESCRIPTION	writable	64 chars
Binary Input	INACTIVE_TEXT	read-only	
	ACTIVE_TEXT	read-only	
BI52..BI67	OBJECT_NAME	writable	32 chars
File	ARCHIVE	writable	

Data Link Layer Options

MS/TP master (Clause 9): 9600, 19200, 38400, 57600, and 115200 baud

Device Address Binding

Static binding is not supported.

Networking Options

EBI does not provide router or Annex H tunneling or BBMD functionality.

Character Sets Supported

UTF-8

BACNET IP AND SNMP COMMUNICATION OPTION MANUAL

THREE-PHASE

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SECTION 1
BACNET MS/TP Communication Board

BACnet IP and SNMP communication from the three-phase Illuminator Hypernova Emergency Lighting Central Inverter is achieved via a standard Myers EPS BACnet MS/TP communication board – which converts the RS-232 communication with the inverter controller into the BACnet MS/TP protocol – and a Babel Buster BB2-7030 BACnet MS/TP to BACnet IP Gateway and Router, made by Control Solutions Inc. (https://www.csimn.com). Figure 1 describes the data flow at a high level.

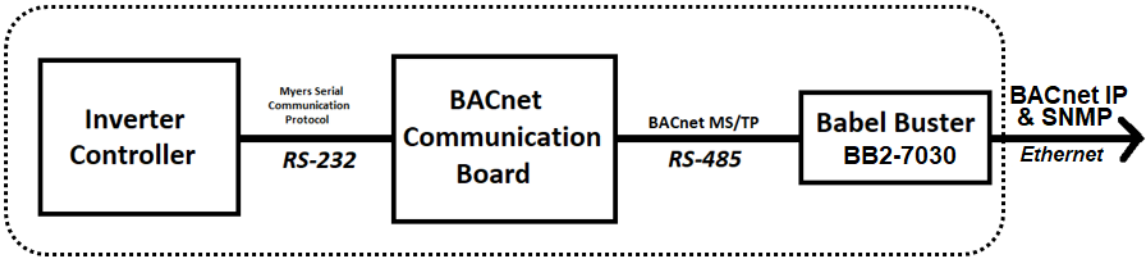


***Figure 1** – Data Flow to Achieve BACnet IP and SNMP Integration*

Everything inside the dashed box (including the Control Solutions Inc. Babel Buster BB2-7030) is pre-wired, pre-programmed and pre-configured by Myers EPS, and is internally mounted and powered inside the inverter cabinet (and will remain powered when the utility A/C input goes down and the inverter switches to battery power). The integrator may integrate directly to the Ethernet link on the BB2-7030. The below information on the BACnet Communication Board is for your information only.

The BACnet Communication Option Board for the three-phase Illuminator Hypernova Emergency Lighting Central Inverter has two internal connections; the RS232 communication bus to the inverter controller, and the input power that powers the board. There are two external connections, a RS485 output connector that is the BACnet MS/TP link, and a USB connection that is a serial computer interface into the RS232 communication bus to the inverter controller. For detailed operation on the protocol and commands for the computer interface see section RS-232 Communications. There are also two DIP switches that setup the BACnet MS/TP communication settings. **These should not be changed.** Figure 2 shows an outline diagram of the BACnet Communication Board and required DIP settings.

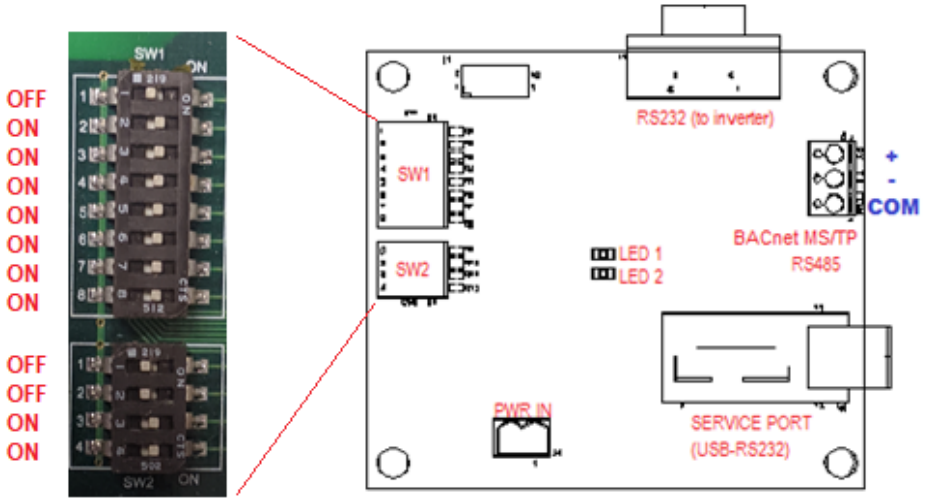


Figure 2 – Outline of BACnet Communication Board, and required DIP settings (do not change)

Babel Buster BB2-7030

The Babel Buster BB2-7030 is a DIN-rail mounted protocol bridge that is pre-programmed to convert between BACnet MS/TP and BACnet IP and/or SNMP. It features two external connectors; one for BACnet MS/TP RS485 and power **in (**24 Volts AC or DC), and the other for Ethernet (LAN connection) **out**. Figure 2 is a diagram of the BB2-7030.

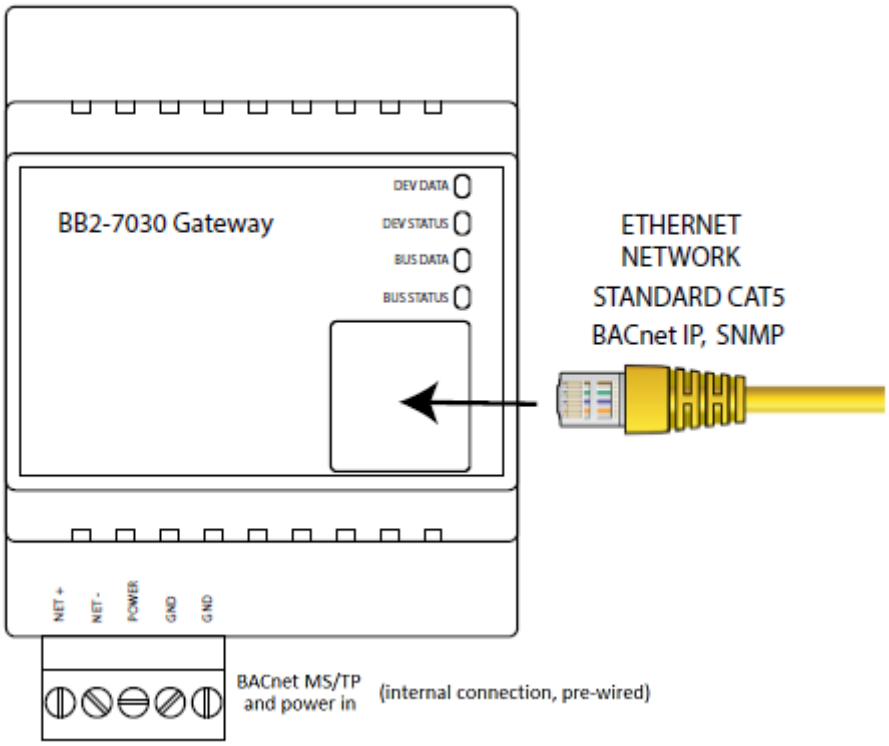


***Figure 2** – BB2-7030 Diagram*

The lower (BACnet MS/TP and power in) connector is pre-wired. Please do not change the internal wiring. The upper (Ethernet) connector should be connected to the Local Area Network (LAN) to which it will be integrated via BACnet IP and/or SNMP. The BB2-7030 is preprogrammed to:

- Provide BACnet IP proxy objects to read the values of the BACnet objects presented by the Myers inverter (see Section 4). The proxy objects are updated every 5 seconds
- Provide SNMP OIDs to access all BACnet objects, and act as an SNMP Agent (server) such that they can also be read via SNMP

The BB2-7030 can be configured using its onboard web server to generate SNMP traps when programmed conditions are met (e.g. ‘inverter is running on battery power’, ‘inverter is overloaded’, ‘ambient temperature is too high’, etc.).

Meter Panel / BACnet Selector Switch

Important Note: The Meter Panel/BACnet selector switch on the front of the cabinet door must be set to 'BACnet' and left there for the BACnet integration to work. When the switch is in the 'BACnet' position, the nearby 'BACnet ENABLED' LED will light up. However, to use the Meter Panel Display, you must move the selector switch to the 'Meter Panel' position (the LED will go off). Note that the BACnet/SNMP integration will stop updating its telemetry until you move the switch back to 'BACnet', so don't forget to move it back after you are done using the Meter Panel Display.

SECTION 2

Description of Operation

The three-phase Illuminator Hypernova Emergency Lighting Central Inverter acts as a BACnet IP server, and SNMP Agent (server).

It supports a total of *eighteen* analog objects (floating point on BACnet IP, and rounded to the nearest integer on SNMP), *sixteen* binary flag objects and *three* file objects (only accessible when BB2-7030 is in Router Mode).

It can also be programmed to transmit SNMP 'traps' when a programmed condition is met (analog value goes above or below a threshold value, or binary flag gets set to 1 or cleared to 0). The traps can be sent to specified IP addresses on the LAN.

SECTION 3

Default Ethernet Settings

- **IP Address:** 10.0.0.101 (static)
- **Subnet Mask:** 255.255.255.0
- **Gateway:** 10.0.0.1
- **DHCP Client:** Turned off by default (but DHCP is supported)
- **Web Server Port:** 80 (HTTP default)

Default BACnet IP Settings

- **Device Instance**: 20800
- **Port**: 47808 (0xBAC0)
- **BACnet Router**: Disabled
- **BBMD**: Disabled
- **APDU Timeout**: 3 seconds
- **APDU Retries**: 3

Default SNMP Settings

- **SNMP Version Support**: v1, v2c (v3 is ***not*** supported)
- **Community**: public
- **Traps**: Disabled

SECTION 4
Object Summary

Analog Inputs (analog sensors or counters read from the inverter)

Object	Object Name	Units	SNMP OID
AI 1	Input Voltage Phase A	Volts AC	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.1
AI 2	Input Voltage Phase B	Volts AC	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.2
AI 3	Input Voltage Phase C	Volts AC	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.3
AI 4	Output Voltage Phase A	Volts AC	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.4
AI 5	Output Voltage Phase B	Volts AC	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.5
AI 6	Output Voltage Phase C	Volts AC	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.6
AI 7	Output Current Phase A	Amps AC	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.7
AI 8	Output Current Phase B	Amps AC	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.8
AI 9	Output Current Phase C	Amps AC	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.9
AI 10	Battery Voltage	Volts DC	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.10
AI 11	Ambient Temperature	°C (Degrees Celsius)	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.11
AI 12	Output VA (Total)	VA (Volt-Ampere Reactive)	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.12
AI 13	Output VA Phase A	VA (Volt-Ampere Reactive)	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.13
AI 14	Output VA Phase B	VA (Volt-Ampere Reactive)	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.14
AI 15	Output VA Phase C	VA (Volt-Ampere Reactive)	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.15
AI 16	Days Online	Days	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.16
AI 17	Battery Runtime	Minutes	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.17
AI 25	Battery Current	Amps DC	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.18

Binary Inputs (status flags from the inverter; value is either 0 or 1)

Object	Object Name	SNMP OID
BI 1	System Ready Status	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.19
BI 2	On Utility Power	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.20
BI 3	Battery Is Charging	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.21
BI 4	On Battery Power	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.22
BI 5	Unit is 3-Phase	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.23
BI 24	Input Not Present Alarm	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.24
BI 26	Battery Low Alarm	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.25
BI 28	High Ambient Temp Alarm	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.26
BI 32	Overload Alarm	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.27
BI 33	Overload Shutdown Alarm	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.28
BI 39	Input Voltage Low	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.29
BI 40	Input Voltage High	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.30

Binary Inputs (cont'd)

Object	Object Name	SNMP OID
BI 43	Battery Charger Alarm	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.31
BI 44	Inverter Failure	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.32
BI 45	Near Low Battery	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.33
BI 46	Load Reduction Alarm	1.3.6.1.4.1.3815.1.3.1.1.1.1.2.34

File Inputs

File Input objects can only be accessed when the BB2-7030 is in Router Mode (see Section 6 below). The contents of the files are described in Section 6 below. File objects cannot be accessed via SNMP.

Object	Object Name
FI 1	Alarm Log File *(only available when BB2-7030 is in Router Mode)*
FI 2	Event Log File *(only available when BB2-7030 is in Router Mode)*
FI 3	Test Log File *(only available when BB2-7030 is in Router Mode)*

SECTION 5
Connecting to the BB2-7030 Web Server the First Time

To be able to do things like change the IP address, set a different BACnet 'Device Instance' number, change the SNMP 'community' code, or set up SNMP traps, you will first need to connect to the BB2-7030's web server.

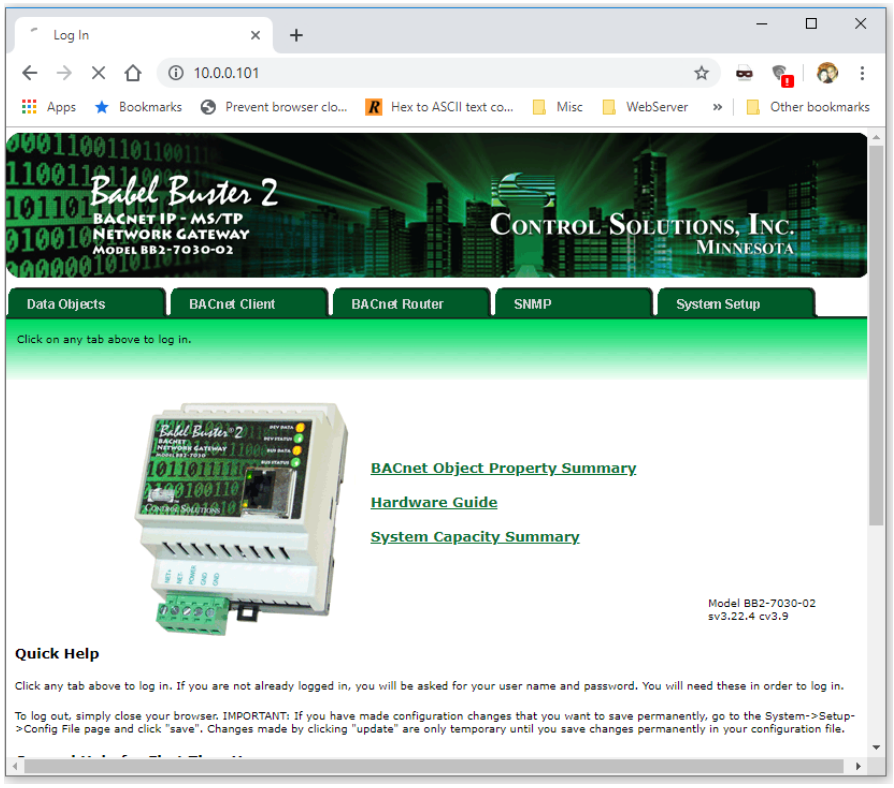
Start by directly connecting an Ethernet cable between your PC and the BB2-7030.

The default IP address of the BB2-7030 is **10.0.0.101**. If your PC is running Microsoft Windows, and is not already on the 10.0.0.0 domain, you will need to add a route on your PC. Do this by opening a command prompt with administrator privileges. First type "ipconfig" and note the IPv4 address listed for the adapter that is connected to the same LAN as the BB2-7030 (or directly to the BB2-7030). Now type the following command into the command prompt, but replace the **x.x.x.x** with your PC's IPv4 address.

```
route add 10.0.0.0 mask 255.255.255.0 x.x.x.x
```

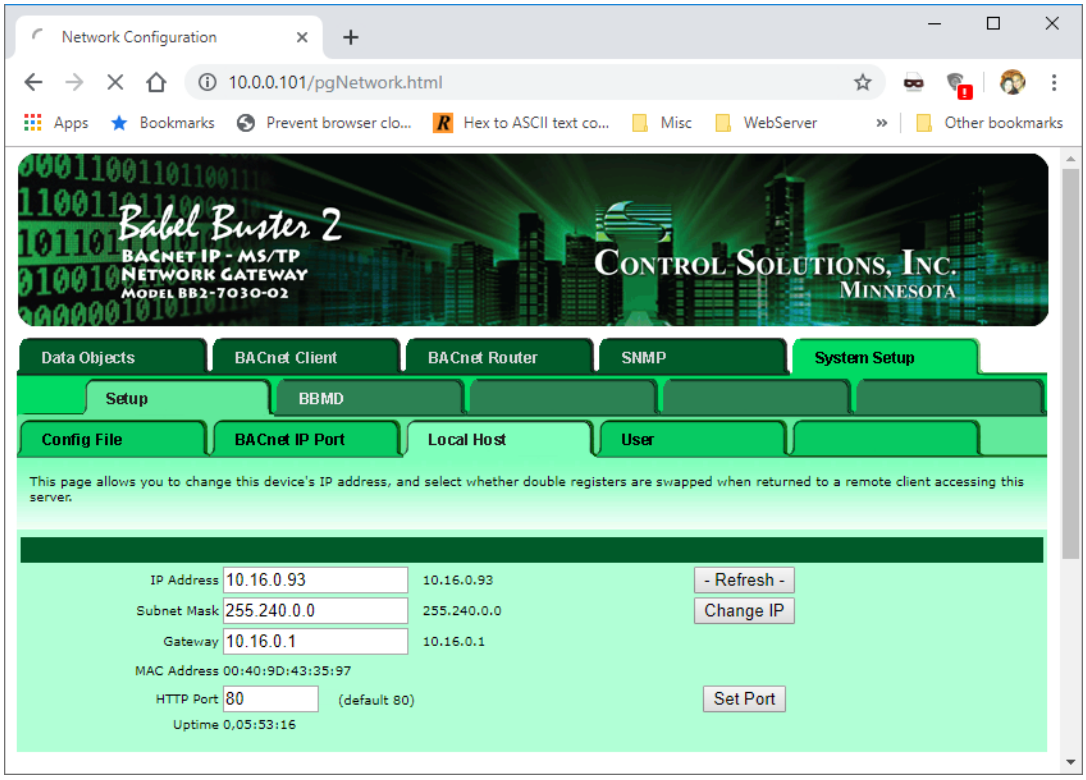
You should now be able to view the BB2-7030 homepage by entering "10.0.0.101" into the URL box of your web browser.

If you are running a non-Windows operating system, or if the above command doesn't work, please refer to your operating system's instructions on how to change your PC's IP address to a static IP of 10.0.0.100. You should now be able to view the BB2-7030 homepage by entering "10.0.0.101" into the URL box of your web browser.



Setting up IP Address and LAN Settings

Click on the “System Setup” tab. You will be presented with a ‘Sign in’ popup prompt. Type “root” for Username, and “buster” for Password. Now navigate to “System Setup” >> “Setup” >> “Local Host”. The page should look like this:



Enter the IP Address that you desire your BB2-7030 to have, and the Subnet Mask and Gateway address for the LAN that the BB2-7030 will be on. If you wish the BB2-7030 to be a DHCP client (i.e. to automatically be assigned IP address, subnet mask and gateway address from a DHCP server if one exists and is reachable on the LAN), simply enter “255.255.255.255” as the IP Address. However, DHCP is not recommended because it means the IP address of the BB2-7030 becomes dynamic and can periodically change; you will have to periodically update any software that communicates with it (over BACnet IP, SNMP or HTTP).

When done, click the “Change IP” button to save your changes. Wait at least 15 seconds until the settings are changed and the webpage reloads. Now cycle power to your BB2-7030 by pulling out and then re-inserting the “BACnet MS/TP and Power In” connector. At this point, if you wish you may disconnect the direct ethernet connection between your PC and the BB2-7030 and put it on the LAN and connect to it through the LAN via its new IP address setting.

Note that clicking the “Change IP” button results in a permanent change of the programmed IP address, even if power to the BB2-7030 is lost. All other programming requires explicit saving (described in the “Saving Your Changes” section below) but changing IP settings is the exception.

Setting Up BACnet IP (Including Device Instance)

Once the IP address is correctly set, the BACnet IP should immediately be working using the IP address you set, Device Instance number 20800, Port 47808, and the BACnet objects described above in Section 4. If these settings are OK, you're good to go.

If you need to change the Device Instance number (**which must be globally unique on the BACnet network**) or Port Number, you can do so on the following page: "System Setup" >> "Setup" >> "BACnet IP Port" . Make the required changes, click the "Save" button, and then refer to the "Saving and Activating Your Changes" subsection below to make your changes permanent ***(otherwise, they may be lost if the inverter loses power for long enough for the entire battery to deplete, or if maintenance is performed on the inverter)***.

By default, the BB2-7030 acts as a BACnet MS/TP to BACnet IP gateway (proxy) for one device (the single Myers EPS inverter system). In the unlikely case that you wish to configure it to be a BACnet router, see the section below on Gateway vs Router.

Setting Up the SNMP Agent

Once the IP address is correctly set, the SNMP Agent (server) should immediately be working using the IP address you set, "public" as the community, and "Get" operations on the SNMP OIDs described in Section 4 above (after the first "Get", you may use "Get Next" as well, or walk the entire MIB). If these settings are OK, you're good to go.

The BB2-7030 supports SNMP v1 and v2c. Note that SNMP v3 is ***not*** supported.

Setting Up SNMP Traps

The BB2-7030 can use SNMP's "trap" mechanism to generate notifications (and send them to one or more trap receiving PCs/devices) when a programmed condition occurs. By default, no traps are programmed. You are only able to program one trap per object (see object list in Section 4).

To program traps, go to the "SNMP" >> "SNMP Agent" >> "Traps" webpage. You must follow the below instructions for each trap you wish to program:

1. Enter the last number (number after the last '.') of the OID of the object you wish to program a trap for (see object list in Section 4).
2. Click the 'Update' button.
3. Select the rule from the dropdown menu. Allowed rules for analog objects are "greater than", "greater or equal", "less than", "less or equal", "equal to" and "not equal to". For binary objects, you only need the "equal" rule.

4. Set the value. For analog objects, use any value. For binary objects, use “0” to trap on a logic 0, or “1” to trap on a logic 1.
5. For analog values, consider setting a hysteresis. For example, if you are programming a trap for when ambient temperature is greater than 30°C, you might want to put in a hysteresis of 2°C so that if the temperature is right on the 30°C mark and oscillating with small variations over and under 30°C, you don’t get hit with a flood of traps (with a hysteresis of 2°C, once the temperature exceeds 30°C and you get the first trap, you won’t get another trap until the temperature drops all the way down to 28°C, and then comes back up over 30°C, or the Repeat Time elapses)
6. If you only want the trap to happen if the condition is reached for a minimum period of time, set that period in the “minimum on time” box. Enter it in the form HH:MM:SS (so for a 10 second minimum on time, you would type “00:00:10”)
7. “minimum off time” is another form of hysteresis, except using time instead of value. For example, if you are programming a trap for when ambient temperature is greater than 30°C, you can make the minimum off time be 2 minutes (00:02:00) so that the temperature has to be below 30°C consistently for 2 whole minutes before a trap can be generated once the temperature climbs above 30°C again.
8. Select the checkbox on whether you want the trap when the rule evaluates to True, to False, or you can check both. Typically, you will only want to trap on True.
9. The Repeat Time field determines how long (in ‘seconds’) the BB2-7030 will wait before resending a trap that is still asserted. For example, if you trap on loss of utility power, and you set the Repeat Time to 30 seconds, and utility power is lost for 10 minutes, you will get one trap every 30 seconds for 10 minutes (for a total of 20 traps). If you enter 0 here, the BB2-7030 uses its default repeat time of 60 seconds.
10. The Repeat Count sets the number of traps to send in immediate succession at each repeat time. If you set this to 0 or 1, the BB2-7030 uses the default repeat count of 1. Using a higher number is only necessary if the network or your ‘Trap Receiver’ client is unreliable and you want to maximize the chances of traps getting through. Going back to the above example, if you trap on loss of utility power, and you set the Repeat Time to 30 seconds, and the Repeat Count to 5, and utility power is lost for 10 minutes, you will get five back-to-back traps every 30 seconds for the 10 minutes for a total of 100 traps.
11. Click the “Update” button once more.

Once you have programmed all your traps, go to the “SNMP” >> “SNMP Agent” >> “Send Traps To” webpage, enter the IP address of your PC/device that will receive the SNMP traps, and click the “Update” button. If you wish to have multiple trap receivers on multiple devices, repeat this process but increment the number in the “Device #” box each time.

Finally, refer to the “Saving and Activating Your Changes” subsection below to make your programming changes permanent ***(otherwise, they may be lost if the inverter loses power for long enough for the entire battery to deplete, or if maintenance is performed on the inverter)***.

Saving and Activating Your Changes

Any changes you make on the BB2-7030 web pages - other than changing IP address - are temporary. They will not take effect until you activate them, plus they will be lost on a power cycle of the BB2-7030, until you permanently save them.

To permanently save your programming, go to “System Setup” >> “Setup” >> “Config File” , select **Hypernova.xml**” from the dropdown list (if it is not already selected), and click the “Save” button. The BB2-7030 will take 10 seconds or so to save the changes. The changes are now permanent and will survive power cycles.

Finally, click the “Load” button to get the BB2-7030 to reinitialize itself and activate your programming changes.

Warning: It is imperative that you click “Save” before you click “Load”. If you accidentally click “Load” first, the BB2-7030 will reload its programming from before you made any changes, and all your changes will be lost!

If you would like to back up your BB2-7030 programming on your PC for safe-keeping or to share with Tech Support, click the “View” button. Your browser will load and display an xml file that contains the BB2-7030’s programming in xml format. To download and save the xml file, press Ctrl-S (⌘-s on an Apple) or right click on white space on the page and click “Save As”.

SECTION 6
Using BB2-7030 as a BACnet Router

Gateway vs Router

By default, the BACnet IP Communication Option ships with the BB2-7030 configured to act as a BACnet IP Gateway. This means the BB2-7030 acts as a proxy, keeping a local copy of all the BACnet objects from the BACnet MS/TP Communication Board, and updating their current values every 5 seconds via BACnet MS/TP, and then presenting the copied objects to the BACnet IP world as its own objects.

In this default configuration, every inverter requires its own BB2-7030, and the inverters appear to the BACnet IP system as a native BACnet IP device. This is illustrated in Figure 3 below:

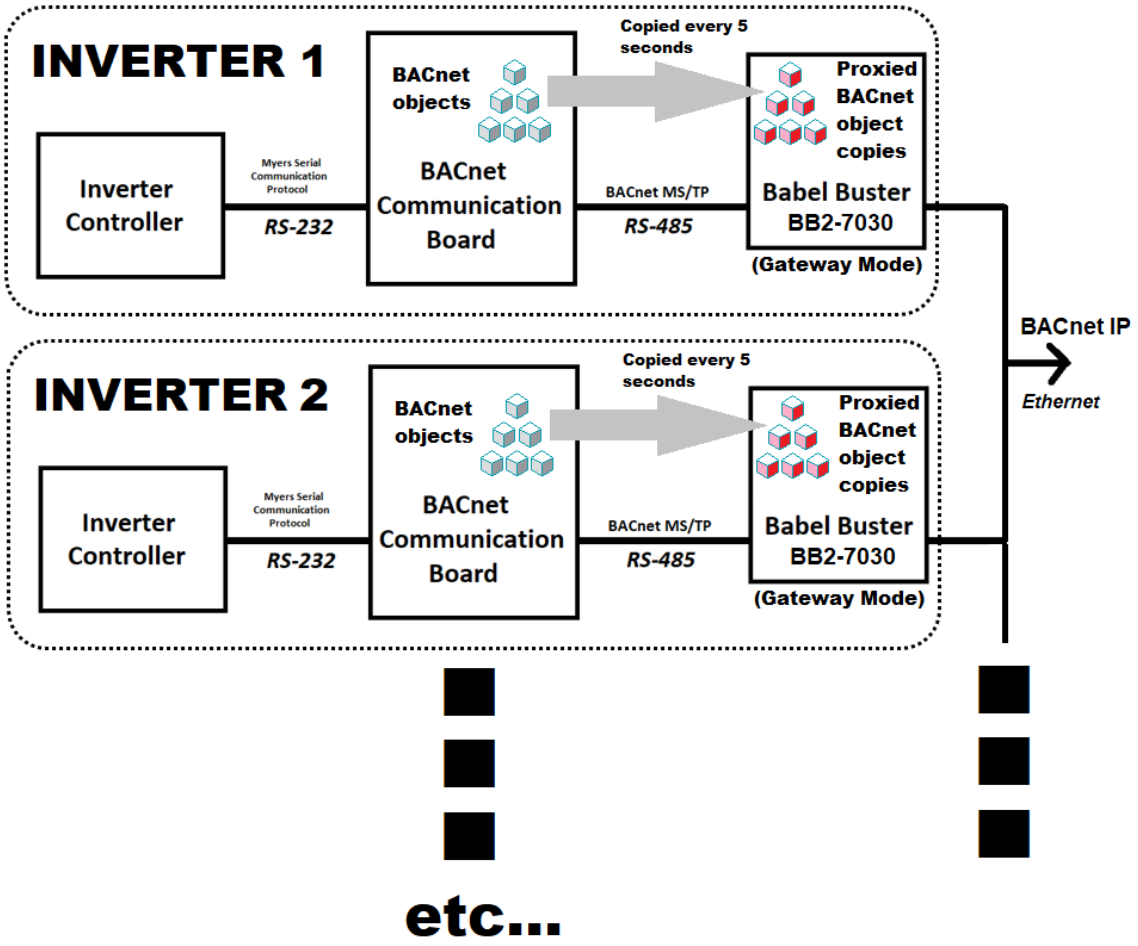


Figure 3 *– Each Inverter Has a BB2-7030 Acting as a Gateway (Proxy)*

This configuration is ideal for buildings that are wired with Ethernet (LAN) wiring (with Ethernet network switches, etc.).

However, the BB2-7030 also has the capability to act as a BACnet MS/TP to IP router (please do not confuse the terminology “BACnet router” with a standard Ethernet network router; they are very different devices). When configured as a BACnet MS/TP router, the BB2-7030 will no longer periodically read and proxy BACnet objects from the BACnet Communication Board. Instead, it will act as a simple ‘middleman’, bridging the BACnet MS/TP network with a BACnet IP network, ‘blindly’ passing traffic back and forth. All devices on the BACnet MS/TP network will become visible on the BACnet IP network, and vice versa. They will be one ‘hop’ apart (the hop through the BB2-7030 router).

This option is more complicated to configure and wire, but it is ideal for buildings that are wired with RS-485 wiring (RS-485 is the physical layer of BACnet MS/TP), and/or systems with 3rd party (non-Myers) BACnet MS/TP devices, but where BACnet IP integration is also required.

This system topology is illustrated in Figure 4:

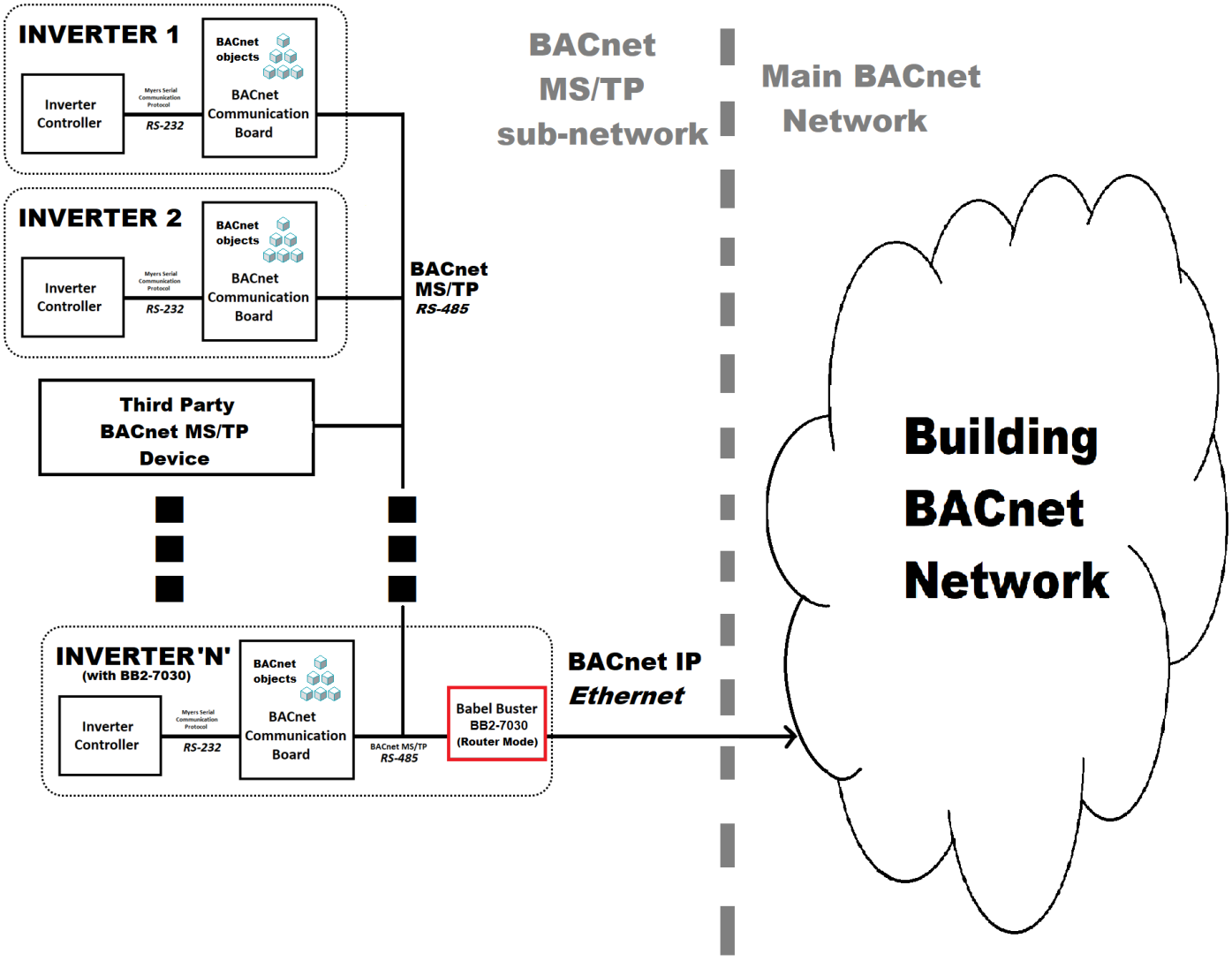


Figure 4 – BB2-7030 in Router Mode, Connecting Networks

Important points to note when operating the BB2-7030 in router mode:

1. In the inverter with the BB2-7030 router (marked “Inverter ‘N’” in the figure above), you must wire the incoming (external) BACnet MS/TP bus to the BACnet MS/TP terminal block on the BACnet MS/TP Communication board (it has 3 screw terminals ; see Figure 2 in Section 1) while keeping the wires that connect to the BB2-7030 also connected.
2. Myers Emergency Power Systems cannot take responsibility for or assist in the behavior / programming / operation of 3rd party (non-Myers) BACnet devices sharing the network. Troubleshooting will have to involve the 3rd party company’s tech support, and/or Control Solutions Incorporated tech support (the manufacturer of the BB2-7030).
3. Each BACnet MS/TP bus must have only one router connecting it to the BACnet IP network. Having multiple routers on the same bus segment will result in problematic and undefined behavior.

4. In line with standard BACnet practice, each device on a given BACnet MS/TP bus must be set to a unique MAC address. For Myers BACnet Communication Boards, this is typically done with DIP switches on the board ; please refer to that device's instruction manual.
5. In line with standard BACnet practice, each device on the entire BACnet network (including all BACnet MS/TP bus segments, and all BACnet IP networks) must be set a unique Device Instance number. Again, refer to each device's instruction manual for instructions on how to set respective Device Instance numbers.
6. Three extra objects are only visible in Router Mode; namely, 'File Input' (FI) objects for the Alarm Log file (FI 1), the Event Log file (FI 2), and the Test Log file (FI 3). Refer to the respective sections below for descriptions on what these files contain.

Configuring BB2-7030 As A Router

While the inverter that ships with a BACnet IP Communication Option (marked Inverter 'N' in Figure 4 above) will be preconfigured to act as a BACnet Gateway, it will have an (inactive) XML file already loaded into it (from Myers EPS manufacturing) that reconfigures the device to be a BACnet Router instead, along with some manual steps on the 'BACnet IP Port' and "Network Info" settings pages.

- On the BB2-7030 web page, go to "System Setup">>"Setup">>"Config File" and select "**SimpleRouterConfiguration.xml**" from the drop-down menu.
- Click the "Load" button. Wait 15 seconds or so for the BB2-7030 to load this new configuration.
- In the text box marked "Boot configuration", type **SimpleRouterConfiguration.xml**
- Click the "Boot" button.
- Navigate the web page to:

  "System Setup" >> "Setup" >> "BACnet IP Port"
- Uncheck the following three checkboxes on the bottom-right of the "BACnet IP Settings" section of the webpage:
  - I-Am route learning
  - I-Am-Router route learning
  - Disable ALL routing
- Click the 'Save' button on the top-right of the "BACnet IP Settings" section of the webpage.
- Navigate the web page to:

  "BACnet Router" >> "Local Networks" >> "Network Info"

- Enter the allocated network numbers for the BACnet IP Network (on the Ethernet side of this BB2-7030), and for the MS/TP Network (on the MS/TP RS-485 side of this BB2-7030). See the section below marked “On Network Numbers” for more detailed information.
- Enter the hop counts for the BACnet IP and MS/TP networks. See the section below marked “On Hop Counts” for more detailed information.
- Optionally, enter names for each network in the “Network Info” text boxes. This is optional, and purely informational. These names will only live within this BB2-7030 ; they are not global to the network.
- Finally, click the “Save” button to temporarily save your changes.
- To activate and permanently save your changes, refer to the section above titled “Saving and Activating Your Changes”.

On Network Numbers

In a large BACnet network that is comprised of multiple smaller sub-networks with BACnet routers in between, each sub-network in the system must be assigned a globally unique network number. All routers on the ‘edges’ of that sub-network must be configured with the same network number for that sub-network.

If your network only consists of a single MS/TP sub-network and a single IP network (with a single BB2-7030 in between), then you can assign any two arbitrary numbers to each sub-network in the BB2-7030 “Network Info” configuration page.

On Hop Counts

In a large BACnet network that is comprised of multiple smaller sub-networks with routers in between, each time a message has to cross from one sub-network to another (through a BACnet router), it is considered a ‘hop’.

Please count the maximum number of hops from any device to any other device on the network, add 1 or 2 to this number as a small buffer, and use this number as the Hop Count on the BB2-7030 “Network Info” configuration page.

If your network only consists of a single MS/TP sub-network and a single IP network (with a single BB2-7030 in between), then you should set the Hop Count to 2.

Parsing File Records (Alarm, Event and Test Logs)

This section will describe the information contained in Alarm, Event and Test log files, and how to parse them. These files can only be accessed when the BB2-7030 is operating in Router Mode. They are accessed as standard BACnet File Input objects.

Alarm Logs

This is an example of an Alarm Log file:

```
19/08/21  09:31     INVERTER FAULT
19/08/25  22:14     LOW VAC
```

- Each line in the file begins with a timestamp in the format “YY/MM/DD HH:MM”. Note that the time is in 24-hour format. Note also that the time must be set up correctly in the inverter control board, or the timestamps will be wrong. This can be done using the display mounted on the front of the cabinet.
- A tab character separates the date from the time, and another tab separates the time from the alarm descriptor.
- The final column on the right is the alarm descriptor, which describes the cause of the alarm.
- Each line ends with a DOS style line ending (“\r\n”)

Event Logs

This is an example of an Event Log file:

```
19/08/16 11:35  13      ALARMS    3P    24.0    277.4   277.8   278.0   10.2    10.8    8.5
19/08/18 20:09  6       NO ALARMS 3P    28.3    278.5   278.8   277.9   10.6    10.2    6.9
```

- Each line in the file begins with a timestamp in the format “YY/MM/DD HH:MM”. Note that the time is in 24-hour format. Note also that the time must be set up correctly in the inverter control board, or the timestamps will be wrong. This can be done using the display mounted on the front of the cabinet.
- A tab character separates the date from the time. Tab characters separate all the fields in the file.
- The next field describes the duration of the event (in integer minutes)
- The next field describes whether or not an alarm condition was asserted when the logged event occurred.
- The next field tells you that this is a three phase (“3P”) inverter
- The next field describes the recorded temperature, in degrees Celsius
- The next three fields provide the recorded output voltages (in Volts) of each of the three phases (phase A first, then phase B, then phase C)
- The final three fields provide the recorded output currents (in Amps) of each of the three phases (phase A first, then phase B, then phase C)
- Each line ends with a DOS style line ending (“\r\n”)

Test Logs

This is an example of a Test Log file:

```
19/08/15  02:45   20     ALARMS     Monthly 3P      28.0     277.9    277.0    278.3    10.8     10.5     8.5
19/08/30  23:00   20     NO ALARMS  Yearly  3P      27.6     276.1    277.1    276.9    10.6     10.5     8.8
```

- Each line in the file begins with a timestamp in the format “YY/MM/DD HH:MM”. Note that the time is in 24-hour format. Note also that the time must be set up correctly in the inverter control board, or the timestamps will be wrong. This can be done using the display mounted on the front of the cabinet.
- A tab character separates the date from the time. Tab characters separate all the fields in the file.
- The next field describes the duration of the event (in integer minutes)
- The next field describes whether or not an alarm condition was asserted when the logged event occurred.
- The next field describes whether the test was an automatically scheduled test (“Monthly” or “Yearly”), or a manually invoked test (“Event”).
- The next field tells you that this is a three phase (“3P”) inverter
- The next field describes the recorded temperature, in degrees Celsius
- The next three fields provide the recorded output voltages (in Volts) of each of the three phases (phase A first, then phase B, then phase C)
- The final three fields provide the recorded output currents (in Amps) of each of the three phases (phase A first, then phase B, then phase C)
- Each line ends with a DOS style line ending (“\r\n”)

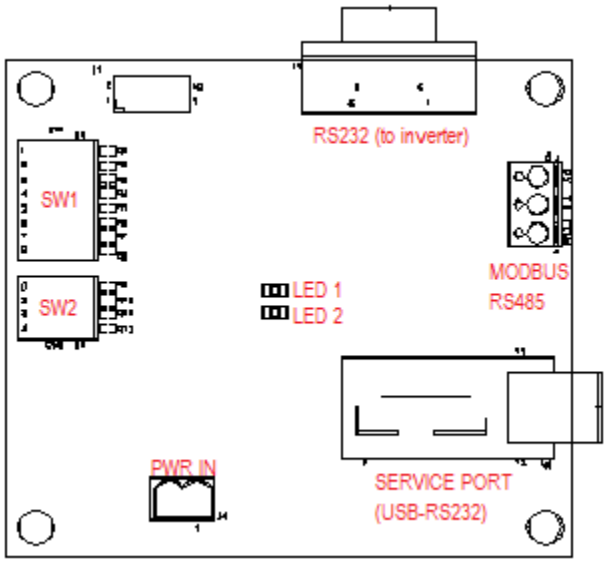
Please contact Myers EPS Service at (610) 868-5400 if you have questions or concerns.

MODBUS SERIAL COMMUNICATION OPTION MANUAL

THREE PHASE

ILLUMINATOR HYPERNOVA

EMERGENCY LIGHTING CENTRAL INVERTER



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SECTION 1

MODBUS Serial Comm Option Board - Introduction

The MODBUS Communication Option Board for the three phase Series C Emergency Lighting Central Inverter has two internal connections; the RS232 communication bus to the inverter controller, and the input power that powers the board. There are two external connections, a RS485 output connector that is the MODBUS link, and a USB connection that is a serial computer interface into the RS232 communication bus to the inverter controller. For detailed operation on the protocol and commands for the computer interface see section RS-232 Communications. There are also two DIP switches that select the MODBUS protocol (RTU or ASCII), baud rate, parity, and MODBUS slave address. See Figure 1 for the locations of these components.

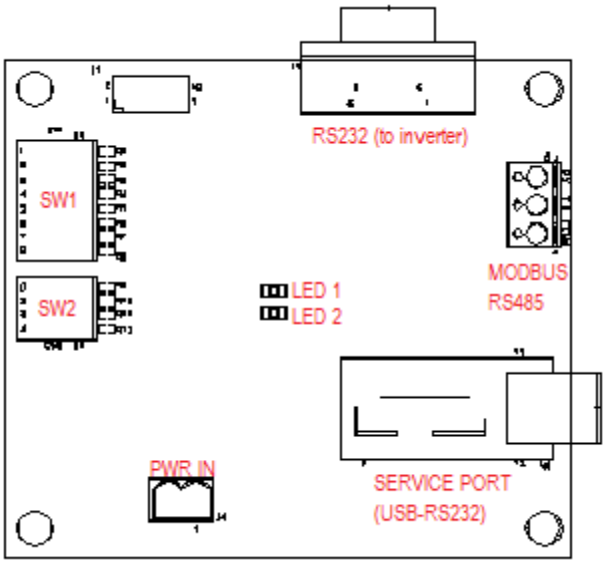


Figure 1 – Outline of MODBUS Communication Board.

Meter Panel / MODBUS Selector Switch

Important Note: The Meter Panel/MODBUS selector switch on the front of the cabinet door must be set to 'MODBUS' and left there for the MODBUS integration to work. When the switch is in the 'MODBUS' position, the nearby 'MODBUS ENABLED' LED will light up. To use the Meter Panel Display, you must move the selector switch to the 'Meter Panel' position (the LED will go off). But note that the MODBUS integration will stop updating its telemetry until you move the switch back to 'MODBUS', so don't forget to move it back after you are done using the Meter Panel Display.

SECTION 2

Description of Operation

The MODBUS Communication Option Board acts as a MODBUS slave. It supports both the RTU (binary) and ASCII modes of MODBUS Over Serial Line. For both modes, it supports either Even Parity or No Parity, and four baud rates: 9600bps, 19,200bps, 38,400bps and 115,200bps. It supports being set to any legal MODBUS slave address, between 1 and 247 (inclusive).

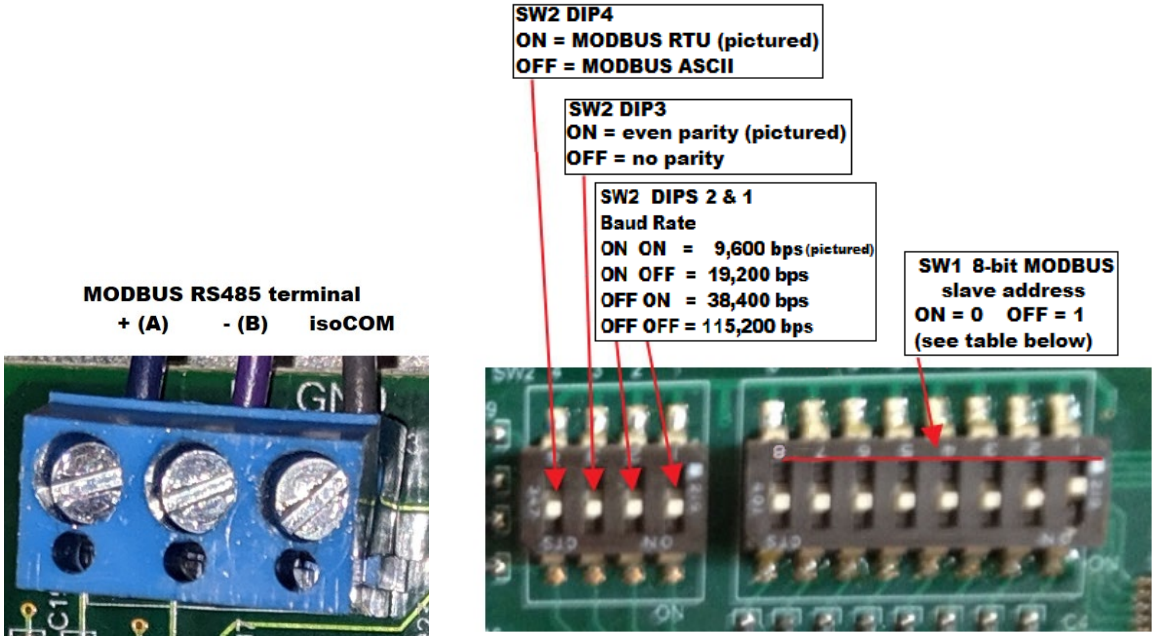
It supports a total of *eighteen* 16-bit analog objects (known as 'holding registers' in MODBUS), *sixteen* binary flag objects (known as 'coils' in MODBUS) and *three* File Record objects. File Records are used to access one of three dynamic logs of Alarms, Tests and Events.

The MODBUS Communication Option Board also supports the MODBUS "Report Server ID" self-identification command, reporting its model number and firmware revision in an ASCII string. You can also program a User ID up to 32 bytes long (in ASCII) that will be appended to the end of the self-identification string.

SECTION 3

Settings

RS-485 connection, Serial Mode, Parity, Baudrate and Slave Address:



MODBUS Slave Address Settings

MODBUS Slave Address is set on SW1, an 8-position DIP switch. The tables below describe the possible address settings:

MODBUS Slave Addresses 1 – 63

8	7	6	5	4	3	2	1	Address
ON	ON	ON	ON	ON	ON	ON	ON	247 (0xF7)
ON	ON	ON	ON	ON	ON	ON	OFF	1 (0x01)
ON	ON	ON	ON	ON	ON	OFF	ON	2 (0x02)
ON	ON	ON	ON	ON	ON	OFF	OFF	3 (0x03)
ON	ON	ON	ON	ON	OFF	ON	ON	4 (0x04)
ON	ON	ON	ON	ON	OFF	ON	OFF	5 (0x05)
ON	ON	ON	ON	ON	OFF	OFF	ON	6 (0x06)
ON	ON	ON	ON	ON	OFF	OFF	OFF	7 (0x07)
ON	ON	ON	ON	OFF	ON	ON	ON	8 (0x08)
ON	ON	ON	ON	OFF	ON	ON	OFF	9 (0x09)
ON	ON	ON	ON	OFF	ON	OFF	ON	10 (0x0A)
ON	ON	ON	ON	OFF	ON	OFF	OFF	11 (0x0B)
ON	ON	ON	ON	OFF	OFF	ON	ON	12 (0x0C)
ON	ON	ON	ON	OFF	OFF	ON	OFF	13 (0x0D)
ON	ON	ON	ON	OFF	OFF	OFF	ON	14 (0x0E)
ON	ON	ON	ON	OFF	OFF	OFF	OFF	15 (0x0F)
ON	ON	ON	OFF	ON	ON	ON	ON	16 (0x10)
ON	ON	ON	OFF	ON	ON	ON	OFF	17 (0x11)
ON	ON	ON	OFF	ON	ON	OFF	ON	18 (0x12)
ON	ON	ON	OFF	ON	ON	OFF	OFF	19 (0x13)
ON	ON	ON	OFF	ON	OFF	ON	ON	20 (0x14)
ON	ON	ON	OFF	ON	OFF	ON	OFF	21 (0x15)
ON	ON	ON	OFF	ON	OFF	OFF	ON	22 (0x16)
ON	ON	ON	OFF	ON	OFF	OFF	OFF	23 (0x17)
ON	ON	ON	OFF	OFF	ON	ON	ON	24 (0x18)
ON	ON	ON	OFF	OFF	ON	ON	OFF	25 (0x19)
ON	ON	ON	OFF	OFF	ON	OFF	ON	26 (0x1A)
ON	ON	ON	OFF	OFF	ON	OFF	OFF	27 (0x1B)
ON	ON	ON	OFF	OFF	OFF	ON	ON	28 (0x1C)
ON	ON	ON	OFF	OFF	OFF	ON	OFF	29 (0x1D)
ON	ON	ON	OFF	OFF	OFF	OFF	ON	30 (0x1E)
ON	ON	ON	OFF	OFF	OFF	OFF	OFF	31 (0x1F)
ON	ON	OFF	ON	ON	ON	ON	ON	32 (0x20)
ON	ON	OFF	ON	ON	ON	ON	OFF	33 (0x21)
ON	ON	OFF	ON	ON	ON	OFF	ON	34 (0x22)
ON	ON	OFF	ON	ON	ON	OFF	OFF	35 (0x23)
ON	ON	OFF	ON	ON	OFF	ON	ON	36 (0x24)
ON	ON	OFF	ON	ON	OFF	ON	OFF	37 (0x25)
ON	ON	OFF	ON	ON	OFF	OFF	ON	38 (0x26)
ON	ON	OFF	ON	ON	OFF	OFF	OFF	39 (0x27)
ON	ON	OFF	ON	OFF	ON	ON	ON	40 (0x28)
ON	ON	OFF	ON	OFF	ON	ON	OFF	41 (0x29)
ON	ON	OFF	ON	OFF	ON	OFF	ON	42 (0x2A)
ON	ON	OFF	ON	OFF	ON	OFF	OFF	43 (0x2B)
ON	ON	OFF	ON	OFF	OFF	ON	ON	44 (0x2C)
ON	ON	OFF	ON	OFF	OFF	ON	OFF	45 (0x2D)
ON	ON	OFF	ON	OFF	OFF	OFF	ON	46 (0x2E)
ON	ON	OFF	ON	OFF	OFF	OFF	OFF	47 (0x2F)
ON	ON	OFF	OFF	ON	ON	ON	ON	48 (0x30)
ON	ON	OFF	OFF	ON	ON	ON	OFF	49 (0x31)
ON	ON	OFF	OFF	ON	ON	OFF	ON	50 (0x32)
ON	ON	OFF	OFF	ON	ON	OFF	OFF	51 (0x33)
ON	ON	OFF	OFF	ON	OFF	ON	ON	52 (0x34)
ON	ON	OFF	OFF	ON	OFF	ON	OFF	53 (0x35)
ON	ON	OFF	OFF	ON	OFF	OFF	ON	54 (0x36)
ON	ON	OFF	OFF	ON	OFF	OFF	OFF	55 (0x37)
ON	ON	OFF	OFF	OFF	ON	ON	ON	56 (0x38)
ON	ON	OFF	OFF	OFF	ON	ON	OFF	57 (0x39)
ON	ON	OFF	OFF	OFF	ON	OFF	ON	58 (0x3A)
ON	ON	OFF	OFF	OFF	ON	OFF	OFF	59 (0x3B)
ON	ON	OFF	OFF	OFF	OFF	ON	ON	60 (0x3C)
ON	ON	OFF	OFF	OFF	OFF	ON	OFF	61 (0x3D)
ON	ON	OFF	OFF	OFF	OFF	OFF	ON	62 (0x3E)
ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	63 (0x3F)

MODBUS Slave Addresses 64 – 127

8	7	6	5	4	3	2	1	Address
ON	OFF	ON	ON	ON	ON	ON	ON	64 (0x40)
ON	OFF	ON	ON	ON	ON	ON	OFF	65 (0x41)
ON	OFF	ON	ON	ON	ON	OFF	ON	66 (0x42)
ON	OFF	ON	ON	ON	ON	OFF	OFF	67 (0x43)
ON	OFF	ON	ON	ON	OFF	ON	ON	68 (0x44)
ON	OFF	ON	ON	ON	OFF	ON	OFF	69 (0x45)
ON	OFF	ON	ON	ON	OFF	OFF	ON	70 (0x46)
ON	OFF	ON	ON	ON	OFF	OFF	OFF	71 (0x47)
ON	OFF	ON	ON	OFF	ON	ON	ON	72 (0x48)
ON	OFF	ON	ON	OFF	ON	ON	OFF	73 (0x49)
ON	OFF	ON	ON	OFF	ON	OFF	ON	74 (0x4A)
ON	OFF	ON	ON	OFF	ON	OFF	OFF	75 (0x4B)
ON	OFF	ON	ON	OFF	OFF	ON	ON	76 (0x4C)
ON	OFF	ON	ON	OFF	OFF	ON	OFF	77 (0x4D)
ON	OFF	ON	ON	OFF	OFF	OFF	ON	78 (0x4E)
ON	OFF	ON	ON	OFF	OFF	OFF	OFF	79 (0x4F)
ON	OFF	ON	OFF	ON	ON	ON	ON	80 (0x50)
ON	OFF	ON	OFF	ON	ON	ON	OFF	81 (0x51)
ON	OFF	ON	OFF	ON	ON	OFF	ON	82 (0x52)
ON	OFF	ON	OFF	ON	ON	OFF	OFF	83 (0x53)
ON	OFF	ON	OFF	ON	OFF	ON	ON	84 (0x54)
ON	OFF	ON	OFF	ON	OFF	ON	OFF	85 (0x55)
ON	OFF	ON	OFF	ON	OFF	OFF	ON	86 (0x56)
ON	OFF	ON	OFF	ON	OFF	OFF	OFF	87 (0x57)
ON	OFF	ON	OFF	OFF	ON	ON	ON	88 (0x58)
ON	OFF	ON	OFF	OFF	ON	ON	OFF	89 (0x59)
ON	OFF	ON	OFF	OFF	ON	OFF	ON	90 (0x5A)
ON	OFF	ON	OFF	OFF	ON	OFF	OFF	91 (0x5B)
ON	OFF	ON	OFF	OFF	OFF	ON	ON	92 (0x5C)
ON	OFF	ON	OFF	OFF	OFF	ON	OFF	93 (0x5D)
ON	OFF	ON	OFF	OFF	OFF	OFF	ON	94 (0x5E)
ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	95 (0x5F)
ON	OFF	OFF	ON	ON	ON	ON	ON	96 (0x60)
ON	OFF	OFF	ON	ON	ON	ON	OFF	97 (0x61)
ON	OFF	OFF	ON	ON	ON	OFF	ON	98 (0x62)
ON	OFF	OFF	ON	ON	ON	OFF	OFF	99 (0x63)
ON	OFF	OFF	ON	ON	OFF	ON	ON	100 (0x64)
ON	OFF	OFF	ON	ON	OFF	ON	OFF	101 (0x65)
ON	OFF	OFF	ON	ON	OFF	OFF	ON	102 (0x66)
ON	OFF	OFF	ON	ON	OFF	OFF	OFF	103 (0x67)
ON	OFF	OFF	ON	OFF	ON	ON	ON	104 (0x68)
ON	OFF	OFF	ON	OFF	ON	ON	OFF	105 (0x69)
ON	OFF	OFF	ON	OFF	ON	OFF	ON	106 (0x6A)
ON	OFF	OFF	ON	OFF	ON	OFF	OFF	107 (0x6B)
ON	OFF	OFF	ON	OFF	OFF	ON	ON	108 (0x6C)
ON	OFF	OFF	ON	OFF	OFF	ON	OFF	109 (0x6D)
ON	OFF	OFF	ON	OFF	OFF	OFF	ON	110 (0x6E)
ON	OFF	OFF	ON	OFF	OFF	OFF	OFF	111 (0x6F)
ON	OFF	OFF	OFF	ON	ON	ON	ON	112 (0x70)
ON	OFF	OFF	OFF	ON	ON	ON	OFF	113 (0x71)

ON	OFF	OFF	OFF	ON	ON	OFF	ON	114 (0x72)
ON	OFF	OFF	OFF	ON	ON	OFF	OFF	115 (0x73)
ON	OFF	OFF	OFF	ON	OFF	ON	ON	116 (0x74)
ON	OFF	OFF	OFF	ON	OFF	ON	OFF	117 (0x75)
ON	OFF	OFF	OFF	ON	OFF	OFF	ON	118 (0x76)
ON	OFF	OFF	OFF	ON	OFF	OFF	OFF	119 (0x77)
ON	OFF	OFF	OFF	OFF	ON	ON	ON	120 (0x78)
ON	OFF	OFF	OFF	OFF	ON	ON	OFF	121 (0x79)
ON	OFF	OFF	OFF	OFF	ON	OFF	ON	122 (0x7A)
ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	123 (0x7B)
ON	OFF	OFF	OFF	OFF	OFF	ON	ON	124 (0x7C)
ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	125 (0x7D)
ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	126 (0x7E)
ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	127 (0x7F)

MODBUS Slave Addresses 128 – 191

8	7	6	5	4	3	2	1	Address
OFF	ON	ON	ON	ON	ON	ON	ON	128 (0x80)
OFF	ON	ON	ON	ON	ON	ON	OFF	129 (0x81)
OFF	ON	ON	ON	ON	ON	OFF	ON	130 (0x82)
OFF	ON	ON	ON	ON	ON	OFF	OFF	131 (0x83)
OFF	ON	ON	ON	ON	OFF	ON	ON	132 (0x84)
OFF	ON	ON	ON	ON	OFF	ON	OFF	133 (0x85)
OFF	ON	ON	ON	ON	OFF	OFF	ON	134 (0x86)
OFF	ON	ON	ON	ON	OFF	OFF	OFF	135 (0x87)
OFF	ON	ON	ON	OFF	ON	ON	ON	136 (0x88)
OFF	ON	ON	ON	OFF	ON	ON	OFF	137 (0x89)
OFF	ON	ON	ON	OFF	ON	OFF	ON	138 (0x8A)
OFF	ON	ON	ON	OFF	ON	OFF	OFF	139 (0x8B)
OFF	ON	ON	ON	OFF	OFF	ON	ON	140 (0x8C)
OFF	ON	ON	ON	OFF	OFF	ON	OFF	141 (0x8D)
OFF	ON	ON	ON	OFF	OFF	OFF	ON	142 (0x8E)
OFF	ON	ON	ON	OFF	OFF	OFF	OFF	143 (0x8F)
OFF	ON	ON	OFF	ON	ON	ON	ON	144 (0x90)
OFF	ON	ON	OFF	ON	ON	ON	OFF	145 (0x91)
OFF	ON	ON	OFF	ON	ON	OFF	ON	146 (0x92)
OFF	ON	ON	OFF	ON	ON	OFF	OFF	147 (0x93)
OFF	ON	ON	OFF	ON	OFF	ON	ON	148 (0x94)
OFF	ON	ON	OFF	ON	OFF	ON	OFF	149 (0x95)
OFF	ON	ON	OFF	ON	OFF	OFF	ON	150 (0x96)
OFF	ON	ON	OFF	ON	OFF	OFF	OFF	151 (0x97)
OFF	ON	ON	OFF	OFF	ON	ON	ON	152 (0x98)
OFF	ON	ON	OFF	OFF	ON	ON	OFF	153 (0x99)
OFF	ON	ON	OFF	OFF	ON	OFF	ON	154 (0x9A)
OFF	ON	ON	OFF	OFF	ON	OFF	OFF	155 (0x9B)
OFF	ON	ON	OFF	OFF	OFF	ON	ON	156 (0x9C)
OFF	ON	ON	OFF	OFF	OFF	ON	OFF	157 (0x9D)
OFF	ON	ON	OFF	OFF	OFF	OFF	ON	158 (0x9E)
OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	159 (0x9F)
OFF	ON	OFF	ON	ON	ON	ON	ON	160 (0xA0)
OFF	ON	OFF	ON	ON	ON	ON	OFF	161 (0xA1)
OFF	ON	OFF	ON	ON	ON	OFF	ON	162 (0xA2)
OFF	ON	OFF	ON	ON	ON	OFF	OFF	163 (0xA3)
OFF	ON	OFF	ON	ON	OFF	ON	ON	164 (0xA4)
OFF	ON	OFF	ON	ON	OFF	ON	OFF	165 (0xA5)
OFF	ON	OFF	ON	ON	OFF	OFF	ON	166 (0xA6)
OFF	ON	OFF	ON	ON	OFF	OFF	OFF	167 (0xA7)
OFF	ON	OFF	ON	OFF	ON	ON	ON	168 (0xA8)
OFF	ON	OFF	ON	OFF	ON	ON	OFF	169 (0xA9)
OFF	ON	OFF	ON	OFF	ON	OFF	ON	170 (0xAA)
OFF	ON	OFF	ON	OFF	ON	OFF	OFF	171 (0xAB)
OFF	ON	OFF	ON	OFF	OFF	ON	ON	172 (0xAC)
OFF	ON	OFF	ON	OFF	OFF	ON	OFF	173 (0xAD)
OFF	ON	OFF	ON	OFF	OFF	OFF	ON	174 (0xAE)
OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	175 (0xAF)
OFF	ON	OFF	OFF	ON	ON	ON	ON	176 (0xB0)
OFF	ON	OFF	OFF	ON	ON	ON	OFF	177 (0xB1)
OFF	ON	OFF	OFF	ON	ON	OFF	ON	178 (0xB2)
OFF	ON	OFF	OFF	ON	ON	OFF	OFF	179 (0xB3)
OFF	ON	OFF	OFF	ON	OFF	ON	ON	180 (0xB4)
OFF	ON	OFF	OFF	ON	OFF	ON	OFF	181 (0xB5)
OFF	ON	OFF	OFF	ON	OFF	OFF	ON	182 (0xB6)
OFF	ON	OFF	OFF	ON	OFF	OFF	OFF	183 (0xB7)
OFF	ON	OFF	OFF	OFF	ON	ON	ON	184 (0xB8)
OFF	ON	OFF	OFF	OFF	ON	ON	OFF	185 (0xB9)
OFF	ON	OFF	OFF	OFF	ON	OFF	ON	186 (0xBA)
OFF	ON	OFF	OFF	OFF	ON	OFF	OFF	187 (0xBB)
OFF	ON	OFF	OFF	OFF	OFF	ON	ON	188 (0xBC)
OFF	ON	OFF	OFF	OFF	OFF	ON	OFF	189 (0xBD)
OFF	ON	OFF	OFF	OFF	OFF	OFF	ON	190 (0xBE)
OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	191 (0xBF)

MODBUS Slave Addresses 192 – 247

8	7	6	5	4	3	2	1	Address
OFF	OFF	ON	ON	ON	ON	ON	ON	192 (0xC0)
OFF	OFF	ON	ON	ON	ON	ON	OFF	193 (0xC1)
OFF	OFF	ON	ON	ON	ON	OFF	ON	194 (0xC2)
OFF	OFF	ON	ON	ON	ON	OFF	OFF	195 (0xC3)
OFF	OFF	ON	ON	ON	OFF	ON	ON	196 (0xC4)
OFF	OFF	ON	ON	ON	OFF	ON	OFF	197 (0xC5)
OFF	OFF	ON	ON	ON	OFF	OFF	ON	198 (0xC6)
OFF	OFF	ON	ON	ON	OFF	OFF	OFF	199 (0xC7)
OFF	OFF	ON	ON	OFF	ON	ON	ON	200 (0xC8)
OFF	OFF	ON	ON	OFF	ON	ON	OFF	201 (0xC9)
OFF	OFF	ON	ON	OFF	ON	OFF	ON	202 (0xCA)
OFF	OFF	ON	ON	OFF	ON	OFF	OFF	203 (0xCB)
OFF	OFF	ON	ON	OFF	OFF	ON	ON	204 (0xCC)
OFF	OFF	ON	ON	OFF	OFF	ON	OFF	205 (0xCD)
OFF	OFF	ON	ON	OFF	OFF	OFF	ON	206 (0xCE)
OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	207 (0xCF)
OFF	OFF	ON	OFF	ON	ON	ON	ON	208 (0xD0)
OFF	OFF	ON	OFF	ON	ON	ON	OFF	209 (0xD1)
OFF	OFF	ON	OFF	ON	ON	OFF	ON	210 (0xD2)
OFF	OFF	ON	OFF	ON	ON	OFF	OFF	211 (0xD3)
OFF	OFF	ON	OFF	ON	OFF	ON	ON	212 (0xD4)
OFF	OFF	ON	OFF	ON	OFF	ON	OFF	213 (0xD5)
OFF	OFF	ON	OFF	ON	OFF	OFF	ON	214 (0xD6)
OFF	OFF	ON	OFF	ON	OFF	OFF	OFF	215 (0xD7)
OFF	OFF	ON	OFF	OFF	ON	ON	ON	216 (0xD8)
OFF	OFF	ON	OFF	OFF	ON	ON	OFF	217 (0xD9)
OFF	OFF	ON	OFF	OFF	ON	OFF	ON	218 (0xDA)
OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	219 (0xDB)
OFF	OFF	ON	OFF	OFF	OFF	ON	ON	220 (0xDC)
OFF	OFF	ON	OFF	OFF	OFF	ON	OFF	221 (0xDD)
OFF	OFF	ON	OFF	OFF	OFF	OFF	ON	222 (0xDE)
OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	223 (0xDF)
OFF	OFF	OFF	ON	ON	ON	ON	ON	224 (0xE0)
OFF	OFF	OFF	ON	ON	ON	ON	OFF	225 (0xE1)
OFF	OFF	OFF	ON	ON	ON	OFF	ON	226 (0xE2)
OFF	OFF	OFF	ON	ON	ON	OFF	OFF	227 (0xE3)
OFF	OFF	OFF	ON	ON	OFF	ON	ON	228 (0xE4)
OFF	OFF	OFF	ON	ON	OFF	ON	OFF	229 (0xE5)
OFF	OFF	OFF	ON	ON	OFF	OFF	ON	230 (0xE6)
OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	231 (0xE7)
OFF	OFF	OFF	ON	OFF	ON	ON	ON	232 (0xE8)
OFF	OFF	OFF	ON	OFF	ON	ON	OFF	233 (0xE9)
OFF	OFF	OFF	ON	OFF	ON	OFF	ON	234 (0xEA)
OFF	OFF	OFF	ON	OFF	ON	OFF	OFF	235 (0xEB)
OFF	OFF	OFF	ON	OFF	OFF	ON	ON	236 (0xEC)
OFF	OFF	OFF	ON	OFF	OFF	ON	OFF	237 (0xED)
OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	238 (0xEE)
OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	239 (0xEF)
OFF	OFF	OFF	OFF	ON	ON	ON	ON	240 (0xF0)
OFF	OFF	OFF	OFF	ON	ON	ON	OFF	241 (0xF1)
OFF	OFF	OFF	OFF	ON	ON	OFF	ON	242 (0xF2)
OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	243 (0xF3)

OFF	OFF	OFF	OFF	ON	OFF	ON	ON	244 (0xF4)
OFF	OFF	OFF	OFF	ON	OFF	ON	OFF	245 (0xF5)
OFF	OFF	OFF	OFF	ON	OFF	OFF	ON	246 (0xF6)
OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	247 (0xF7)
OFF	OFF	OFF	OFF	OFF	ON	ON	ON	7 (0x07)
OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	6 (0x06)
OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	5 (0x05)
OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	4 (0x04)

OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	3 (0x03)
OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	2 (0x02)
OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	1 (0x01)
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	247 (0xF7)

Serial Communication Information

- **MODBUS Slave Address:** 1 to 247 (selectable by DIP)
- **Communication Mode:** MODBUS RTU or MODBUS ASCII (selectable by DIP)
- **Parity:** Even or None (selectable by DIP)
- **Baud Rate:** 9600, 19200, 38400 or 115200 (selectable by DIP)
- **Start Bits:** 1
- **Data Bits:**
  - 8 if MODBUS RTU
  - 7 if MODBUS ASCII
- **Stop Bits:**
  - 1 if Even Parity
  - 2 if No Parity
- **Flow Control:** None

LED Behavior

The MODBUS Communication Option Board has two LEDs.

- LED1 blinks to indicate communication on the RS-232 serial link between the MODBUS Communication Option Board and the inverter controller.
- LED2 blinks to indicate communication on the MODBUS RS-485 bus.

Note: both LEDs should be blinking to indicate healthy operation. Note that the RS-232 link will always be active, while the MODBUS link is only active when transactions are initiated by the MODBUS master. If there is no MODBUS master on the bus yet, LED2 will remain off. Also note that just because LED2 is blinking, that does not necessarily mean that this particular MODBUS Communication Option Board is communicating on the bus. If the MODBUS master is only addressing *other* devices on the bus, the LED will still blink indicating traffic on the bus.

SECTION 4
Object Summary (Registers and Coils)

The sixteen-bit registers can be accessed via either MODBUS Function Code 3 (0x03 Read Holding Registers) or Function Code 4 (0x04 Read Input Registers). Results will be identical.

The flag objects can be accessed via either MODBUS Function Code 1 (0x01 Read Coils) or Function Code 2 (0x02 Read Discrete Inputs). Results will be identical.

All objects are read-only; no MODBUS write commands are supported.

Register	Object Name	Units
0 (0x0000)	Input Voltage Phase A	0.1 Volts AC (e.g. 1203 = 120.3V)
1 (0x0001)	Input Voltage Phase B	0.1 Volts AC
2 (0x0002)	Input Voltage Phase C	0.1 Volts AC
3 (0x0003)	Output Voltage Phase A	0.1 Volts AC
4 (0x0004)	Output Voltage Phase B	0.1 Volts AC
5 (0x0005)	Output Voltage Phase C	0.1 Volts AC
6 (0x0006)	Output Current Phase A	0.1 Amps AC (e.g. 65 = 6.5A)
7 (0x0007)	Output Current Phase B	0.1 Amps AC
8 (0x0008)	Output Current Phase C	0.1 Amps AC
9 (0x0009)	Battery Voltage	0.1 Volts DC (e.g. 483 = 48.3 V)
10 (0x000A)	Ambient Temperature	0.1 °C (e.g. 301 = 30.1°C = 86.1°F)
11 (0x000B)	Output VA (Total)	1 VA (e.g. 38000 = 38kVA)
12 (0x000C)	Output VA Phase A	1 VA
13 (0x000D)	Output VA Phase B	1 VA
14 (0x000E)	Output VA Phase C	1 VA
15 (0x000F)	Days Online	Days (0-65535)
16 (0x0010)	Battery Runtime	Minutes (0-65535)
24 (0x0018)	Battery Current	0.1 Amps DC (e.g. 52 = 5.2A)
152 (0x0098)	Alarm Log File Size	Bytes (0-65535)
153 (0x0099)	Event Log File Size	Bytes (0-65535)
154 (0x009A)	Test Log File Size	Bytes (0-65535)
Coil	**Object Name**	**Values**
0 (0x0000)	System Ready Status	1 = ready, 0 = not ready
1 (0x0001)	AC Line Present Status	1 = present, 0 = not present
2 (0x0002)	Battery Charging Status	1 = charging, 0 = not charging
3 (0x0003)	On Battery Power Status	1 = battery power, 0 = line power
4 (0x0004)	Unit Is 3-Phase Status	1 = 3-phase unit, 0 = single-phase
23 (0x0017)	Input not Present	1 = alarm, 0 = normal
25 (0x0019)	Battery Low	1 = alarm, 0 = normal
27 (0x001B)	High Ambient Temperature	1 = alarm, 0 = normal
31 (0x001F)	Overload	1 = alarm, 0 = normal
32 (0x0020)	Overload Shutdown	1 = alarm, 0 = normal
38 (0x0026)	Input Voltage Low	1 = alarm, 0 = normal
39 (0x0027)	Input Voltage High	1 = alarm, 0 = normal
42 (0x002A)	Battery Charger	1 = alarm, 0 = normal

43 (0x002B)	Inverter Failure	1 = alarm, 0 = normal
44 (0x002C)	Near Low Battery	1 = alarm, 0 = normal
45 (0x002D)	Load Reduction	1 = alarm, 0 = normal

SECTION 5

Biasing, Link Load and Link Termination

The MODBUS Communication Option Board includes weak (10kΩ) pull-up and pull-down resistors on the MODBUS RS-485 link for the purpose of link biasing. Therefore, external link biasing on the bus is not required when at least one MODBUS Communication Option Board is connected on the bus segment.

The RS-485 transceiver in the MODBUS Communication Option Board is a Maxim MAX487E, which presents a quarter (1/4) Unit Load on the bus. Up to 128 quarter-Unit-Load devices may be on the same bus segment before requiring a repeater. However, for long (1000ft and greater) RS485 wire runs, fewer devices and lower baud rates (9,600 bps or 19,200 bps) are recommended for reliable performance. If this is not possible, you should consider multiple independent MODBUS segments, either running separately as separate systems, or combined with signal repeaters, or combined over MODBUS TCP using an Ethernet backbone and bridge devices.

The MODBUS electrical specification allows various wiring topologies, but for best performance at high baud rates and long wire runs, pure daisy chaining is strongly recommended to minimize reflections on the line.

To further minimize reflections and improve link reliability, you must correctly terminate the MODBUS link externally on either end of the bus as recommended by the MODBUS specification (and according to the type of link cable used).

SECTION 6

Device Identification

To enable identification and differentiation of MODBUS Communication Option Boards on the same MODBUS link, the board:

- Allows you to set a custom User ID string (up to 31 bytes of printable ASCII characters, i.e. ASCII characters 0x20 through 0x7E)
- Allows you to read out identification strings using either of two different methods:
  - MODBUS Report Server ID (MODBUS Function Code 0x11)
  - MODBUS Encapsulated Interface Transport 'Read Device Identification' (MODBUS Function Code 0x2B / 0x0E)

  The identification strings that you can read out include the User ID string (if set), manufacturer info, model number, and firmware revision.

Setting a Custom User ID

Setting a Custom User ID is done with MODBUS Function Code 0x15 (Write File Record). See the description of the Write File Record function code in the MODBUS Application Protocol Specification document from http://www.modbus.org/specs.php

- Sub Request Reference Type must be **0x06**
- Sub Request File Number must be **0x0004**. Note: File numbers 1, 2 and 3 are used for Alarm Log, Event Log and Test Log file records which are Read Only (see Section 7).
- Sub Request Record Number must be 0x0000 through 0x001F to start writing at any of the 32 bytes of the Custom User ID string. It is recommended that you start writing at Record Number 0x0000 and write all 32 bytes (or less) in one MODBUS packet/frame.
- The Sub Request Record Data occurs in 16-bit 'byte pairs'. The MODBUS Communication Option Board will always ignore the first (most significant) byte of a pair, and will only store the second.

Example
You wish to set the Custom User ID string to "2nd Floor West Emergency Lights".

- **Step 1**: Converted to ASCII codes in hexadecimal, this string is:

```
32 6e 64 20 46 6c 6f 6f 72 20 57 65 73 74 20 45
6d 65 72 67 65 6e 63 79 20 4c 69 67 68 74 73 00
```

- **Step 2**: As stated above, the MODBUS Communication Option Board ignores the most significant byte of each byte pair. After translating the string to byte pairs, we have:

```
00 32 00 6e 00 64 00 20 00 46 00 6c 00 6f 00 6f
00 72 00 20 00 57 00 65 00 73 00 74 00 20 00 45
00 6d 00 65 00 72 00 67 00 65 00 6e 00 63 00 79
00 20 00 4c 00 69 00 67 00 68 00 74 00 73 00 00
```

- **Step 3**: The entire MODBUS PDU (Protocol Data Unit) would therefore be:

```
                              15 47 06 00 04 00 00 00 20
   00 32 00 6e 00 64 00 20 00 46 00 6c 00 6f 00 6f
   00 72 00 20 00 57 00 65 00 73 00 74 00 20 00 45
   00 6d 00 65 00 72 00 67 00 65 00 6e 00 63 00 79
   00 20 00 4c 00 69 00 67 00 68 00 74 00 73 00 00
```

  Where:
  - 0x15 is the MODBUS Function Code (Write File Record)
  - 0x47 (71) is the size of the remainder of the PDU
  - 0x06 is the Sub Request Reference Type (fixed)
  - 0x0004 is the Sub Request File Number
  - 0x0000 is the Sub Request Record Number
  - 0x00020 is the Sub Request Record Length (in units of '2 byte words')

Requesting Identification With 'Report Server ID' (0x11)

The first way to request identification from the MODBUS Communication Option Board is with MODBUS Function Code 0x11 (Report Server ID).

The MODBUS Communication Option Board will respond with an ASCII string that contains:

- The Custom User ID (if set)
- Manufacturer info
- Model number
- Firmware revision

Requesting Identification With 'EIT Read Device Identification' (0x2B / 0x0E)

The second way to request identification from the MODBUS Communication Option Board is with MODBUS Encapsulated Interface Transport 'Read Device Identification' (MODBUS Function Code 0x2B / 0x0E). Refer to the MODBUS Application Protocol Specification document from http://www.modbus.org/specs.php for details on this function.

Use Function Code 0x2B, and MEI Type 0x0E. The MODBUS Communication Option Board has conformity level 3, so it can support any Device ID code (1 = basic device ID, 2 = regular device ID, 3 = extended device ID, 4 = specific device ID).

The MODBUS Communication Option Board supports Object IDs 0x00 (Vendor Name) through 0x06 (UserApplicationName). Object ID 0x06 (UserApplicationName) is used to return the Custom User ID string (if set).

SECTION 7

Retrieving File Records (Alarm, Event, and Test Logs)

The MODBUS Communication Option Board allows you to retrieve:

- **Alarm Logs**: Time stamped data on alarm conditions that have occurred (if any).
- **Event Logs**: Time stamped data that the inverter keeps on events (such as power ups)
- **Test Logs**: Time stamped logs of inverter self-tests that have taken place, and their results. The self-tests may have been automated (monthly or yearly tests on preset schedule), or manual (user invoked).

To discover the current file sizes of the above three files, read registers 112, 113 and 114 (see the Object Summary table in Section 4). You need to know the file size to avoid reading outside the bounds of the respective log file (which will result in MODBUS errors).

Reading a log is done with MODBUS Function Code 0x14 (Read File Record). See the description of the Read File Record function code in the MODBUS Application Protocol Specification document from http://www.modbus.org/specs.php

- Sub Request Reference Type must be **0x06**
- Sub Request File Number must be **0x0001**, **0x0002** or **0x0003**.
  - File Number 0x0001 is used to access the Alarm Log file
  - File Number 0x0002 is used to access the Event Log file
  - File Number 0x0003 is used to access the Test Log file
  - *Note: File number 0x0004 can be used to read out the Custom User ID string (see Section 6)*
- Sub Request Record Number must be between 0x0000 and the file size (retrieved through the respective register; 112, 113 or 114).
- The Sub Request Record Data is returned by the MODBUS Communication Option Board in 16-bit 'byte pairs'. The MODBUS Communication Option Board will always populate the first (most significant) byte of a pair with 0x00, and will put a byte from the respective file in the second (least significant) byte of the pair.
- All bytes from the files are going to be printable ASCII characters, or tabs (ASCII 0x09), or DOS style line endings (ASCII 0x0D, and ASCII 0x0A). See the sections below to understand how to parse the data in the files.

Example

In this example, we will retrieve the contents of the Alarm Log file.

- **Step 1:** The first step is to determine the current size of the Alarm Log file. We do this using the Read Holding Registers (0x03) function, on register 0x70 (112 - the Alarm Log File Size register). Let's assume we transmit the following PDU…

```
03 00 70 00 01
```

…and receive the following PDU in response from the MODBUS Communication Option Board:

```
03 02 00 37
```

The response says that the Alarm Log file is currently 0x37 (55) bytes long.

- **Step 2**: Now we have to use function code 0x14 (Read File Record) to retrieve the Alarm Log file. For the sake of this example, let's read the Alarm Log file in two transactions; a 32-byte read, followed by a 55 – 32 = 23 byte read. Here are the request PDUs and response PDUs:

  Request PDU 1

  ```
  14 07 06 00 01 00 00 00 20
  ```

  Where:
  - 0x14 (20) is the Read File Record function code
  - 0x07 is the remaining length of the PDU in bytes
  - 0x06 is the Reference Type (fixed)
  - 0x0001 is the File Number (for the Alarm Log File)
  - 0x0000 is the Record Number (we're starting to read the file from byte 0)
  - 0x0020 (32) is the Record Length. We wish to read the first 32 bytes of the file.

  Response PDU 1

  ```
                                              14 42 41 06
  00 31 00 39 00 2f 00 30 00 38 00 2f 00 32 00 31
  00 09 00 30 00 39 00 3a 00 33 00 31 00 09 00 49
  00 4e 00 56 00 45 00 52 00 54 00 45 00 52 00 20
  00 46 00 41 00 55 00 4c 00 54 00 0D 00 0A 00 31
  ```

  Where:
  - 0x14 (20) is the Read File Record function code
  - 0x42 (66) is the remaining length of the PDU in bytes
  - 0x41 (65) is the file read response length (including the Reference Type byte)
  - 0x06 is the Reference Type (fixed)
  - The last 64 bytes of the PDU are byte pairs. If you eliminate all the (0x00 valued) most significant bytes of each byte pair, you are left with the ASCII data read out of the Alarm Log file:

    ```
    31 39 2f 30 38 2f 32 31 09 30 39 3a 33 31 09 49
    4e 56 45 52 54 45 52 20 46 41 55 4c 54 0D 0A 31
    ```

    Note that 0x09 is the 'tab' character, and 0x0D 0x0A is a DOS style line ending ("\r\n"). The ASCII would display as:

    ```
    19/08/21  09:31     INVERTER FAULT
    1
    ```

  Request PDU 2

```
14 07 06 00 01 00 20 00 17
```

Where:

- 0x14 (20) is the Read File Record function code
- 0x07 is the remaining length of the PDU in bytes
- 0x06 is the Reference Type (fixed)
- 0x0001 is the File Number (for the Alarm Log File)
- 0x0020 (32) is the Record Number (we're starting to read the file from byte 32, where we left off)
- 0x0017 (23) is the Record Length. This is the remainder of the file (55 – 32 = 23 bytes)

Response PDU 2

```
                                        14 30 2F 06
00 39 00 2f 00 30 00 38 00 2f 00 32 00 35 00 09
00 32 00 32 00 3a 00 31 00 34 00 09 00 4c 00 4f
00 57 00 20 00 56 00 41 00 43 00 0D 00 0A
```

Where:

- 0x14 (20) is the Read File Record function code
- 0x30 (48) is the remaining length of the PDU in bytes
- 0x2F (47) is the file read response length (including the Reference Type byte)
- 0x06 is the Reference Type (fixed)
- The last 46 bytes of the PDU are byte pairs. If you eliminate all the (0x00 valued) most significant bytes of each byte pair, you are left with the ASCII data read out of the Alarm Log file:

```
39 2f 30 38 2f 32 35 09 32 32 3a 31 34 09 4c 4f
57 20 56 41 43 0D 0A
```

Note that 0x09 is the 'tab' character, and 0x0D 0x0A is a DOS style line ending ("\r\n"). The ASCII would display as:

```
9/08/25   22:14     LOW VAC
```

- **Step 3**: Now we have only to combine the two received fragments of the Alarm Log File to form the complete file, revealing two alarm events logged on August 21st 2019 and August 25th 2019:

```
19/08/21  09:31     INVERTER FAULT
19/08/25  22:14     LOW VAC
```

Further information follows below on how to parse the data in Alarm Log, Event Log and Test Log files.

Parsing File Records (Alarm, Event and Test Logs)

This section will describe the information contained in Alarm, Event and Test log files, and how to parse them.

Alarm Logs

This is an example of an Alarm Log file:

```
19/08/21  09:31     INVERTER FAULT
19/08/25  22:14     LOW VAC
```

- Each line in the file begins with a timestamp in the format “YY/MM/DD HH:MM”. Note that the time is in 24-hour format. Note also that the time must be set up correctly in the inverter control board, or the timestamps will be wrong. This can be done using the display mounted on the front of the cabinet.
- A tab character separates the date from the time, and another tab separates the time from the alarm descriptor.
- The final column on the right is the alarm descriptor, which describes the cause of the alarm.
- Each line ends with a DOS style line ending (“\r\n”)

Event Logs

This is an example of an Event Log file:

```
19/08/16 11:35  13      ALARMS    3P     24.0    277.4   277.8   278.0   10.2    10.8    8.5
19/08/18 20:09  6       NO ALARMS 3P     28.3    278.5   278.8   277.9   10.6    10.2    6.9
```

- Each line in the file begins with a timestamp in the format “YY/MM/DD HH:MM”. Note that the time is in 24-hour format. Note also that the time must be set up correctly in the inverter control board, or the timestamps will be wrong. This can be done using the display mounted on the front of the cabinet.
- A tab character separates the date from the time. Tab characters separate all the fields in the file.
- The next field describes the duration of the event (in integer minutes)
- The next field describes whether or not an alarm condition was asserted when the logged event occurred.
- The next field tells you that this is a three phase (“3P”) inverter
- The next field describes the recorded temperature, in degrees Celsius
- The next three fields provide the recorded output voltages (in Volts) of each of the three phases (phase A first, then phase B, then phase C)
- The final three fields provide the recorded output currents (in Amps) of each of the three phases (phase A first, then phase B, then phase C)
- Each line ends with a DOS style line ending (“\r\n”)

Test Logs

This is an example of a Test Log file:

```
19/08/15  02:45   20     ALARMS     M       3P       28.0     277.9    277.0    278.3    10.8     10.5     8.5
19/08/30  23:00   20     NO ALARMS  Y       3P       27.6     276.1    277.1    276.9    10.6     10.5     8.8
```

- Each line in the file begins with a timestamp in the format “YY/MM/DD HH:MM”. Note that the time is in 24-hour format. Note also that the time must be set up correctly in the inverter control board, or the timestamps will be wrong. This can be done using the display mounted on the front of the cabinet.
- A tab character separates the date from the time. Tab characters separate all the fields in the file.
- The next field describes the duration of the event (in integer minutes)
- The next field describes whether or not an alarm condition was asserted when the logged event occurred.
- The next field describes whether the test was a monthly or yearly automatically scheduled test (“M” for Monthly or “Y” for Yearly).
- The next field tells you that this is a three phase (“3P”) inverter
- The next field describes the recorded temperature, in degrees Celsius
- The next three fields provide the recorded output voltages (in Volts) of each of the three phases (phase A first, then phase B, then phase C)
- The final three fields provide the recorded output currents (in Amps) of each of the three phases (phase A first, then phase B, then phase C)

- Each line ends with a DOS style line ending (“\r\n”)

MODBUS TCP AND SNMP COMMUNICATION OPTION MANUAL

THREE-PHASE

ILLUMINATOR HYPERNOVA

EMERGENCY LIGHTING CENTRAL INVERTER

Myers Emergency Power Systems
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Table of Contents

SECTION 1
MODBUS Serial Communication Board

MODBUS TCP and SNMP communication from the three-phase Illuminator Hypernova Emergency Lighting Central Inverter is achieved via a standard Myers EPS MODBUS serial communication option board – which converts the RS-232 communication with the inverter controller into the MODBUS RTU protocol – and a Babel Buster BB2-6010 MODBUS RTU to MODBUS TCP Gateway, made by Control Solutions Inc. (https://www.csimn.com). Figure 1 describes the data flow at a high level.

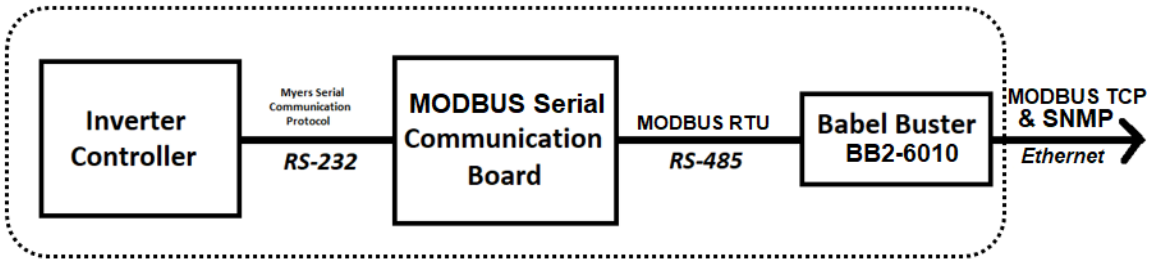


***Figure 1** – Data Flow to Achieve MODBUS TCP and SNMP Integration*

Everything inside the dashed box (including the Control Solutions Inc. Babel Buster BB2-6010) is pre-wired, pre-programmed and pre-configured by Myers EPS, and is internally mounted and powered inside the inverter cabinet (and will remain powered when the utility A/C input goes down and the inverter switches to battery power). The integrator may integrate directly to the Ethernet link on the BB2-6010. The below information on the MODBUS Serial Communication Board is for your information only.

The MODBUS Serial Communication Option Board for the three-phase Illuminator Hypernova Emergency Lighting Central Inverter has two internal connections; the RS232 communication bus to the inverter controller, and the input power that powers the board. There are two external connections, a RS485 output connector that is the MODBUS RTU link, and a USB connection that is a serial computer interface into the RS232 communication bus to the inverter controller. For detailed operation on the protocol and commands for the computer interface see manual 113786 RS-232 Communications. There are also two DIP switches that setup the MODBUS RTU communication settings. **These should not be changed.** Figure 2 shows an outline diagram of the MODBUS Serial Communication Option Board and required DIP settings.

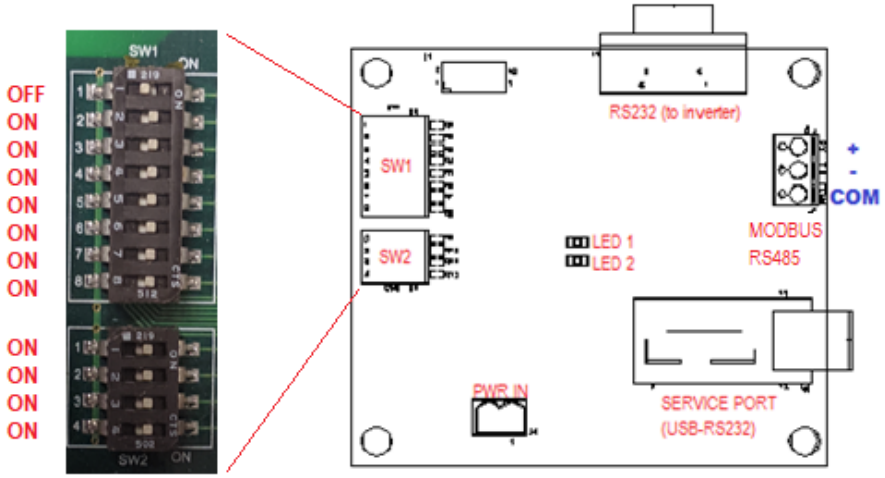


Figure 2 – Outline of MODBUS Serial Communication Board, and required DIP settings (do not change)

Babel Buster BB2-6010

The Babel Buster BB2-6010 is a DIN-rail mounted protocol bridge that is pre-programmed to convert between MODBUS RTU and MODBUS TCP and/or SNMP. It features two external connectors; one for MODBUS RTU RS485 and power **in (**24 Volts AC or DC), and the other for Ethernet (LAN connection) **out**. Figure 2 is a diagram of the BB2-6010.

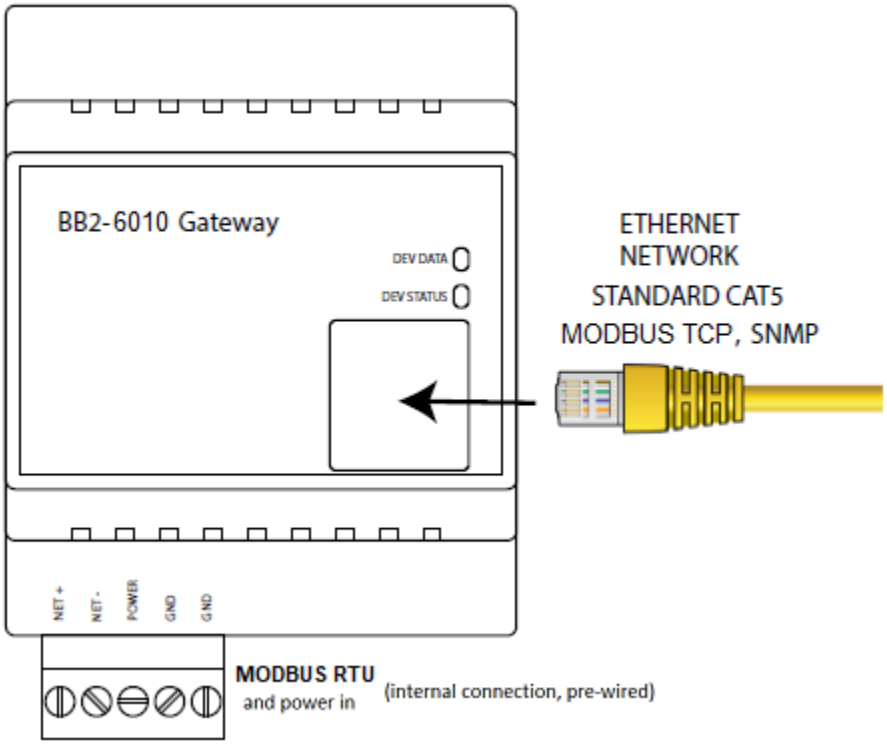


Figure 2 *– BB2-6010 Diagram*

The lower (MODBUS RTU and power in) connector is pre-wired. Please do not change the internal wiring. The upper (Ethernet) connector should be connected to the Local Area Network (LAN) to which it will be integrated via MODBUS TCP and/or SNMP. The BB2-6010 is preprogrammed to:

- Provide proxy objects to read the values of the MODBUS objects presented by the inverter (see Section 4). The proxy objects are updated once every second.
- Provide SNMP OIDs to access all MODBUS objects, and act as an SNMP Agent (server) such that they can also be read via SNMP

The BB2-6010 can be configured using its onboard web server to generate SNMP traps when programmed conditions are met (e.g. ‘inverter is running on battery power’, ‘inverter is overloaded’, ‘ambient temperature is too high’, etc.).

Meter Panel / MODBUS Selector Switch

Important Note: The Meter Panel/MODBUS selector switch on the front of the cabinet door must be set to 'MODBUS' and left there for the MODBUS integration to work. When the switch is in the 'MODBUS' position, the nearby 'MODBUS ENABLED' LED will light up. To use the Meter Panel Display, you must move the selector switch to the 'Meter Panel' position (the LED will go off). Note that the MODBUS/SNMP integration will stop updating its telemetry until you move the switch back to 'MODBUS', so don't forget to move it back after you are done using the Meter Panel Display.

SECTION 2

Description of Operation

The three-phase Illuminator Hypernova Emergency Lighting Central Inverter acts as a MODBUS TCP server, and SNMP Agent (server).

It supports a total of *eighteen* analog objects (sixteen-bit integers), and *sixteen* binary flag objects.

It can also be programmed to transmit SNMP 'traps' when a programmed condition is met (analog value goes above or below a threshold value, or binary flag gets set to 1 or cleared to 0). The traps can be sent to specified IP addresses on the LAN.

SECTION 3

Default Ethernet Settings

- **IP Address:** 10.0.0.101 (static)
- **Subnet Mask:** 255.255.255.0
- **Gateway:** 10.0.0.1
- **DHCP Client:** Turned off by default (but DHCP is supported)
- **Web Server Port:** 80 (HTTP default)

Default MODBUS TCP Settings

- **Port**: 502

Default SNMP Settings

- **SNMP Version Support**: v1, v2c (v3 is ***not*** supported)
- **Community**: public
- **Traps**: Disabled

SECTION 4

Object Summary

All registers below are accessible via either MODBUS Function Code 3 (0x03 Read Holding Registers) using the specified register address, or SNMP 'Get' / 'Get Next' using the specified SNMP OID.

Register / SNMP OID	Object Name	Units
Analog Values (analog sensors or counters read from the inverter)		
0 (0x0000) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.1*	Input Voltage Phase A	0.1 Volts AC (e.g. 1203 = 120.3V)
1 (0x0001) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.2*	Input Voltage Phase B	0.1 Volts AC
2 (0x0002) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.3*	Input Voltage Phase C	0.1 Volts AC
3 (0x0003) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.4*	Output Voltage Phase A	0.1 Volts AC
4 (0x0004) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.5*	Output Voltage Phase B	0.1 Volts AC
5 (0x0005) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.6*	Output Voltage Phase C	0.1 Volts AC
6 (0x0006) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.7*	Output Current Phase A	0.1 Amps AC (e.g. 65 = 6.5A)
7 (0x0007) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.8*	Output Current Phase B	0.1 Amps AC
8 (0x0008) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.9*	Output Current Phase C	0.1 Amps AC
9 (0x0009) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.10*	Battery Voltage	0.1 Volts DC (e.g. 483 = 48.3 V)
10 (0x000A) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.11*	Ambient Temperature	0.1 °C (e.g. 301 = 30.1°C = 86.1°F)
11 (0x000B) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.12*	Output VA (Total)	1 VA (e.g. 38000 = 38kVA)
12 (0x000C) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.13*	Output VA Phase A	1 VA
13 (0x000D) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.14*	Output VA Phase B	1 VA
14 (0x000E) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.15*	Output VA Phase C	1 VA
15 (0x000F) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.16*	Days Online	Days (0-65535)
16 (0x0010) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.17*	Battery Runtime	Minutes (0-65535)
24 (0x0018) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.25*	Battery Current	0.1 Amps DC (e.g. 52 = 5.2A)
Binary Values (status flags from the inverter; value is either 0 or 1)		
100 (0x0064) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.101*	System Ready Status	0 (false) or 1 (true)
101 (0x0065) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.102*	AC Line Present Status	0 (false) or 1 (true)
102 (0x0066) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.103*	Battery Charging Status	0 (false) or 1 (true)
103 (0x0067)	On Battery Power Status	0 (false) or 1 (true)

1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.104		
Register / SNMP OID	**Object Name**	**Units**
104 (0x0068) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.105*	Unit Is 3-Phase Status	0 (false) or 1 (true)
123 (0x007B) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.124*	Input not Present	0 (false) or 1 (true)
125 (0x007D) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.126*	Battery Low	0 (false) or 1 (true)
127 (0x0017F) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.128*	High Ambient Temperature	0 (false) or 1 (true)
131 (0x0083) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.132*	Overload	0 (false) or 1 (true)
132 (0x0084) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.133*	Overload Shutdown	0 (false) or 1 (true)
138 (0x008A) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.139*	Input Voltage Low	0 (false) or 1 (true)
139 (0x008B) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.140*	Input Voltage High	0 (false) or 1 (true)
142 (0x008E) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.143*	Battery Charger Alarm	0 (false) or 1 (true)
143 (0x008F) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.144*	Inverter Failure	0 (false) or 1 (true)
144 (0x0090) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.145*	Near Low Battery	0 (false) or 1 (true)
145 (0x0091) *1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.146*	In Load Reduction	0 (false) or 1 (true)

SECTION 5
Connecting to the BB2-6010 Web Server the First Time

To be able to do things like change the IP address, change the SNMP 'community' code, or set up SNMP traps, you will first need to connect to the BB2-6010's web server.

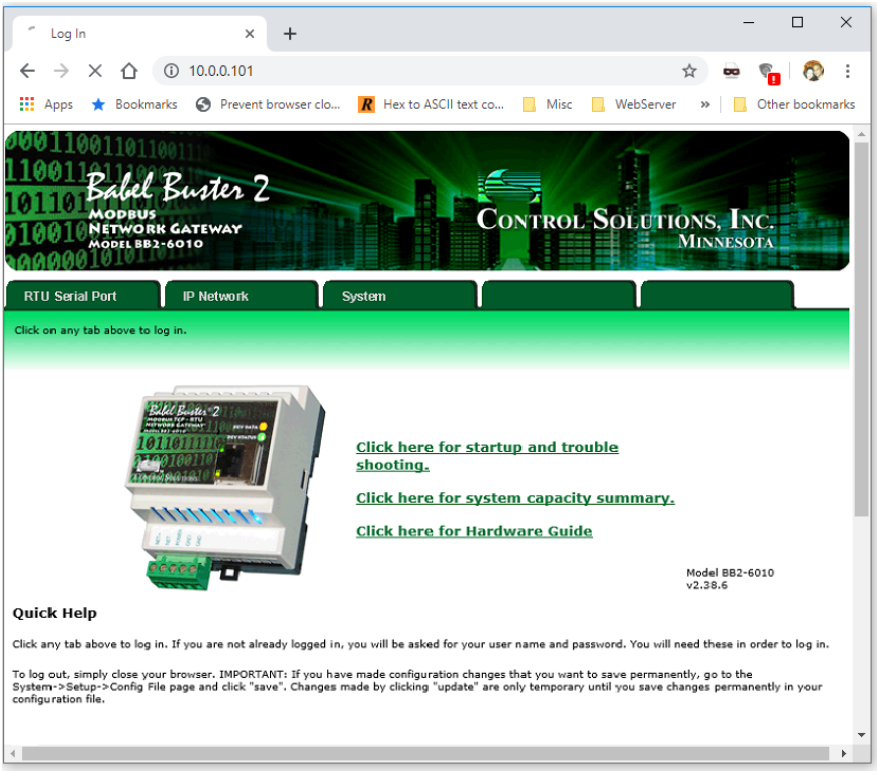
Start by directly connecting an Ethernet cable between your PC and the BB2-6010.

The default IP address of the BB2-6010 is **10.0.0.101**. If your PC is running Microsoft Windows, and is not already on the 10.0.0.0 domain, you will need to add a route on your PC. Do this by opening a command prompt with administrator privileges. First type "ipconfig" and note the IPv4 address listed for the adapter that is connected to the same LAN as the BB2-6010 (or directly to the BB2-6010). Now type the following command into the command prompt, but replace the **x.x.x.x** with your PC's IPv4 address.

```
route add 10.0.0.0 mask 255.255.255.0 x.x.x.x
```

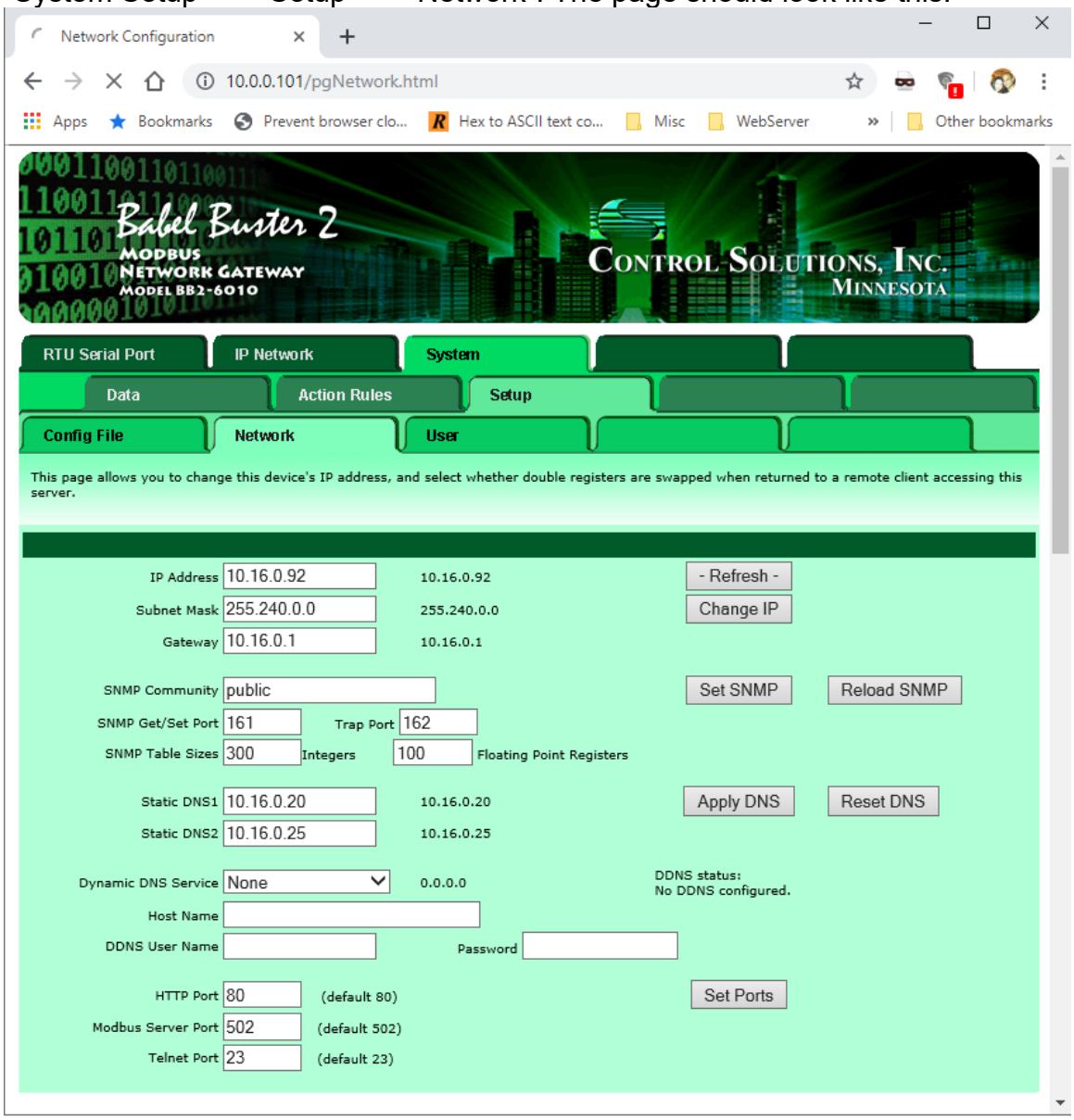
You should now be able to view the BB2-6010 homepage by entering "10.0.0.101" into the URL box of your web browser.

If you are running a non-Windows operating system, or if the above command doesn't work, please refer to your operating system's instructions on how to change your PC's IP address to a static IP of 10.0.0.100. You should now be able to view the BB2-6010 homepage by entering "10.0.0.101" into the URL box of your web browser.



Setting Up IP Address and LAN Settings

Click on the “System” tab. You will be presented with a ‘Sign in’ popup prompt. Type “root” for Username, and “buster” for Password. Now navigate to “System Setup” >> “Setup” >> “Network”. The page should look like this:



Enter the IP Address that you desire your BB2-6010 to have, and the Subnet Mask and Gateway address for the LAN that the BB2-6010 will be on. If you wish the BB2-6010 to be a DHCP client (i.e. to automatically be assigned IP address, subnet mask and gateway address from a DHCP server if one exists and is reachable on the LAN), simply enter “255.255.255.255” as the IP Address. However, DHCP is not recommended because it means the IP address of the BB2-6010 becomes dynamic and can periodically change; you will have to periodically update any software that communicates with it (over MODBUS TCP, SNMP or HTTP).

When done, click the “Change IP” button to save your changes. Wait at least 15 seconds until the settings are changed and the webpage reloads. Now cycle power to your BB2-6010 by pulling out and then re-inserting the “MODBUS RTU and Power In” connector. At this point, if you wish you may disconnect the direct ethernet connection between your PC and the BB2-6010 and put it on the LAN and connect to it through the LAN via its new IP address setting.

Note that clicking the “Change IP” button results in a permanent change of the programmed IP address, even if power to the BB2-6010 is lost. All other programming requires explicit saving (described in the “Saving Your Changes” section below) but changing IP settings is the exception.

Setting Up MODBUS TCP

Once the IP address is correctly set, the MODBUS TCP interface should immediately be working using the IP address you set, Port 502, and the objects described above in Section 4 (using MODBUS Function Code 0x03 - Read Holding Registers). If these settings are OK, you’re good to go.

If you need to change the MODBUS TCP port number, you can do so on the following page: “System Setup” >> “Setup” >> “Network”. Make the required changes, click the “Set Ports” button, and then refer to the “Saving and Activating Your Changes” subsection below to make your changes permanent ***(otherwise, they may be lost if the inverter loses power for long enough for the entire battery to deplete, or if maintenance is performed on the inverter)***.

Setting Up the SNMP Agent

Once the IP address is correctly set, the SNMP Agent (server) should immediately be working using the IP address you set, “public” as the community, and “Get” operations on the SNMP OIDs described in Section 4 above (after the first “Get”, you may use “Get Next” as well, or walk the entire MIB). If these settings are OK, you’re good to go.

The BB2-6010 supports SNMP v1 and v2c. Note that SNMP v3 is ***not*** supported.

If you need to change the community code, you can do so on the following page: “System Setup” >> “Setup” >> “Network”. Make the required changes, click the “Set SNMP” button, and then refer to the “Saving and Activating Your Changes” subsection below to make your changes permanent ***(otherwise, they may be lost if the inverter loses power for long enough for the entire battery to deplete, or if maintenance is performed on the inverter)***.

Setting Up SNMP Traps

The BB2-6010 can use SNMP’s “trap” mechanism to generate notifications (and send them to one or more trap receiving PCs/devices) when a programmed condition occurs. By default, no traps are programmed.

The first step in programming a trap is to program a ‘Threshold’ rule (a rule that when true, will send a trap). To program a ‘Threshold’ rule, first navigate to the following web page: “System” >> “Action Rules” >> “Thresholds” . Initially, there is just one threshold rule, and it is blank. As you program more rules, they will appear on the list, and each time the BB2-6010 will auto-generate a new threshold rule that is blank. In the “Rule #” column, click on the last rule in the list (that is blank). The web page will change to a page that lets you program the details of the rule. To illustrate, we will create an example rule that becomes true when the ambient temperature exceeds 30°C.

1 In the ‘register #’ box, enter the register number (from the table in Section 4) plus one. Adding one to the register number is critical. The Ambient Temperature object is in register 10, so we enter 11.

2 Type a descriptive name in the ‘event name’ box. We will enter “Ambient Temp is too high”. This step is optional but will help you remember what the rule is for. The text you enter here will also be embedded in SNMP traps generated by this rule evaluating to ‘true’.

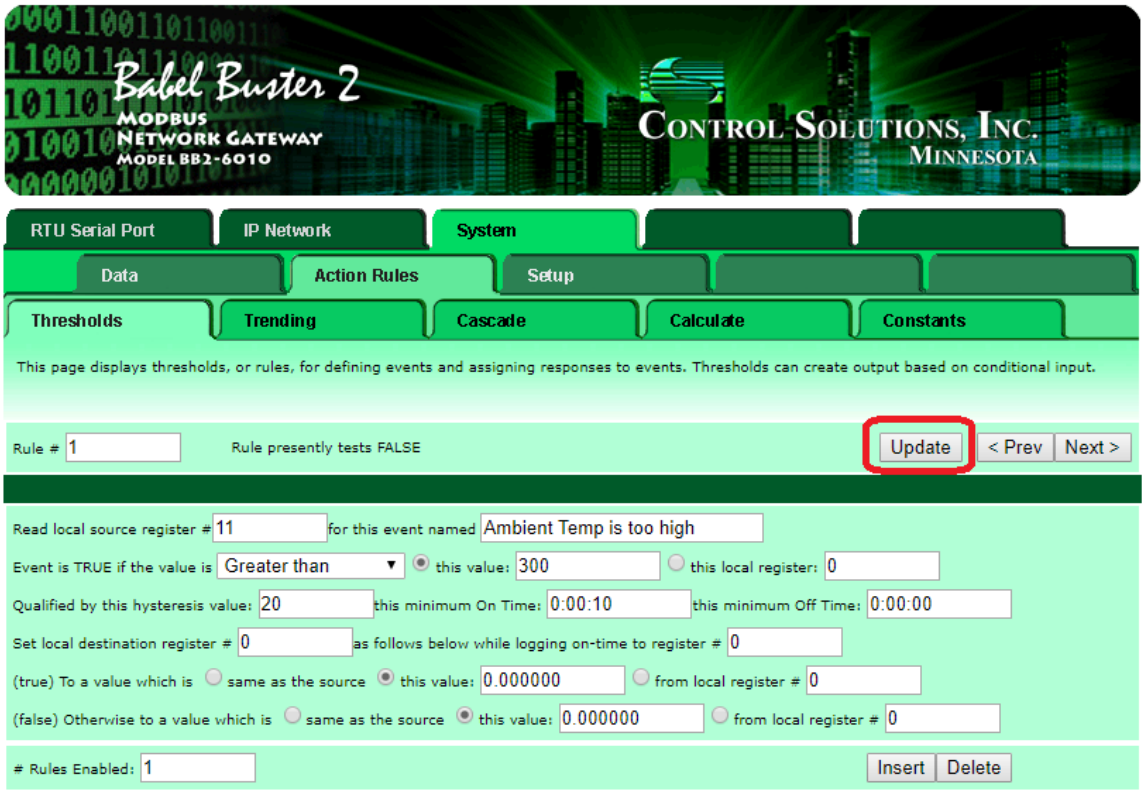
3 Set the dropdown menu to “Greater than”, click the “this value:” radio button (if it is not already selected) and enter 300 as the value (300 is 30.0°C, in units of 0.1°C as described in Section 4)

4 For analog values such as ambient temperature, consider setting a hysteresis. For our example, you might want to put in a hysteresis of 2°C (20 in units of 0.1°C) so that if the temperature is right on the 30°C mark and oscillating with small variations over and under 30°C, you don’t get hit with a flood of traps. With a hysteresis of 2°C, once the temperature exceeds 30°C and you get the first trap, you won’t get another trap until the temperature drops all the way down to 28°C, and then comes back up over 30°C again (or the Repeat Time elapses… more on this later)

5 If you only want the trap to happen if the condition is reached for a minimum period of time, set that period in the “minimum on time” box. Enter it in the form HH:MM:SS (so for a 10 second minimum on time, you would type “00:00:10”)

6 “minimum off time” is another form of hysteresis, except using time instead of value. In our example, we could make the ‘minimum off time’ be 2 minutes (00:02:00) so that the temperature has to be below 30°C consistently for 2 whole minutes before a trap can be generated once the temperature climbs above 30°C again. But lets just do it by value since we did that in step 4.

7 We can ignore the rest of the rule programming. Let’s click the “Update” button to temporarily save the rule.



Once you have programmed all your desired rules, the next step is to make them generate traps. The BB2-6010 lets you send traps to up to three different groups of “Trap Receivers” (in case you want some traps to go to one destination, and other traps to go to another). For now, lets assume you only want to have one group of trap receivers. Go to the “IP Network” >> “SNMP Setup” >> “Devices” web page. For each trap receiving device:

- Enter the device’s IP address **or** hostname (IP address is preferable for a static IP device. For a DHCP client device whose IP address changes over time, enter its hostname in the “Domain Name” box – if using hostnames, please ensure that DNS server has been correctly set in the “Setting Up IP Address and LAN Settings” section above)
- Optionally enter a textual name for the device (such as “Maintenance PC” or “Net Mgmt Server”, etc.)
- Check the “Group 1” checkbox
- Click the “Update” button

Next, go to the “IP Network” >> “SNMP Setup” >> “Trap Enable” webpage and click the “Trap on True” checkbox and the “Enable Group 1” checkbox for all the rules you programmed above. Then click the “Update” button. Note:

- The Repeat Time field determines how long (in ‘seconds’) the BB2-6010 will wait before resending a trap that is still asserted. For example, if you trap on loss of utility power, and you set the Repeat Time to 30 seconds, and utility power is lost for 10 minutes, you will get one trap every 30

seconds for 10 minutes (for a total of 20 traps). If you enter 0 here, the BB2-6010 uses its default repeat time of 60 seconds.

- The Repeat Count sets the number of traps to send in immediate succession at each repeat time. If you set this to 0 or 1, the BB2-6010 uses the default repeat count of 1. Using a higher number is only necessary if the network or your 'Trap Receiver' client is unreliable, and you want to maximize the chances of traps getting through. Going back to the above example, if you trap on loss of utility power, and you set the Repeat Time to 30 seconds, and the Repeat Count to 5, and utility power is lost for 10 minutes, you will get five back-to-back traps every 30 seconds for the 10 minutes for a total of 100 traps.

Finally, refer to the "Saving and Activating Your Changes" subsection below to make your programming changes permanent ***(otherwise, they may be lost if the inverter loses power for long enough for the entire battery to deplete, or if maintenance is performed on the inverter)***.

Saving and Activating Your Changes

Any changes you make on the BB2-6010 web pages - other than changing IP address - are temporary. They will not take effect until you activate them, plus they will be lost on a power cycle of the BB2-6010, until you permanently save them.

To permanently save your programming, go to "System" >> "Setup" >> "Config File" , select "**InverterModbus.xml**" from the dropdown list (if it is not already selected), and click the "Save" button. The BB2-6010 will take 10 seconds or so to save the changes. The changes are now permanent and will survive power cycles.

Finally, click the "Load" button to get the BB2-6010 to reinitialize itself and activate your programming changes.

Warning: It is imperative that you click "Save" before you click "Load". If you accidentally click "Load" first, the BB2-6010 will reload its programming from before you made any changes, and all your changes will be lost!

If you would like to back up your BB2-6010 programming on your PC for safe-keeping or to share with Tech Support, click the "View" button. Your browser will load and display an xml file that contains the BB2-6010's programming in xml format. To download and save the xml file, press Ctrl-S (⌘-*s* on an Apple) or right click on white space on the page and click "Save As".

Please contact Myers EPS Service at (610) 868-5400 if you have questions or concerns.

RS-232 Communications

Illuminator Hypernova

Users Manual

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TABLE OF CONTENTS

1.0 - INTRODUCTION

This manual is intended to explain the RS-232 communication protocol for the Hypernova Emergency Lighting Central Inverter. Serial Communication can be established by means of a computer using terminal emulation software (such as Tera Term, PuTTy, xterm, etc.), or by any embedded device capable of RS-232 communication. We shall call this device the Client.

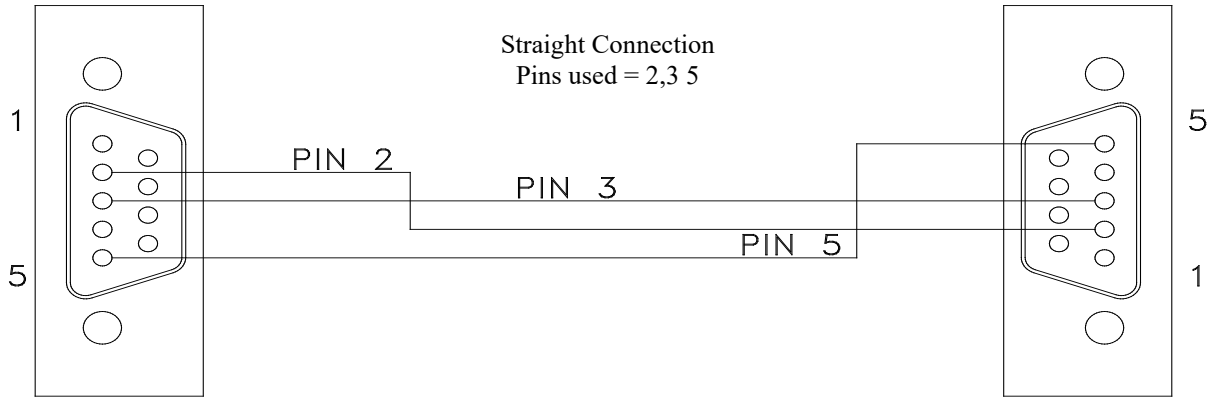
2.0 - CONNECTION

The Illuminator Hypernova Central Inverter has a 9-pin Sub-D (DB9) female connector located inside the inverter. See the Installation Guide for the exact location of the connector.

The connection between the Client and the Inverter is a straight-through connection. Do ***not*** use a Null Modem Cable that flips pins 2 and 3. Pin 2 and Pin 3 are the Data send and receive lines; Pin 5 is the Ground (common) line. Optical isolation on the interface card provides galvanic isolation between the client device's ground signal and the inverter's ground.

Important: The RS-232 connection between the inverter and the Client is physically shared with the RS232 connection between the inverter and the front mounted 'meter panel' display. Since RS-232 only supports one device at a time, please disconnect the meter panel display before attempting RS-232 communication from the Client device. This can be done by opening the inverter cabinet door, and carefully disconnecting the connector on the back of the meter panel module that connects it with the inverter control board (which is deeper inside the cabinet).

Client Connector DB-9 **Illuminator Hypernova Central Inverter Connector DB-9**



3.0 - TERMINAL SETTINGS

Communication is established through a standard ASCII format of 8 Data bits, 1 Stop bit, No parity, No Flow Control, and a Baud rate of 9600 BPS.

Baud Rate:	9,600
Data Bits:	8
Parity:	None
Stop Bits:	1
Flow Control:	None
Character Set:	ANSI

The RS-232 protocol uses carriage returns ('\r', ANSI code 0x0D), but does ***not*** use line feeds ('\n', ANSI code 0x0A). If you are manually typing commands, some terminal emulator software will automatically feed the line back when you press enter (and a carriage return is sent) and when the inverter responds (with a response string followed by a carriage return). However, some terminal emulator software will not do this, and you will end up with something like the following where each line is staggered:

```
*0DA0
     *0da09/16/19X
                  *0TM0
                       *0tm12:59X
```

If this is the case, look for the setting in your terminal emulator software that automatically appends line feeds after (outgoing or incoming) carriage returns.

Finally, the inverter will not echo back characters you type. If it looks like nothing is happening when you type, until you press enter, then turn on the 'local echo' feature in your terminal emulator software.

4.0 - PROTOCOL OVERVIEW

The RS-232 protocol specifies the 'language' for commands and responses between the Client and the inverter. Information is exchanged between the two devices in this 'language'.

The Client is the initiator of all communications. The Client sends out commands in all upper-case letters, like the following string. Commands must be typed perfectly; The inverter will just drop (ignore) mistyped commands – you will not receive any error feedback. You may use the backspace key to fix typos. The square brackets ('[' and ']') below are not transmitted in the protocol; they are just in this document for clarity, to help differentiate fields that are dynamic (as opposed to fields that are static, or fixed).

***ACC[DDDD][P]<CR>**

*****:	Start Character, marks the start of a command.
A:	Character represents the System's node address. This will always be 0.
CC:	Two characters that specify the command (upper case!).
DDDD:	Data Field with variable length (often there is no data and the length is zero).
P:	Phase (0, 1 or 2). This is almost always 0, but for commands that can be addressed to each of the three phases of a 3-phase inverter, you would use 0 for phase A, 1 for phase B and 2 for phase C.
<CR>:	Carriage return character ('\r', ANSI code 0x0d).

When the inverter correctly receives this string of characters, it will reply. The inverter usually (not always) sends back the same command but in lower case letters, and in the following syntax:

***acc[dddd][uuuu]t<CR>**

*****:	Start Character, marks the start of a command.
a:	Character represents the System's node address. This will always be 0.
cc:	Two characters that reflect the command that is being responded to (lower case!).
dddd:	Data Field with variable length (sometimes there is no data and the length is zero).
uuuu:	The 'Unit' field, with variable length. For example, 'V' for volts, 'Min' for minutes, etc. For 3-phase inverters, this may also contain the phase for which the data was returned.
t:	Termination character. Either '0' or 'X'.
<CR>:	Carriage return character ('\r', ANSI code 0x0d).

5.0 - COMMANDS

Meter Functions

5.1 Get Alarm Status

Command: ***0AS0**<CR>
Response: ***0as[dddd]0**<CR>

dddd represents a 16-bit field in HEX format. Please refer to the table below for bit definitions.

Bit	Alarm Name	Alarm Description
0	Overload Alarm	Too much load connected to inverter output
1	Overload Shutdown Alarm	Inverter has shutdown due to too much load
2	High AC Voltage Alarm	Excessively high input voltage
3	Low AC Voltage Alarm	Excessively low input voltage
4	High Ambient Alarm	Excessively high ambient temperature
5	Circuit Breaker Alarm	Circuit breaker(s) has/have tripped
6	Load Reduction Alarm	Load has reduced below programmed threshold (a load device has gone offline – perhaps a lamp is out?)
7	Near Low Battery Alarm	Inverter is approaching low battery
8	Low Battery Alarm	Inverter battery voltage is critically low
9	Inverter Failure Alarm	Inverter cannot output voltage (problem with circuitry)
10	Charge Failure Alarm	The battery charging circuitry has failed
11	Utility Power Down Alarm	No utility power; inverter is running on battery
12	Spare	**reserved**
13	Output Fault Alarm	There is an issue with the load (such as a short circuit)
14	Spare	**reserved**
15	Spare	**reserved**

The conversion of each of the four hex characters (in **dddd**) from hex to binary is as follows:

Hex	Binary
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

If there were an overload alarm, the Alarm status would read 0001 in hex, which would be 0000 0000 0000 0001 in binary. As can be seen, the last bit (bit 0) is set, indicating an overload alarm.

Example:
Command: ***0AS0**<CR>
Response: ***0as[088B]0**<CR>
In this theoretical response, 0x088B is translated into binary as 0000 1000 1000 1011 (where the leftmost bit is bit15, and the rightmost bit is bit0), which tells us that the following alarm conditions

are asserted: Overload, Overload Shutdown, Low AC Voltage, Near Low Battery, Utility Power Down.

5.2 Get Indicator Status

Command: ***0IS0**<CR>
Response: ***0is[dddd]0**<CR>
dddd represents a 16-bit field in HEX format. Please refer to the table below for bit definitions.

Bit	Status Flag Name	Status Flag Description
0	System Ready	0 while rebooting, on battery or charging. 1 all other times.
1	AC Present	0 when there is no AC input voltage from the utility (i.e. utility power outage). 1 otherwise.
2	Battery Charging	0 when on battery power, 1 otherwise (the battery is always charging when power is not being drawn from it. When its full, the inverter uses 'float charging' to keep it full)
3	On Battery Power	1 when the inverter is running on battery power. 0 otherwise.
4	Spare	**reserved**
5	Spare	**reserved**
6	Spare	**reserved**
7	Is 3-phase inverter	0 if the inverter is single-phase. 1 if the inverter is three-phase.
8	Spare	**reserved**
9	Spare	**reserved**
10	Spare	**reserved**
11	Spare	**reserved**
12	Spare	**reserved**
13	Spare	**reserved**
14	Spare	**reserved**
15	Spare	**reserved**

This format is just like the Alarm status. Please read Hex format from Alarm Status (above).

5.3 Get Input Voltage

Command: ***0VI[ϕ]**<CR>
Where ϕ represents the phase. Use '**0**' for phase A, '**1**' for phase B or '**2**' for phase C. For a single-phase inverter, always use '**0**')

Response: ***0vi[ddd.d]VX**<CR> (for a single-phase inverter)
***0vi[ddd.d]V òAX**<CR> (for phase A on 3-phase inverter)
***0vi[ddd.d]V òBX**<CR> (for phase B on 3-phase inverter)
***0vi[ddd.d]V òCX**<CR> (for phase C on 3-phase inverter)
Where **ddd.d** is the voltage in Volts (for example, **120.6**). The character 'ò' (ANSI code 0xF2) means 'phase' (there is no 8-bit ANSI code for 'ϕ' - the Greek letter Phi that is usually used to mean 'phase' – in the US ANSI-8 character set).

Example 1: You query a single-phase inverter whose input voltage is 118.6 Volts:
(you send) ***0VI0**<CR>
(it responds) ***0vi118.6VX**<CR>
Example 2: You query a three-phase inverter whose input voltages are 278.6 Volts (phase A), 277.9 Volts (phase B) and 277.6 Volts (phase C):
(you send) ***0VI0**<CR>
(it responds) ***0vi278.6V òAX**<CR>
(you send) ***0VI1**<CR>

(it responds) ***0vi277.9V òBX**<CR>
(you send) ***0VI2**<CR>
(it responds) ***0vi277.6V òCX**<CR>

5.4 Get Output Voltage

Command: ***0VO[ϕ]**<CR>
Where ϕ represents the phase. Use '**0**' for phase A, '**1**' for phase B or '**2**' for phase C. For a single-phase inverter, always use '**0**')

Response: ***0vo[ddd.d]VX**<CR> (for a single-phase inverter)
***0vo[ddd.d]V òAX**<CR> (for phase A on 3-phase inverter)
***0vo[ddd.d]V òBX**<CR> (for phase B on 3-phase inverter)
***0vo[ddd.d]V òCX**<CR> (for phase C on 3-phase inverter)

Where **ddd.d** is the voltage in Volts (for example, **121.2**). For more information and to understand the 3-phase syntax better, see the comments and read the examples in section 5.3 – Get Input Voltage.

5.5 Get Output Current

Command: ***0IO[ϕ]**<CR>
Where ϕ represents the phase. Use '**0**' for phase A, '**1**' for phase B or '**2**' for phase C. For a single-phase inverter, always use '**0**')

Response: ***0io[ddd.d]AX**<CR> (for a single-phase inverter)
***0io[ddd.d]A òAX**<CR> (for phase A on 3-phase inverter)
***0io[ddd.d]A òBX**<CR> (for phase B on 3-phase inverter)
***0io[ddd.d]A òCX**<CR> (for phase C on 3-phase inverter)

Where **ddd.d** is the current in Amps (for example, **.7**, **8.2**, **23.8**, or **148.8**). For more information and to understand the 3-phase syntax better, see the comments and read the examples in section 5.3 – Get Input Voltage.

5.6 Get Battery Voltage

Command: ***0BV0**<CR>
Response: ***0bv[ddd.d]VX**<CR>

Where **ddd.d** is the voltage in Volts (for example, **48.6**, **132.5**, or **267.2**).

5.7 Get Battery Current

Command: ***0BI0**<CR>
Response: ***0bi[ddd.d]AX**<CR>

Where **ddd.d** is the current in Amps (for example, **.1**, **5.6**, **31.3**, or **104.7**). Note that when current is less than 1A, the leading zero is not displayed (i.e. **.1**, not **0.1**).

5.8 Get Ambient Temperature

Command: ***0TP0**<CR>
Response: ***0tp[ddd.d]ßCX**<CR>

Where **ddd.d** represents the temperature in degrees Celsius (for example, **26.6**, **30.8**, or **33.0**). The Beta symbol ('**ß**', ANSI code 0xDF) can be ignored. To convert to degrees Fahrenheit, subtract 32, then multiply by 5, then divide by 9. $°F = \frac{5(°C-32)}{9}$

5.9 Get Battery Output Power

Command: ***0WA0**<CR>
Response: ***0wa[dddd]X**<CR>

Where dddd represents the output power from the batteries, in Watts (for example, **27**, **8045**, **19822**, or **44781**). Note that there is no decimal point; the output is a whole number in Watts. When on utility power, this value will be very low.

5.10 Get Output VA

Command: ***0VA[ϕ]**<CR>
Where ϕ represents the phase. Use '**0**' for phase A, '**1**' for phase B or '**2**' for phase C. For a single-phase inverter, always use '**0**')

Response:	***0va[dddd]VAX**<CR>	(for a single-phase inverter)
	***0va[dddd]VA òAX**<CR>	(for phase A on 3-phase inverter)
	***0va[dddd]VA òBX**<CR>	(for phase B on 3-phase inverter)
	***0va[dddd]VA òCX**<CR>	(for phase C on 3-phase inverter)

Where **dddd** is the output power of that phase of the inverter in VA (Vars – or Voltage-Ampere Reactive). For example, **6824**, **13219**, or **21688**). Note that there is no decimal point; the output is a whole number in VA. For more information and to understand the 3-phase syntax better, see the comments and read the examples in section 5.3 – Get Input Voltage.

5.11 Get Elapsed System-Up Time (days)

Command: ***0ED0**<CR>
Response: ***0ed[dddd]X**<CR>

Where **dddd** represents the number of days the inverter has been up and running (for example, **9**, **62**, **113**, or **2128**).

5.12 Get Inverter Run time

Command: ***0RT0**<CR>
Response: ***0et[dddd]MinX**<CR>

Where **dddd** represents the number of minutes that the inverter has run the output on battery power (for example, **9**, **62**, **113**, or **2128**).
IMPORTANT NOTE: This is one of the few commands where the response from the inverter ("**et**") has different letters than the command ("**RT**").

Control Functions

5.13 Set Date

Command: ***0DA[MM][DD][YY]0**<CR>
Where **MM** is month (01=January...12=December), **DD** is day (01..31) and **YY** is year (**19** = 2019). Do not forget the final **0** in the command, or it won't work.
Response: None! Use the Get Date command to confirm it worked.

5.14 Get Date

Command: ***0DA0**<CR>
Response: ***0da[mm][dd][yy]X**<CR>
Where **mm** is month (01=January...12=December), **dd** is day (01..31) and **yy** is year (**19** = 2019)

5.15 Set Time

Command: ***0TM[HH][MM]0**<CR>
Where **HH** is the hour in 24-hour format (00..23), and **MM** is the minute (00..59)
Response: None! Use the Get Time command to confirm it worked.

5.16 Get Time

Command: ***0TM0**<CR>
Response: ***0tm[hh]:[mm]X**<CR>
Where **hh** is the hour in 24-hour format (00..23), and **mm** is the minute (00..59)

5.17 Set Inverter Max Run Time

Command: ***0MT[HHHH]0**<CR>
Where **HHHH** is the maximum 'battery power' runtime that you want to allow the inverter to reach (in hours).
Response: None! Use the Get Inverter Max Run Time command to confirm it worked

5.18 Get Inverter Max Run Time

Command: ***0MT0**<CR>
Response: ***0mt[hhhh]X**<CR>
Where **hhhh** is the maximum 'battery power' runtime (in hours) that the inverter is allowed to reach.

5.19 Set Output Current Load Reduction Fault

Command: ***0F[ϕ][DDDD]0**<CR>
ϕ is the phase (**A** for phase A or if single-phase, **B** for phase B, or **C** for phase C). **DDDD** is the 'nominal output current' (in tenths of Amps. For example, to set 123.4 Amps, enter **1234.** To turn off this feature, use **0000**) that you consider normal (all loads functioning normally). If you set this value, and if the output current dips below 90% of this value, the Load Reduction Fault alarm will trigger. Do not forget the final 0 to terminate the command, or it won't work properly.
Response: None! Use the Get Output Current Load Reduction Fault command to confirm it worked.

5.20 Get Output Current Load Reduction Fault

Command: ***0F[ϕ]0**<CR>

ϕ is the phase (**A** for phase A or if single-phase, **B** for phase B, or **C** for phase C).

Response: ***0lf[ddd.d]AX**<CR>

dddd is the 'nominal output current' (in Amps). If this value is set, and if the current value of output current dips below 90% of this value, the Load Reduction Fault alarm will trigger. Note that leading zeros are not displayed for currents below 1A (e.g. **.4** for 0.4A). If the feature is off, **.0** will be returned.

5.21 Set Low Battery Voltage Alarm

Command: ***0LB[DDDD]0**<CR>

Where **DDDD** is the voltage (in tenths of a Volt, for example 216.5 Volts would be entered as **2165**) that you wish to set as the 'low battery voltage' threshold that triggers the Low Battery Voltage Alarm. Do not forget the final 0 to terminate the command, or it won't work properly.

Response: None! Use the Get Low Battery Voltage Alarm command to confirm it worked.

5.22 Get Low Battery Voltage Alarm

Command: ***0LB0**<CR>

Response: ***0lb[ddd.d]VX**<CR>

Where **ddd.d** is the voltage (in Volts) that is currently set as the 'low battery voltage' threshold that triggers the 'Low Battery Voltage' alarm.

5.23 Set Low AC Voltage Alarm

Command: ***0LV[DDDD]0**<CR>

Where **DDDD** is the voltage (in tenths of a Volt, for example 250.5 Volts would be entered as **2505**) that you wish to set as the 'low AC input voltage' threshold that triggers the 'Low AC Voltage' alarm.

Response: None! Use the Get Low AC Voltage Alarm command to confirm it worked.

5.24 Get Low AC Voltage Alarm

Command: ***0LV0**<CR>

Response: ***0lv[ddd.d]VX**<CR>

Where **ddd.d** is the voltage (in Volts) that is currently set as the 'low AC input voltage' threshold that triggers the 'Low AC Voltage' alarm.

5.25 Set High AC Voltage Alarm

Command: ***0HV[DDDD]0**<CR>

Where **DDDD** is the voltage (in tenths of a Volt, for example 318.6 Volts would be entered as **3186**) that you wish to set as the 'high AC input voltage' threshold that triggers the 'High AC Voltage' alarm.

Response: None! Use the Get High AC Voltage Alarm command to confirm it worked.

5.26 Get High AC Voltage Alarm

Command: ***0HV0**<CR>
Response: ***0hv[ddd.d]VX**<CR>
Where **ddd.d** is the voltage (in Volts) that is currently set as the 'high AC input voltage' threshold that triggers the 'High AC Voltage' alarm.

5.27 Set Ambient Temperature Alarm

Command: ***0AT[DD]0**<CR>
Where **DD** is temperature (in degrees Celsius) that you wish to set as the 'high ambient temperature' threshold that triggers the 'High Ambient' alarm. Note: to translate from degrees Fahrenheit to Celsius, multiply by 9, divide by 5, then add 32. $°C = \frac{9(°F)}{5} + 32$
Response: None! Use the Get Ambient Temperature Alarm command to confirm it worked.

5.28 Get Ambient Temperature Alarm

Command: ***0AT0**<CR>
Response: ***0at[dd]CX**<CR>
Where **dd** represents the temperature (in degrees Celsius) that is currently set as the 'high ambient temperature' threshold that triggers the 'High Ambient' alarm. To convert to degrees Fahrenheit, subtract 32, then multiply by 5, then divide by 9. $°F = \frac{5(°C-32)}{9}$

Log Functions

5.29 Get Number of Test Log Entries

Command: ***0LT9100**<CR>

If there are no self-tests in the log yet:
Response: ***0ltNo Tests X**<CR>

If there is at least one self-test in the log, or more:
Response: ***0ltT[dd]/[ee]X**<CR>
Where **dd** is the last log entry that was fetched (ignore this value), and **ee** is the current 'total number of Test Log entries' (max possible value is 75).

5.30 Get Test Log Entry Field

Each time the inverter runs an automatic self-test, it logs the results in the Test Log as multiple fields. Each Test Log entry has 12 fields (numbered **00** through **11**) that can be individually retrieved.

Command: ***0LT[ii][jj]**<CR>
Where **ii** is the Test Log entry number (must be a two-digit number between **01** and the 'number of Test Log entries' (see section 5.29 above), and **jj** is the field number (must be a two-digit number between **00** and **11**).

See the table below for the field number specifications, and the type of response that is generated with each field number.

Field #	Field name	Response Syntax	Description
00	Date	*0lt[mm]/[dd]/[yy]X<CR>	mm is month (01..12), dd is day (01..31), yy is year
01	Time	*0lt[hh]:[mm]X<CR>	hh is hour (00..23, 24-hour format) and mm is minute (00..59)
02	Duration	*0lt[dd]MinX<CR>	dd is the test duration, in minutes (for example, 5, 20, etc)
03	Output Voltage Phase A	*0lt[ddd.d]V òAX<CR>	ddd.d is the single-phase or Phase A output voltage when the test was run, in Volts.
04	Output Voltage Phase B	*0lt[ddd.d]V òBX<CR>	ddd.d is the Phase B output voltage when the test was run, in Volts. Only applicable if 3-phase inverter.
05	Output Voltage Phase C	*0lt[ddd.d]V òCX<CR>	ddd.d is the Phase C output voltage when the test was run, in Volts. Only applicable if 3-phase inverter.
06	Output Current Phase A	*0lt[ddd.d]A òAX<CR>	ddd.d is the single-phase or Phase A output current when the test was run, in Amps
07	Output Current Phase B	*0lt[ddd.d]A òBX<CR>	ddd.d is the Phase B output current when the test was run, in Amps. Only applicable if 3-phase inverter.
08	Output Current Phase C	*0lt[ddd.d]A òCX<CR>	ddd.d is the Phase C output current when the test was run, in Amps. Only applicable if 3-phase inverter.
09	Ambient Temp	*0lt[dd.d]ßCX<CR>	dd.d is the ambient temperature when the test was run, in degrees Celsius
10	Alarm Status	*0ltAlarms: NoX<CR> *0ltAlarms: YesX<CR>	Indicates whether or not any alarm conditions were asserted at the time in which the self-test was run
11	Test Trigger	*0ltMonthlyX<CR> *0ltYearlyX<CR>	Indicates what triggered the self-test (either it was an automatic monthly self-test, or an automatic yearly one)

***Example**:* In the example, we retrieve the third self-test log. Let's assume this test was run on February 16th 2018, at 11:30pm, it took 5 minutes to complete, the output voltages on the three phases were 277.1V, 277.2V and 276.9V respectively, the output currents on the three phases were 28.1A, 27.3A and 29.7A respectively, the ambient temperature was 24.6°C, no alarms were asserted at the time of the test, and the test was an automatic monthly self-test.

(you send) ***0LT0300**<CR>
(it responds) ***0lt02/16/18X**<CR>

(you send) ***0LT0301**<CR>
(it responds) ***0lt23:30X**<CR>

(you send) ***0LT0302**<CR>
(it responds) ***0lt5MinX**<CR>

(you send) ***0LT0303**<CR>
(it responds) ***0lt277.1V òAX**<CR>

(you send) ***0LT0304**<CR>
(it responds) ***0lt277.2V òBX**<CR>

(you send) ***0LT0305**<CR>
(it responds) ***0lt276.9V òCX**<CR>

(you send) ***0LT0306**<CR>
(it responds) ***0lt28.1A òAX**<CR>

(you send) ***0LT0307**<CR>
(it responds) ***0lt27.3A òBX**<CR>
(you send) ***0LT0308**<CR>
(it responds) ***0lt29.7A òCX**<CR>

(you send) ***0LT0309**<CR>

(it responds) ***0lt24.6ßCX**<CR>

(you send) ***0LT0310**<CR>
(it responds) ***0ltAlarms: NoX**<CR>

(you send) ***0LT0311**<CR>
(it responds) ***0ltMonthlyX**<CR>

5.31 Dump Test Log

Command: ***0DT0**<CR>

This command dumps all Test Log entries to the RS-232 port. It is essentially a script which reads out all log entries (where for each log entry, it reads out all fields). Each field gets its own line. Log entries are separated by two blank lines. Here is a sample of the response syntax (showing the first two log entries, and the last log entry):

(you send) ***0DT0**
(it responds...)

```
*01t10/15/15X
*01t05:00X
*01t5MinX
*01t283.1V òAX
*01t283.2V òBX
*01t281.9V òCX
*01t8.6A òAX
*01t12.6A òBX
*01t9.1A òCX
*01t30.0ßCX
*01tAlarms: NoX
*01tMonthlyX


*01t11/15/15X
*01t05:00X
*01t5MinX
*01t283.6V òAX
*01t282.1V òBX
*01t282.6V òCX
*01t8.7A òAX
*01t12.8A òBX
*01t9.2A òCX
*01t27.2ßCX
*01tAlarms: NoX
*01tMonthlyX

  :   :   :

*01t10/15/19X
*01t05:00X
*01t5MinX
*01t284.2V òAX
*01t282.8V òBX
*01t282.8V òCX
*01t8.6A òAX
*01t11.7A òBX
*01t9.3A òCX
*01t31.1ßCX
*01tAlarms: NoX
*01tMonthlyX
```

5.32 Get Number of Event Log Entries

Command: ***0LE**9100<CR>

If there are no manually invoked tests (AKA ‘events’) in the log yet:
Response: ***0leNo EventsX**<CR>

If there is at least one event in the log, or more:

Response: ***0leE[dd]/[ee]X**<CR>

Where **dd** is the last log entry that was fetched (ignore this value), and **ee** is the current 'total number of Event Log entries' (max possible value is 75).

5.33 Get Event Log Entry Field

Each time a user manually invokes an inverter self-test (AKA 'event'), the inverter logs the results in the Event Log as multiple fields. Each Event Log entry has 11 fields that can be individually retrieved.

Command: ***0LE[ii][jj]**<CR>

Where **ii** is the Event Log entry number (must be a two-digit number between **01** and the 'number of Event Log entries' (see section 5.32 above), and **jj** is the field number (must be a two-digit number between **00** and **10**).

The fields in the Event Log are exactly the same as the fields in the Test Log, except that the last field ('Test Trigger') does not exist in an Event Log entry (in other words, there is one fewer field). See the table in section 5.30 above for a description of the fields.

5.34 Dump Event Log

Command: ***0DE0**<CR>

This command dumps all Event Log entries to the RS-232 port. It is essentially a script which reads out all log entries (where for each log entry, it reads out all fields). Each field gets its own line. Log entries are separated by two blank lines. Here is a sample of the response syntax (showing the first two log entries, and the last log entry):

(you send) ***0DE0**

(it responds...)

```
*01e02/03/18X
*01e04:59X
*01e1MinX
*01e283.3V òAX
*01e284.6V òBX
*01e282.0V òCX
*01e8.0A òAX
*01e11.6A òBX
*01e8.9A òCX
*01e34.3ßCX
*01eAlarms: NoX


*01e07/31/18X
*01e06:04X
*01e1MinX
*01e283.9V òAX
*01e282.9V òBX
*01e282.4V òCX
*01e8.1A òAX
*01e12.7A òBX
*01e9.1A òCX
*01e34.1ßCX
*01eAlarms: NoX
  :   :   :
*01e09/02/19X
*01e19:32X
*01e1MinX
*01e284.7V òAX
*01e282.5V òBX
*01e295.3V òCX
*01e7.3A òAX
*01e11.4A òBX
*01e.4A òCX
*01e34.8ßCX
*01eAlarms: NoX
```

5.35 Get Number of Alarm Log Entries

Command: ***0AL9100**<CR>

If there are no alarms logged in the Alarm Log yet:
Response: ***0alNo Alarms X**<CR>

If there is at least one alarm log entry, or more:
Response: ***0alA[dd]/[ee]X**<CR>

Where **dd** is the last log entry that was fetched (ignore this value), and **ee** is the current 'total number of Alarm Log entries' (max possible value is 50).

5.36 Get Alarm Log Entry Field

Each time a new alarm condition asserts, the inverter logs the alarm in the Alarm Log as multiple fields. Each Alarm Log entry has 3 fields that can be individually retrieved.

Command: ***0AL[ii][jj]**<CR>

Where **ii** is the Alarm Log entry number (must be a two-digit number between **01** and the 'number of Alarm Log entries' (see section 5.35 above), and **jj** is the field number (must be a two-digit number between **00** and **02**).

See the table below for the field number specifications, and the type of response that is generated with each field number.

Field #	Field name	Response Syntax	Description
00	Date	***0al[mm]/[dd]/[yy]X**<CR>	**mm** is month (01..12), **dd** is day (01..31), **yy** is year
01	Time	***0al[hh]:[mm]X**<CR>	**hh** is hour (00..23, 24-hour format) and **mm** is minute (00..59)
02	Alarm	***0al[ssss]X**<CR>	**ssss** is a text string that describes the alarm. The possible values of the string are: • **Overload** • **OverloadShutdown** • **High AC Voltage** • **Low AC Voltage** • **High Ambient** • **Circuit Breaker** • **Load Variation** (Load Reduction) • **Near Low Battery** • **Low Battery** • **Inverter** • **Charger** • **Utility Failure** • **Output** These correspond with the alarm statuses described in section 5.1 above.

***Example**:* In the example, we retrieve the third Alarm Log entry. Let's assume the alarm triggered on November 8th, 2017, at 3:06pm, and the alarm was a high AC voltage.

(you send) ***0AL0300**<CR>
(it responds) ***0al11/08/17X**<CR>

(you send) ***0AL0301**<CR>
(it responds) ***0al15:06X**<CR>

(you send) ***0AL0302**<CR>
(it responds) ***0alHigh AC VoltageX**<CR>

5.37 Dump Alarm Log

Command: ***0DF0**<CR>

This command dumps all Alarm Log entries to the RS-232 port. It is essentially a script which reads out all log entries (where for each log entry, it reads out all fields). Each field gets its own line. Log entries are separated by two blank lines. Here is a sample of the response syntax (showing the first two log entries, and the last log entry):

(you send) `*0DF0`
(it responds…)
```
*0al09/30/18X
*0al05:52X
*0alUtility FailureX


*0al01/03/19X
*0al03:02X
*0alLoad VariationX

   :   :   :    :

*0al09/26/19X
*0al14:54X
*0alUtility FailureX
```

Self-Test Functions

5.38 Initiate Self-Test

Command: ***0TS0**<CR>
Response: ***0ts0**<CR>

This command invokes a manual inverter self-test, testing the battery power and inverter operation. The Response (***0ts0**<CR>) gets sent immediately on receipt of the command. Once the self-test completes, there is no notification over RS-232. The results of the test will be stored in the Event Log (see sections 5.32 through 5.34 above).

5.39 Set Monthly Self-Test Day

Command: ***0MD**[**DD**]**0**<CR>
Where **DD** is the day of the month (01..28) on which to run the monthly inverter self-test (it is not recommended to use 29, 30 or 31 as the day, as not all months have those days). Do not forget the final **0** in the command, or it won't work.
Response: None! Use the Get Monthly Self-Test Day command to confirm it worked.

5.40 Get Monthly Self-Test Day

Command: ***0MD0**<CR>
Response: ***0md**[**dd**]**X**<CR>
Where **dd** is the day of the month (01..31) in which the monthly self-test will be run.

5.41 Set Monthly Self-Test Time

Command: ***0TT**[**HH**][**MM**]**0**<CR>
Where **HH** is the hour in 24-hour format (00..23), and **MM** is the minute (00..59) at which you would like the monthly self-test to run when the programmed 'day of the month' is reached. It is recommended to use a time where it is unlikely that people are around the inverter, as it will make a humming noise while on battery power. Do not forget the final **0** in the command, or it won't work.
Response: None! Use the Get Monthly Self-Test Time command to confirm it worked.

5.42 Get Monthly Self-Test Time

Command: ***0TT0**<CR>
Response: ***0tt[hh][mm]X**<CR>
Where **hh** is the hour in 24-hour format (00..23), and **mm** is the minute (00..59) at which the monthly self-test will be run when the programmed 'day of the month' is reached.

5.43 Set Yearly Self-Test Month and Day

Command: ***0YD[MM][DD]0**<CR>
Where **MM** is the month (01..12) and **DD** is the day of the month (01..31) on which to run the yearly inverter self-test. Do not forget the final **0** in the command, or it won't work.
Response: None! Use the Get Yearly Self-Test Month and Day command to confirm it worked.

5.44 Get Yearly Self-Test Month and Day

Command: ***0YD0**<CR>
Response: ***0yd[mm][dd]X**<CR>
Where **mm** is the month (01..12) and **dd** is the day of the month (01..31) on which the yearly self-test will be run.

5.45 Set Yearly Self-Test Time

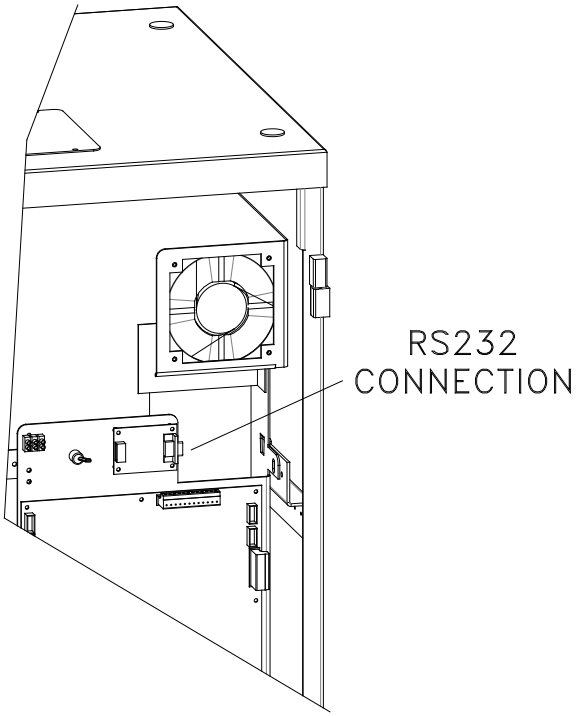
Command: ***0YT[HH][MM]0**<CR>
Where **HH** is the hour in 24-hour format (00..23), and **MM** is the minute (00..59) at which you would like the yearly self-test to run when the programmed month and day are reached. It is recommended to use a time where it is unlikely that people are around the inverter, as it will make a humming noise while on battery power. Do not forget the final **0** in the command, or it won't work.
Response: None! Use the Get Yearly Self-Test Time command to confirm it worked.

5.46 Get Yearly Self-Test Time

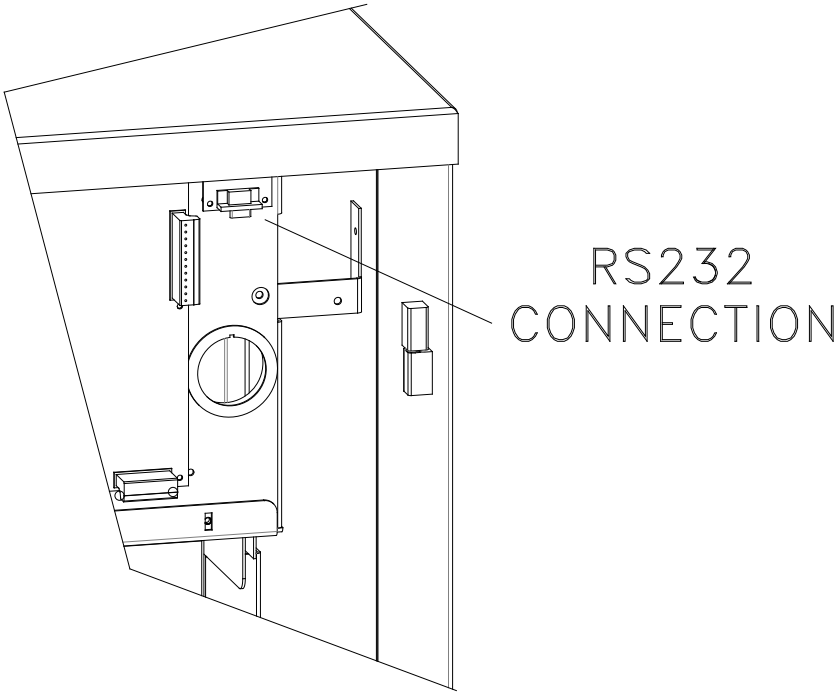
Command: ***0YT0**<CR>
Response: ***0yt[hh][mm]X**<CR>
Where **hh** is the hour in 24-hour format (00..23), and **mm** is the minute (00..59) at which the yearly self-test will be run when the programmed month and day are reached.

6.0 - LOCATING THE RS-232 PORT

LOCATION OF THE RS-232 PORT For Illuminator Hypernova 5.0 –16.7KVA



LOCATION OF THE RS-232 PORT For Illuminator Hypernova 25.0 –50.0KVA



7.0 - THE ZOOM MODEM (OPTIONAL)

Configuring the Zoom Modem

Connect the 9VDC Power Adapter
Connect the PC serial port to the modem's serial port (if your PC doesn't have a serial port, you can use an off-the-shelf 'USB to RS-232' adapter.
On the PC, bring up a terminal emulator program such as PuTTy, Tera Term or xterm.
Configure the terminal emulator to the following:

9600 BPS
8 Data Bits
No Parity
No Stop Bits

No Flow Control
Make sure there is communication by typing AT<enter> until the message "OK" appears.
Type the following AT commands:

ATM1 <enter>	(speaker on until connected)
AT&D0 <enter>	(ignore DTR)
AT&K0 <enter>	(no flow control)
ATS0=1 <enter>	(auto-answer after one ring)
AT&W0	(store to non-volatile memory)

Dialing the ZOOM Modem

Type AT<enter> until the "OK" message appears

Type the following to make the call:

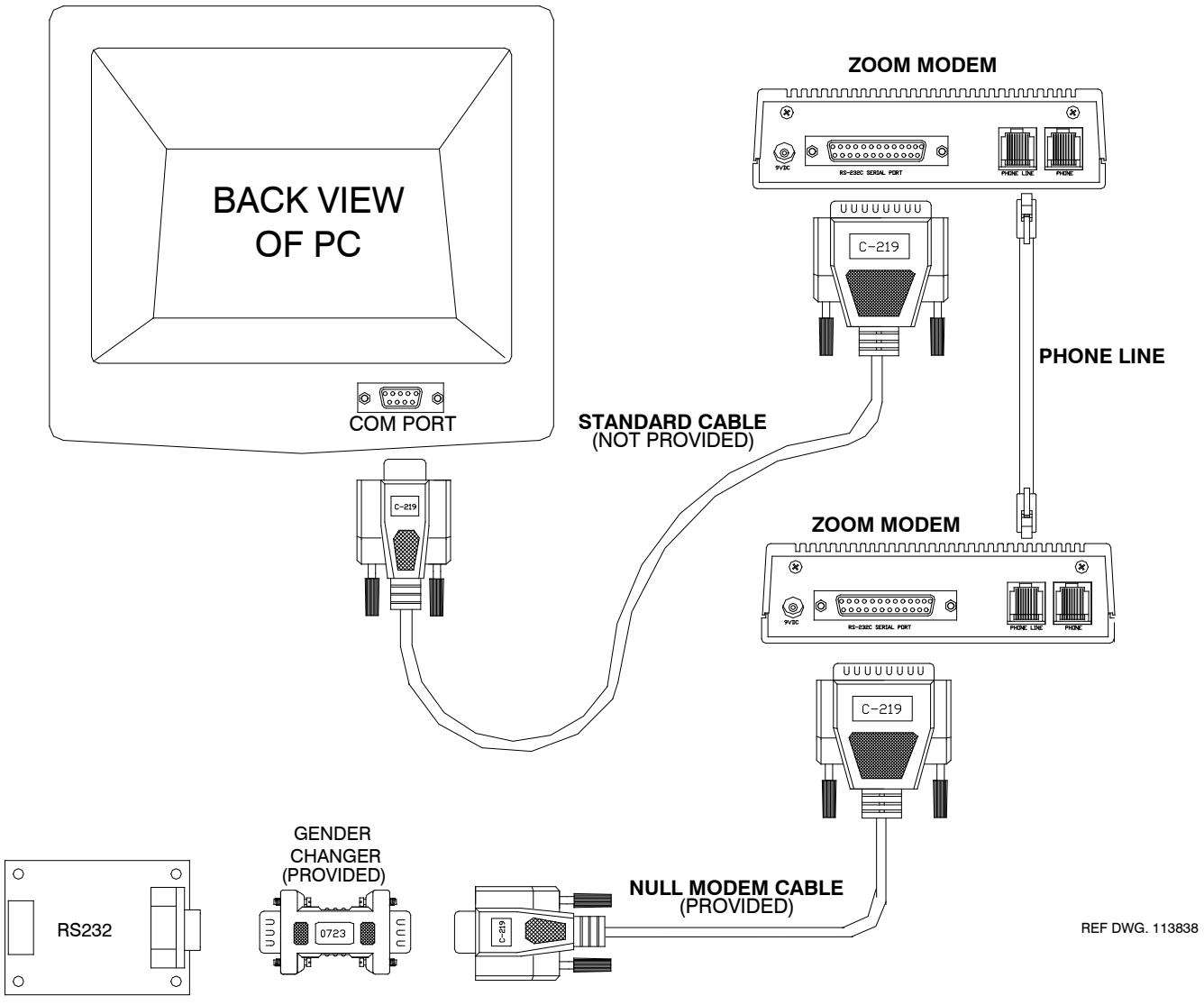
ATD9, 16105555224 <enter>
ATD is the command
9,16105555224 is the phone number –9, for outside line.

Wait for the message "connected"
To hang up:

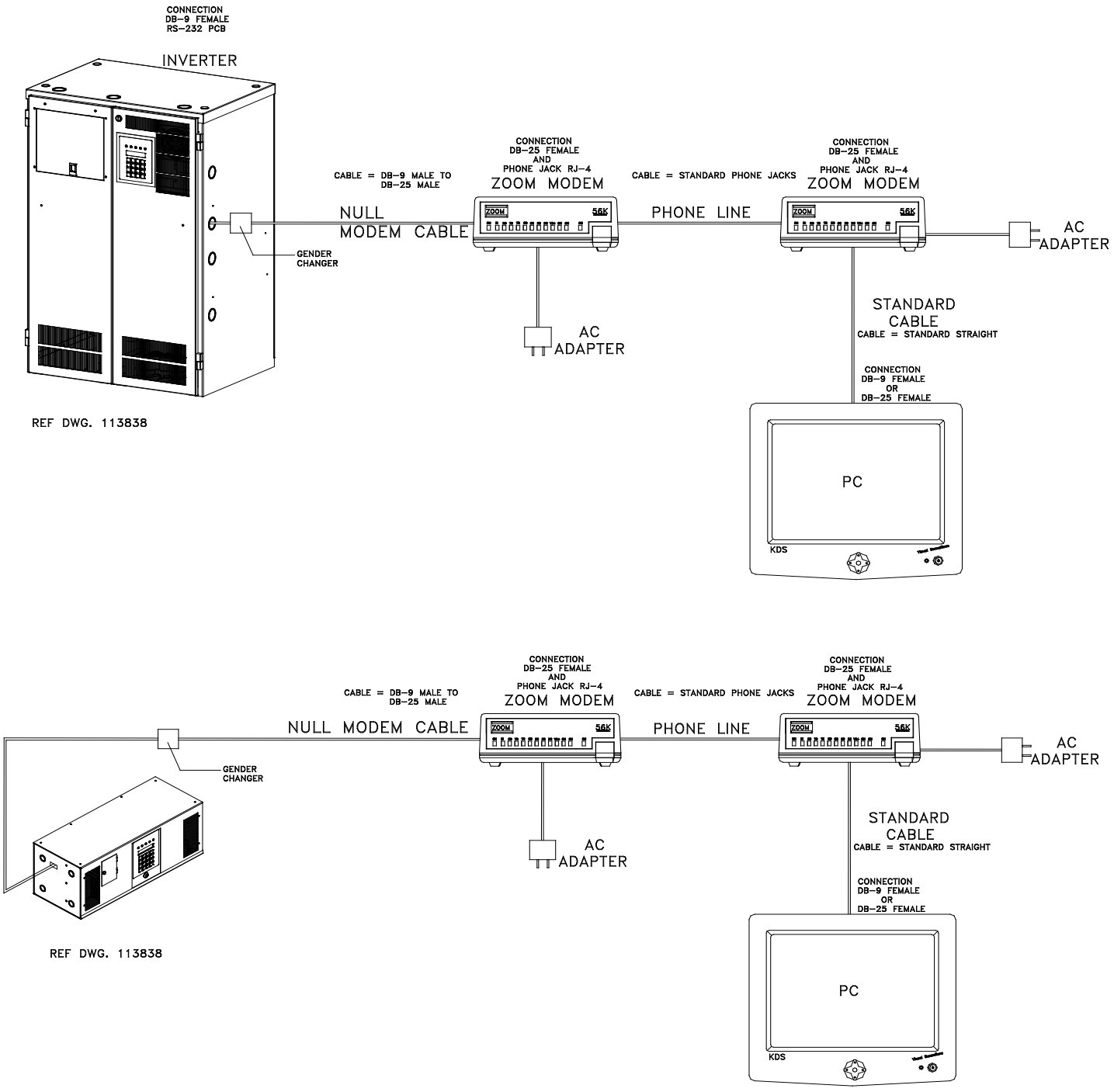
Type three plus signs (+++) and wait for the message "OK"
Type ATH0 <enter> to hang up or,

Type ATO0 <enter> to enter online mode again

DETAILED WIRING DIAGRAM



ZOOM MODEM CONNECTION BLOCK DIAGRAM



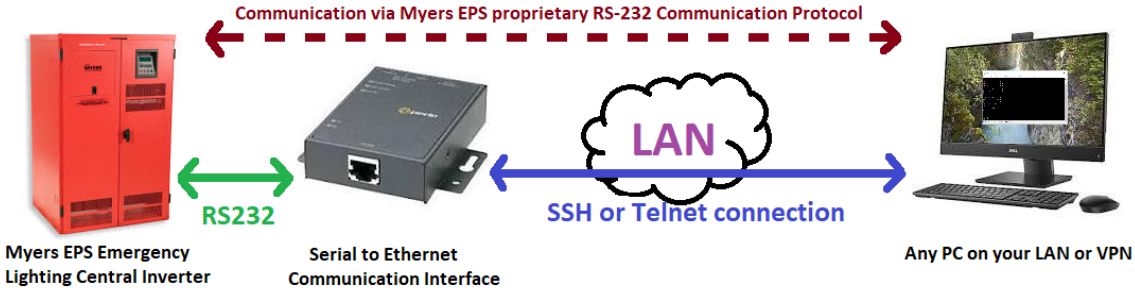
Serial to Ethernet Adapter

Illuminator Hypernova

Quick Start Manual

Myers Emergency Power Systems
44 South Commerce Way, Bethlehem, PA 18017
1-800-526-5088 • (610) 868-3500 • Fax: (610) 868-8686
Service: (610) 868-5400
www.myerseps.com

Myers Emergency Power Systems – Emergency Lighting Central Inverter Serial to Ethernet Communication Interface – QuickStart Guide



The Serial to Ethernet Communication Interface primarily allows you to monitor and control your Myers EPS Emergency Lighting Central Inverter over an SSH connection (on port 2222) using the Myers EPS RS-232 Communication Protocol. The SSH port number can be configured, or if you choose, Telnet may be selected instead of SSH.

The Serial to Ethernet Communication Interface is based on the IOLAN SDG1 product by Perle, which has many features including the ability to install a Virtual Com Port (VCP) driver on a Windows PC, create a virtual COM port, and make a 'serial tunnel' through your LAN from that virtual COM port to your inverter to exactly mimic being directly connected from your PC to the inverter with a serial (RS232) cable.

This QuickStart Guide only describes a subset of the features in the IOLAN SDG1:

1. Basic network configuration
2. Communicating with your inverter via an SSH client
3. Changing the port number
4. Changing the protocol from SSH to Telnet
5. Factory Reset

For more information on instead using the Virtual Com Port feature or other features, please reference the IOLAN Secure User's Guide, Perle Document Part Number 5500431-10, currently hosted at the following URL:
https://www.perle.com/support_services/documentation_pdfs/iolan_scg-sdg-stg_ug.pdf

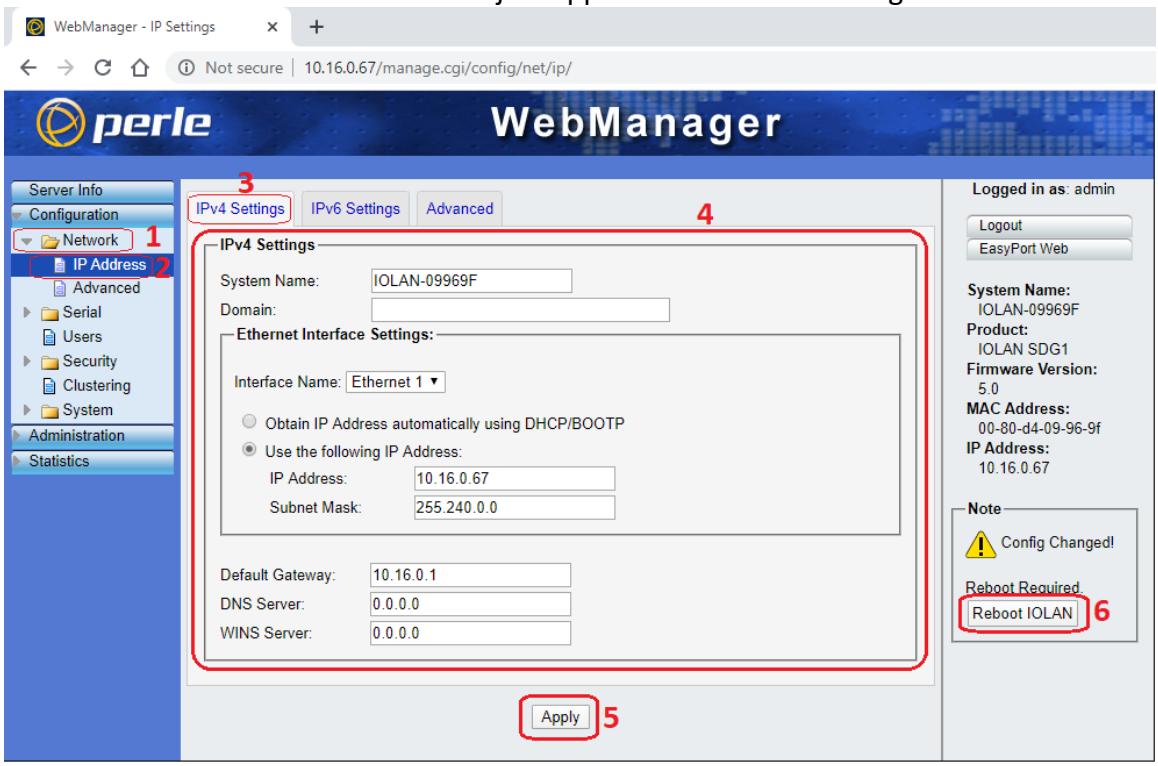
1 - Basic Network Configuration for your LAN

The default static IP address of the IOLAN SDG1 is **10.16.0.67** (Subnet Mask **255.240.0.0**). To set it to the correct network settings for your LAN:

1. Connect a direct Ethernet cable connection between a PC and the IOLAN SDG1. It doesn't matter if the Ethernet cable is a straight-through or crossover cable.
2. Set the wired LAN interface of the connected PC to a static IP address in the 10.16.0.XXX range (where XXX is any number from 1 to 254, *except 67*). Set the subnet mask to 255.240.0.0. It doesn't matter what you set the Default Gateway or DNS Server settings to. Note that you should save your previous settings for the PC so that you can remember how to restore them when you're done. Note also that the instructions to change the IP address, subnet, etc. will vary depending on which version of which Operating System is on your PC. If you are not aware of how to do so, please Google how to do so for your Operating System and version. Note also that if your PC has multiple network interfaces

(for example, a Wired LAN Interface, and a Wireless (WiFi) LAN Interface), be sure to only change these settings on the correct Wired LAN Interface.

3. Open a web browser window, and enter “10.16.0.67” in the “Address” bar.
4. The login page of the IOLAN SDG1 will load. Enter “**admin**” as the Username, and “**superuser**” as the Password.
5. On the navigation frame (left column), click the word “Network” (with an icon of a yellow folder to the left of it). This will expand the “Network” menu.
6. Click the word “IP Address” in the expanded “Network” menu.
7. Click on the “IPv4 Settings” tab if it is not already selected.
8. Set the IP address, Subnet Mask, and Default Gateway you wish to assign the IOLAN SDG1 to work on your LAN. Note: Entering a static IP address is highly recommended, even if your LAN includes a DHCP (dynamic IP) server, because with DHCP your IOLAN SDG1 might periodically change IP address.
9. Click the Apply button
10. Click the “Reboot IOLAN” button that just appeared in the bottom right



11. Close your web browser window
12. Disconnect the Ethernet cable between your PC and the IOLAN SDG1
13. Restore the previous IP settings for the wired LAN interface on your PC
14. Connect the IOLAN SDG1 ethernet port to your LAN
15. We recommend you stick a label on the IOLAN SDG1 – or on the outside of your inverter cabinet – listing the IP address and subnet mask you set the device up with. This may prove very useful to you or someone else in future.

2 - Communicating with Your Inverter Using an SSH Client

Your Serial to Ethernet Communication Interface is now ready for SSH communication with your Myers EPS Emergency Lighting Central Inverter, using the IP address you set in Section 1 above, and SSH on port **2222**. If you would like to change

the port number, or use Telnet instead of SSH, see sections 3 and 4 below (note that SSH is highly recommended over Telnet, as it is encrypted while all Telnet communications – including passwords – are cleartext).

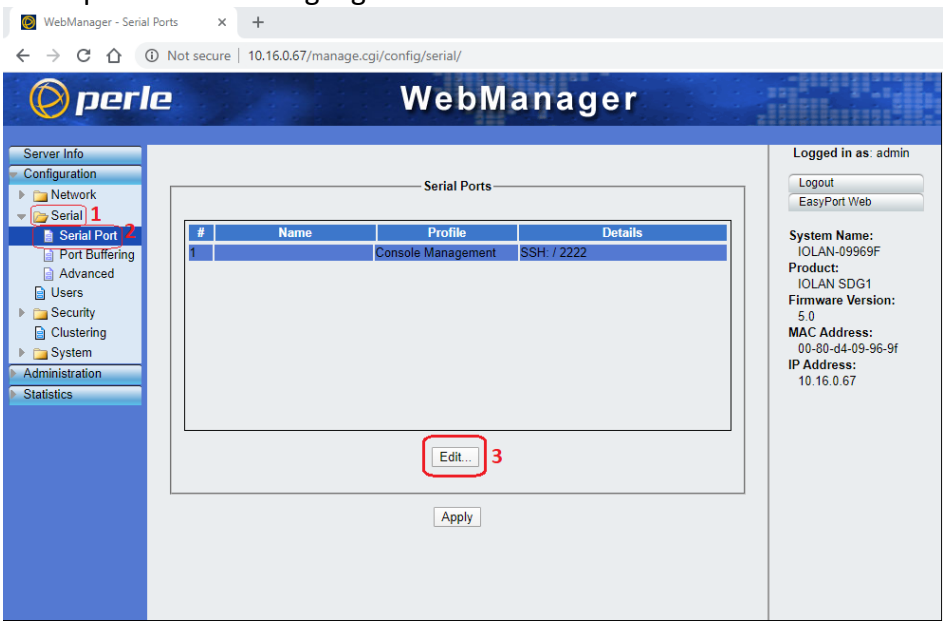
Simply open your SSH Client software (for example, PuTTY is a completely free and very lightweight SSH client, Windows 10 and newer includes a bundled OpenSSH Client feature that can be enabled, etc.) and connect to the SSH server on the IOLAN SDG1. The first time you do this from a given PC, the SSH Client will ask you if you wish to accept the security key, and you must answer 'yes'. You will then be presented with a login. Use "**myerseps**" as the username, and "**inverter**" as the password.

You should now be connected to your Myers EPS Emergency Lighting Central Inverter, and ready to communicate with it using the Myers EPS RS-232 Communication Protocol, as described in the RS-232 Protocol Manual Section.

3 - Changing the Port Number

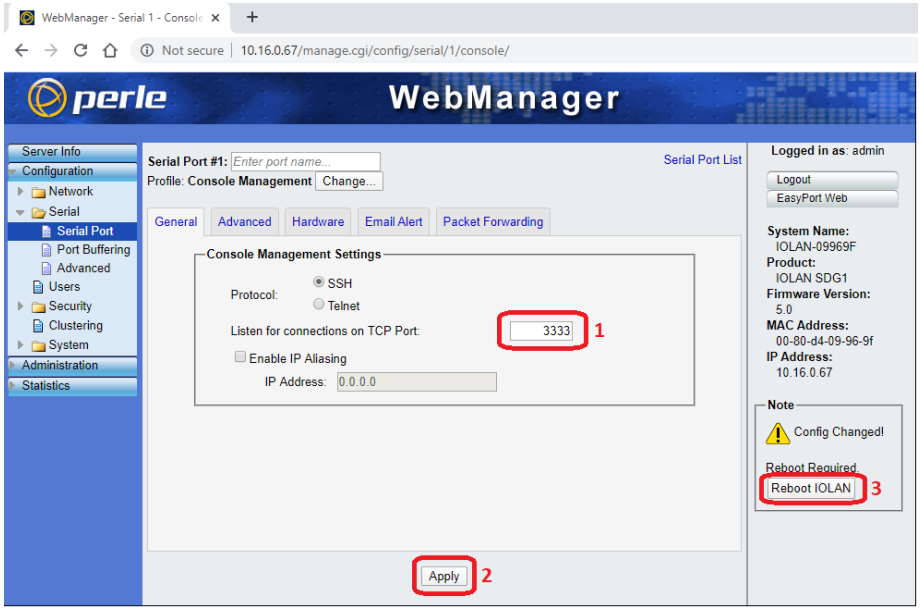
Depending on your organization's IT policies, sometimes certain port numbers may be firewalled (blocked) on your LAN, and so you might be asked by your IT/network staff to change the port number used by this interface to a port number that is not firewalled.

1. Open a web browser window, type the IP address (that you set to your IOLAN SDG1 in Section 1 above) in the "Address" bar, and press enter.
2. The login page of the IOLAN SDG1 will load. Enter "**admin**" as the Username, and "**superuser**" as the Password.
3. On the navigation frame (left column), click the word "Serial" (with an icon of a yellow folder to the left of it). This will expand the "Serial" menu.
4. Click the word "Serial Port" in the expanded "Serial" menu.
5. One serial port should be highlighted in a table with one row. Click "Edit…"



6. Change the port number to your desired value in the box labeled "Listed for connections on TCP Port"
7. Click the "Apply" button

8. Click the “Reboot IOLAN” button that just appeared in the bottom right. After the IOLAN SDG1 reboots (give is 60 seconds), it will accept SSH connections on the new port number you specified.



4 - Changing the Protocol from SSH to Telnet

Depending on your organization’s IT policies or available client software on your PCs, you may desire to use Telnet protocol instead of SSH. Note that SSH is simply an encrypted and more secure version of Telnet, therefore, SSH is highly recommended over Telnet. But if you must use Telnet, simply follow the same exact steps in the “Changing the Port Number” section above (section 3), except in step 6, instead of changing the port number, change the selected protocol from “SSH” to “Telnet”.

5 - Factory Reset

If the configuration or operation of your IOLAN SDG1 were to somehow get corrupted beyond recovery, or were you to forget or lose the IP address of your IOLAN SDG, it can be simply recovered using the Reset pinhole button next to the Ethernet jack on the device. You will need a small paper clip that is straightened out, or other narrow and long implement able to fit through the small hole. When the Reset button is pushed (through the small hole), you will feel the mechanical feedback sensation of the button.

- Tap the Reset button to perform a simple reboot of the device, or:
- Hold the Reset button down for over 3 seconds (but less than 10 seconds) to perform a Factory Reset. Note that this will not work if the IOLAN SDG1 is in the process of rebooting; make sure it is fully booted before doing this.

SYSTEM OPTIONS MANUAL
BATTERY THERMAL RUNAWAY

FOR

ILLUMINATOR HYPERNOVA

EMERGENCY LIGHTING CENTRAL INVERTER

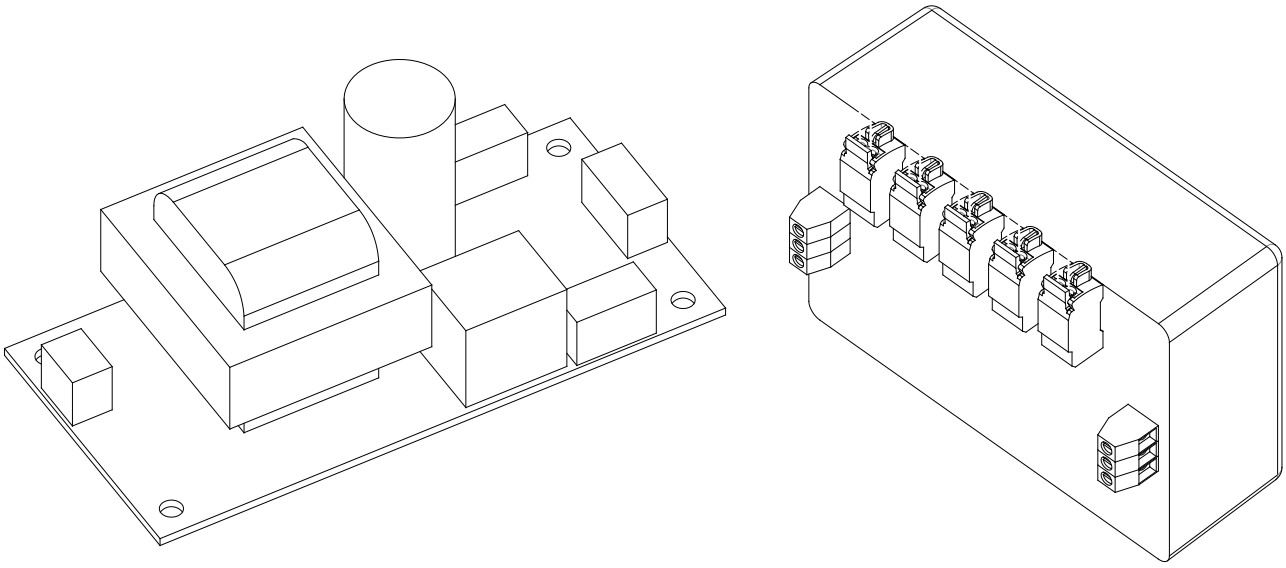


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Table of Contents

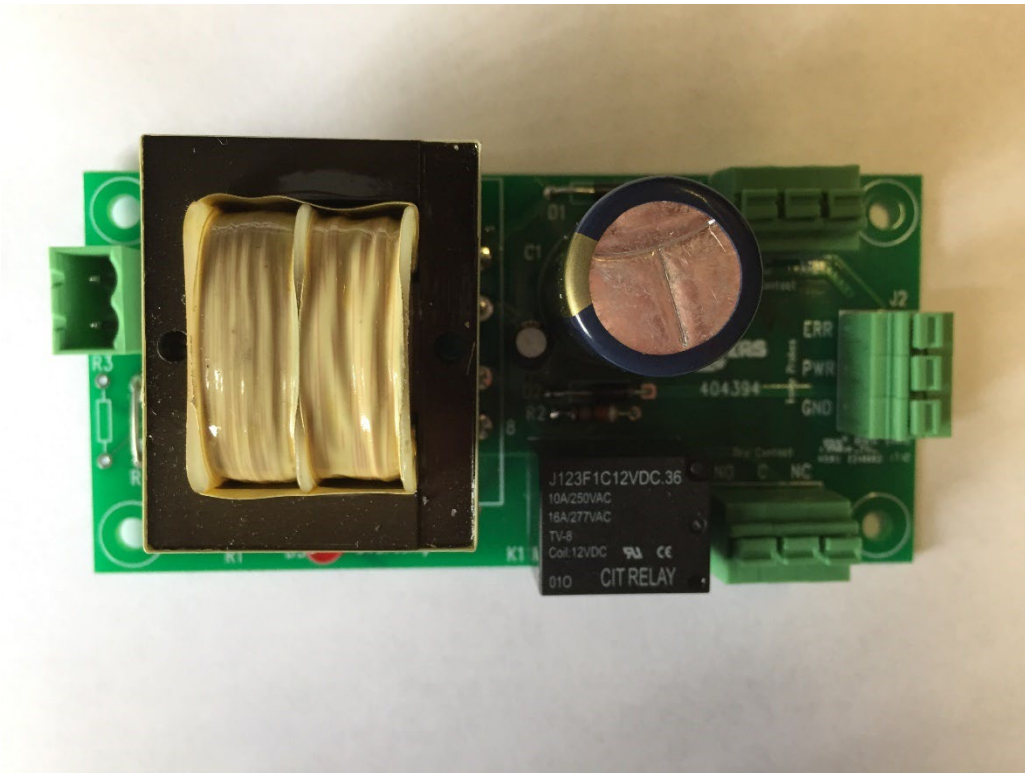
SECTION 1

System Description

The Thermal Runaway Detection Option consists of two components. The first PCB component is the Power Supply Relay PCB that performs a summary dry contact closure on an alarm from any of the temperature sensor boards. This PCB is shown in Picture 1. The second PCB component is a Temperature Sensor PCB that measures the temperature from each battery, runs an algorithm, and sets an alarm if there is a troubling condition. The temperature sensor PCB is shown in Picture 2.

Power Supply/Summary Relay PCB connections

The Power Supply and Summary Alarm PCB can be identified by the assembly number PCB404394XXX. The main power is supplied to the connector on the left. If jumpers R4 and R5 are installed the input voltage required is 115vac. If jumper R3 is installed then the input voltage is set up to accept a 230vac input. Connector J2, in the center on the right side of the PCB is used to supply the power to the Temperature Sensor PCB as well as collects the alarm trigger from the Temperature Sensor PCB. The connectors on the right at the top and bottom as shown provides the summary dry contacts for the alarm signal.



Picture 1 – Power Supply/Summary Relay PCB

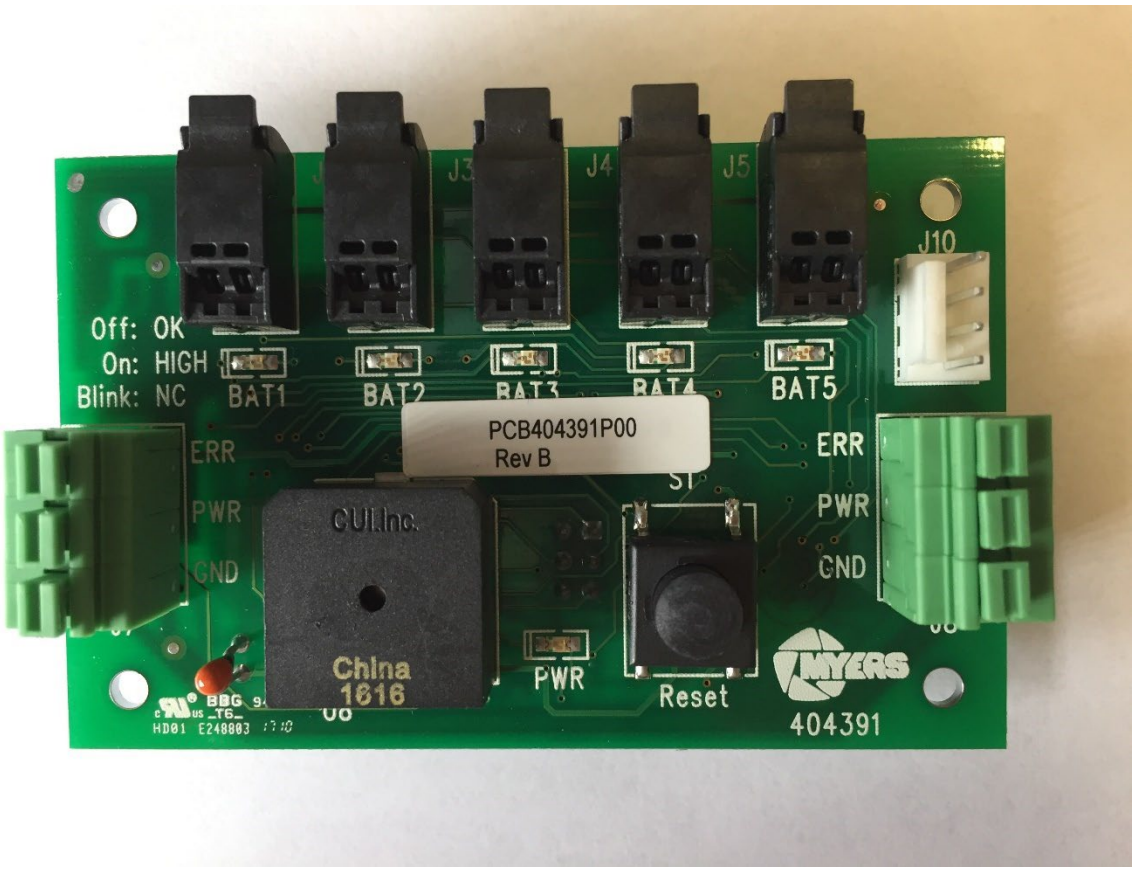
Temperature Sensor PCB Connections:

The Temperature Sensor PCB can be identified by the assembly number PCB404391XXX. The power is supplied to the connector on the left as well as the connector on the right labeled ERR, PWR, and GND. The two connectors support daisy chaining from one temperature sensor circuit board to another*.

*Note – A maximum of four daisy chained Temperature Sensor PCB's can be connected to a single Power Supply/Summary Relay PCB.

Two position insulation displacement connectors, J1-J5, provide the termination for the battery temperature probes. The temperature probe are NTC type and have a measurement range from -40°C to 125°C**. The wire length of the temperature probes can be cut to any length without adversely affecting the temperature accuracy.

**Note – Only use Myers Emergency Power Systems supplied temperature probes (Part# RE-THER2100I).



Picture 2 – Temperature Sensor PCB

System Schematic:

Figure 1 shows a schematic of the power supply and temperature sensor PCB and the connections. The schematic shows a two temperature sensor board system with four temperature probes connected to each monitoring board but there are many other different possible configurations. Dry contacts are setup for normally open configuration. Contact rating: 0.5 Amps @ 277VAC maximum.

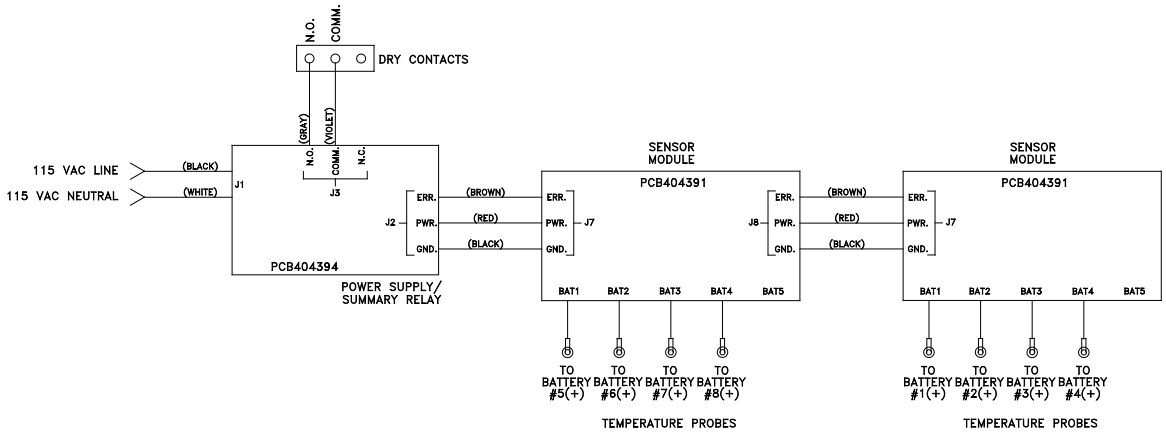


Figure 1 –System Schematic

SECTION 2

Description of Operation

The Thermal Runaway System monitors each of the battery temperatures individually and annunciates an alarm if one of two conditions occurs.

1) If any of the connected battery temperature probes measure a differential rise greater than 40°C between the measured battery temperature and the ambient temperature as measured from a temperature sensor on the Temperature Sensor PCB.***

***Note: The Temperature Sensor PCB Modules must be mounted in proximity to the batteries that are being measured. Never lengthen or splice the supplied battery temperature probes to move the Temperature Sensor PCB further from the measured batteries.

2) If any of the connected battery temperature probes measure an absolute temperature greater than 80°C.

If a battery is in a thermal runaway condition there are four indications that will result. The four conditions will remain in a latched state until the reset button is depressed for a few seconds and then released.

1) The summary alarm contact will be activated.
2) The audible summary alarm will be activated on the temperature sensor pcb with the battery that is in a thermal runaway condition.
3) The LED below the particular battery temperature probe connector on the temperature sensor pcb will be illuminated.
4) The Battery Overtemp LED on the power supply/summary relay pcb will be illuminated.

LED Definitions

1) Power Supply/Summary Relay PCB (PCB404394XXX)
    a. Battery Overtemp LED – Illuminated when a battery is experiencing thermal runaway condition on one or more of the batteries on the connected Temperature Sensor PCB.

2) Temperature Sensor PCB (PCB404391XXX)
    a. PWR LED – Illuminated when the +5V supply is present on the temperature sensor pcb.
    b. BAT1-BAT5 – There are three states of the LED for each of the battery temperature probes.
        i. LED OFF – Temperature probe connected and in tolerance.
        ii. LED ON – Connected battery is in a thermal runaway condition.
        iii. LED Flash – Temperature probe not connected****.

****Note: If a temperature probe is not connected all other probe channels will operate normally. The probe that is not connected will be ignored.

SECTION 3

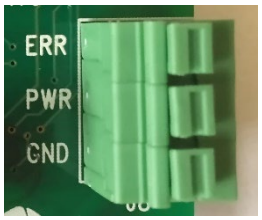
System Installation

1) Power Supply/Summary Relay – The PCB's will be installed in the Emergency Lighting Inverter Electronics Cabinet. Dependant on the number of batteries there may be more than one power supply presenting the electronics module please refer to Battery Thermal Runaway drawing specific to the Emergency Lighting Inverter System Installed.

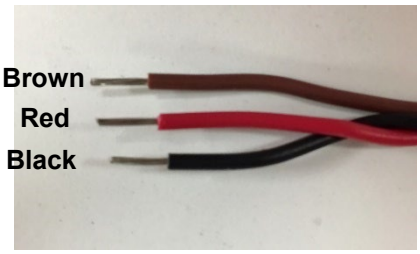
    a. The dry contacts will already be combined through the power supply/summary relay printed circuit boards and wired to a terminal block labeled Thermal Dry Contacts. There will be a normally open, common, and normally closed set of contacts rated for 277VAC, 0.5AAC.

    b. The power and error signal connections will need to be wired from the Power Supply/Summary Relay PCB to the first Temperature Sensor PCB via the wire supplied in the kit. To install the wires in the power supply/summary relay pcb follow the instructions below:
        i. Strip about ¼" off from the end of each of the three wires.
        ii. Depress and hold the actuator on top of the terminal block down.
        iii. Insert the wire all the way to the back of the terminal block being careful not to pinch any insulation in the connector.
            1. Brown Wire = ERR
            2. Red Wire = PWR
            3. Black Wire = GND
        iv. Release the actuator and tug on the wire to ensure a good connection.

    Picture 3 and picture 4 show the terminal block on the printed circuit board and the wire stripped.



Picture 3



Picture 4

2) Temperature Sensor PCB – The PCB's will be mounted in the battery cabinets of the Emergency Lighting Inverter. If the batteries are in the same cabinet as the electronics then it will be mounted in the electronics/battery cabinet. The thermal probe leads are 1000mm long to accommodate all scenarios. The temperature probe leads may be trimmed to any length without affecting the temperature measurement. Dependant on the number of batteries and battery cabinets there may be more than one temperature sensor module required. Please refer to Battery Thermal Runaway drawing specific to the Emergency Lighting Inverter System Installed.

Note: Do not connect more than four temperature sensor pcb's to one power supply/summary relay pcb and do not connect power supply/summary relay pcb's to each other.

a. The power and error signal connections will need to be wired from the Power Supply/Summary Relay PCB to the first Temperature Sensor PCB via the wire supplied in the kit. To install the wires in the temperature sensor pcb follow the instructions below:
    i. Strip about ¼" off from the end of each of the three wires.
    ii. Depress and hold the actuator on top of the terminal block down.
    iii. Insert the wire all the way to the back of the terminal block being careful not to pinch any insulation in the connector.
        1. Brown Wire = ERR
        2. Red Wire = PWR
        3. Black Wire = GND
    iv. Release the actuator and tug on the wire to ensure a good connection.

b. The power and error signal connections will need to be wired from the first Temperature Sensor PCB to the next Temperature sensor

PCB via the wire supplied in the kit. This will follow the instruction in item a until the last temperature sensor pcb has been wired.

c. The temperature probes are installed following the instruction below:

    i. Make sure that the stripped wire is removed and ends of the temperature probe are full insulated and separated by at least 1 inch. See Picture 5.

Picture 5

    ii. Lift the top of the connector fully and insert the probe wire all the way into the connector. The wire should insert about ½" inside the connector. See Picture 6.

Note: The blade of the insulation displacement knife is in the back of the left side hole and if the top is not fully lifted the wire may be stopped by the top of the insulation displacement knife and will not make a proper connection.

    iii. Once the probe is fully inserted force the wire into the insulation displacement knife by pressing the top down securely locking it in place.

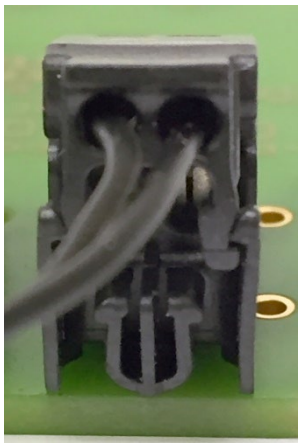


Figure 6

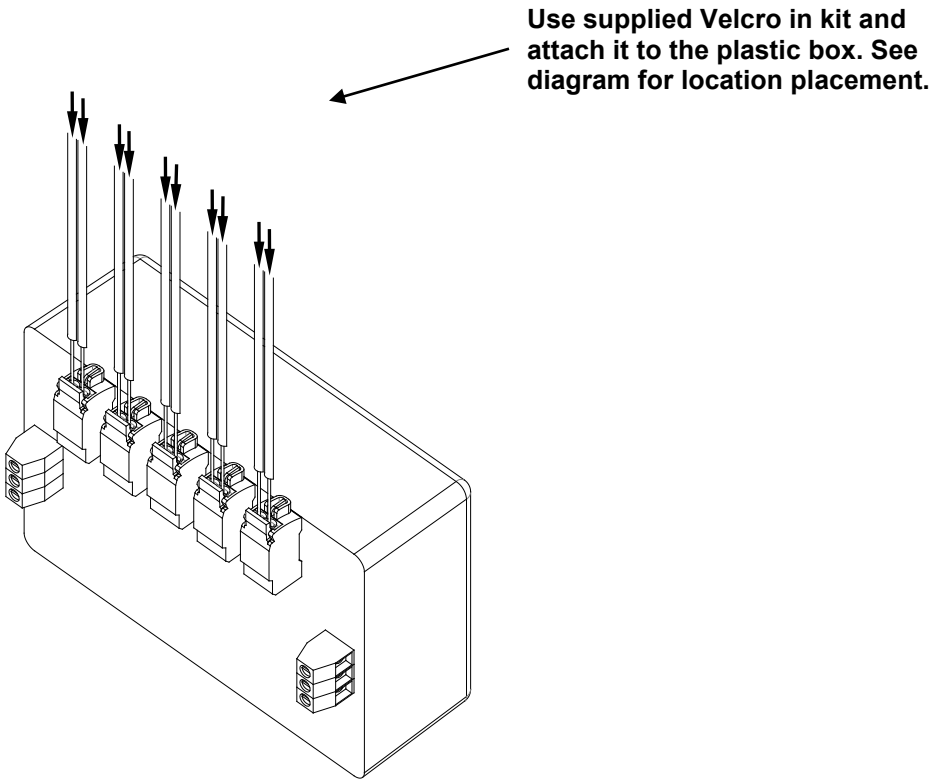


Figure 2 – Stripped Probe leads insert into connectors

NOTES:

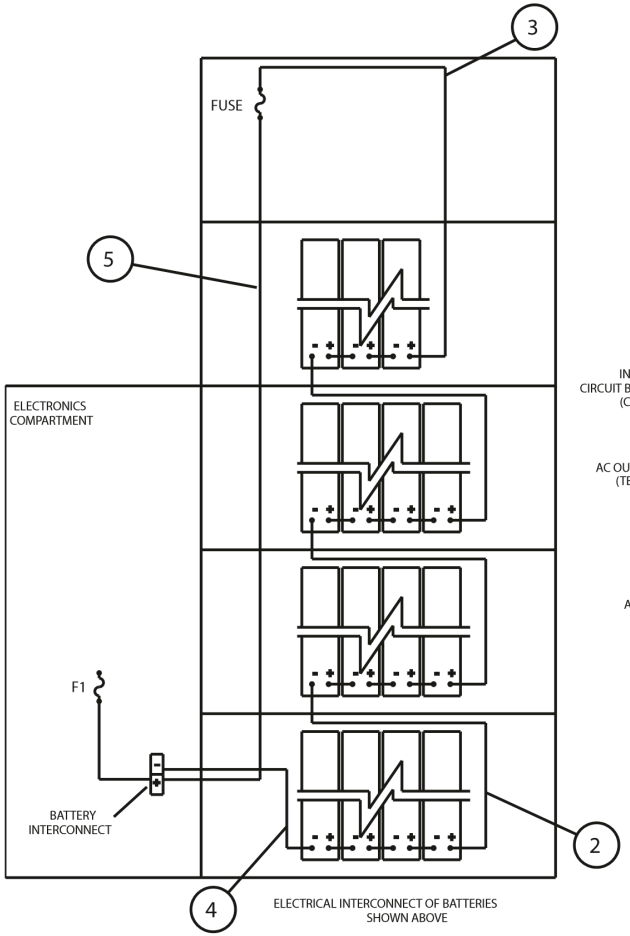
PART III

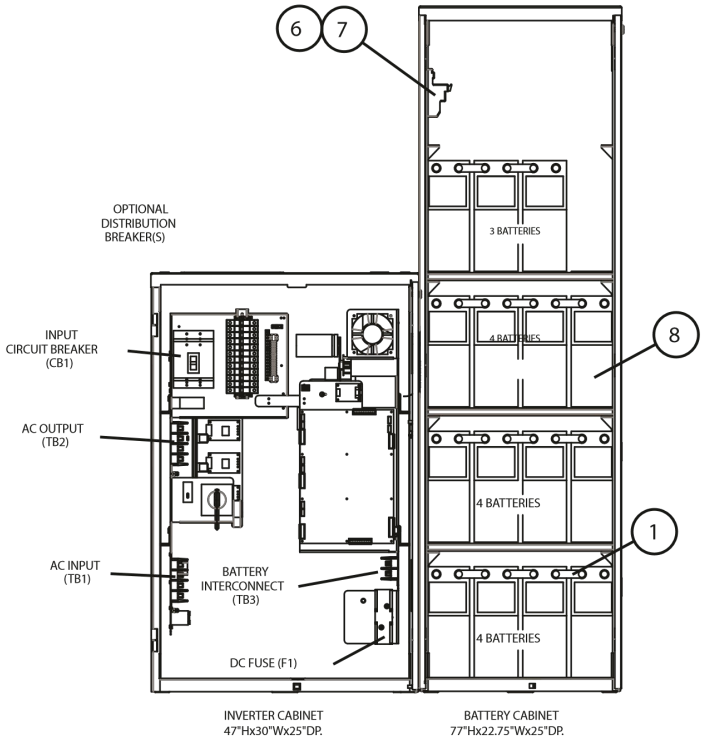
DRAWINGS

(Drawings section continues on next page)

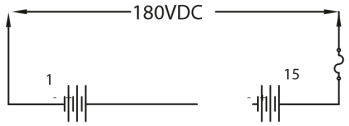
CAUTION:

1- BEFORE WIRING TO INVERTER, TURN INSTALLATION SWITCH TO OFF AND REMOVE DC FUSE.
2- CUT ITEMS 3 - 5 TO MINIMUM LENGTH.
3- OBSERVE POLARITY, CONNECT BATTERIES AS SHOWN.
4- FOLLOW START-UP PROCEDURE IN SYSTEM MANUAL.





DOORS OMITTED FOR CLARITY



ITEM NO.	DESCRIPTION	QTY.	PART NO.
8	BATTERY	15	BAT-CG12180A / BAT-CG12180
7	FUSE HOLDER	1	F-H125-690
6	FUSE	1	FLA70QS100690B
5	CABLE 2 GA. 60 "LG.	1	W-B060-020B0
4	CABLE 2 GA. 12 "LG.	1	W-B012-020L1
3	CABLE 2 GA. 24 "LG.	1	W-B024-020L1
2	CABLE 2 GA. 36 "LG.	3	W-B036-020L2
1	INTERCONNECT	11	MANUFACTURER PROVIDED

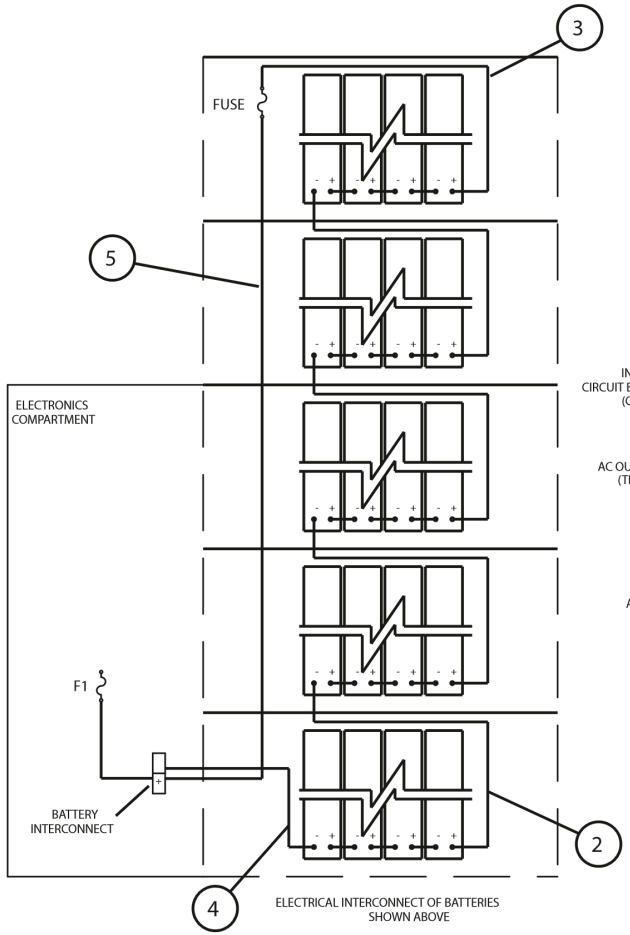
REV.	DESCRIPTION	DATE	BY
A	INITIAL RELEASE.	05/07/20	KW

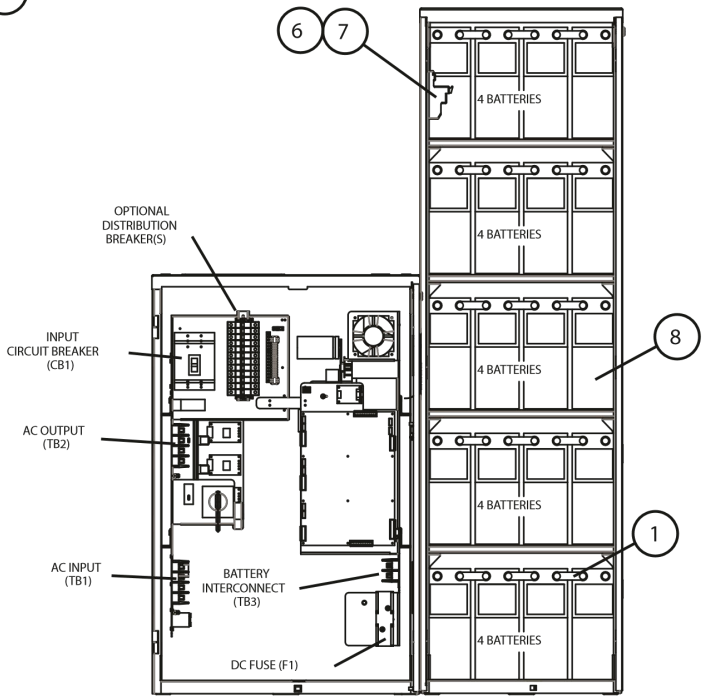
SCALE: 1 = 10
DATE: 05/07/20
DRAWN BY: KW
APPROVED BY:

BATTERY INTERCONNECT,3PH,FRONT MOUNT,
12.5kVA @ 90 min. & 10kVA @ 120 min.
DRAWING NUMBER: 303765A

CAUTION:

1- BEFORE WIRING TO INVERTER, TURN INSTALLATION SWITCH TO OFF AND REMOVE DC FUSE.
2- CUT ITEMS 3 - 5 TO MINIMUM LENGTH.
3- OBSERVE POLARITY, CONNECT BATTERIES AS SHOWN.
4- FOLLOW START-UP PROCEDURE IN SYSTEM MANUAL.





DOORS OMITTED FOR CLARITY

ITEM NO.	DESCRIPTION	QTY.	PART NO.
8	BATTERY	20	BAT-CG12180A / BAT-CG12180
7	FUSE HOLDER	1	F-H125-690
6	FUSE	1	FLA70QS100690B
5	CABLE 2 GA. 60 "LG.	1	W-B060-020B0
4	CABLE 2 GA. 12 "LG.	1	W-B012-020L1
3	CABLE 2 GA. 24 "LG.	1	W-B024-020L1
2	CABLE 2 GA. 36 "LG.	4	W-B036-020L2
1	INTERCONNECT	15	MANUFACTURER PROVIDED

REV.	DESCRIPTION	DATE	BY
A	INITIAL RELEASE.	05/07/20	KW

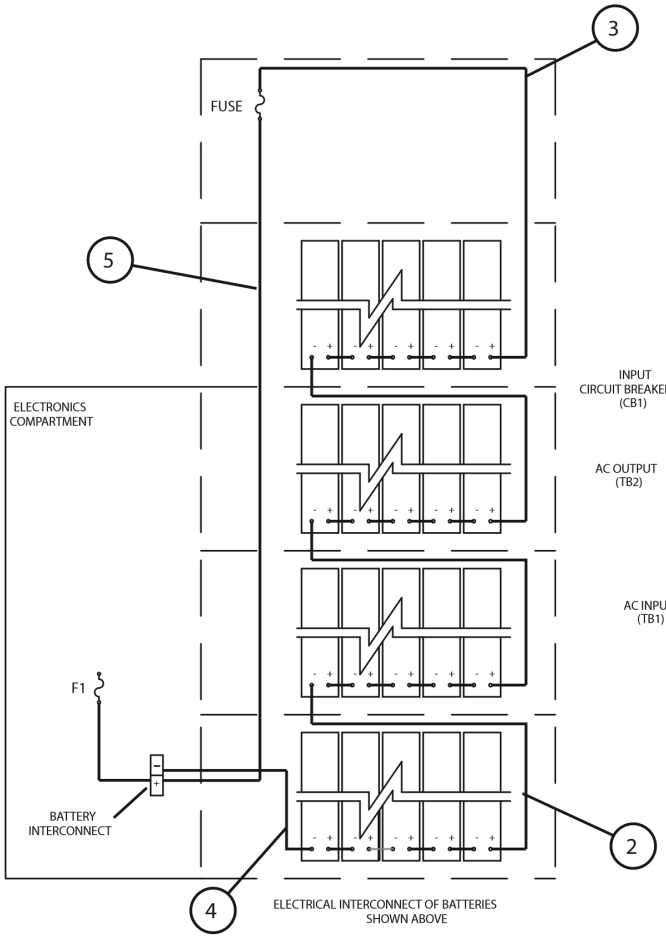
SCALE: 1 = 10
DATE: 05/07/20
DRAWN BY: KW
APPROVED BY:

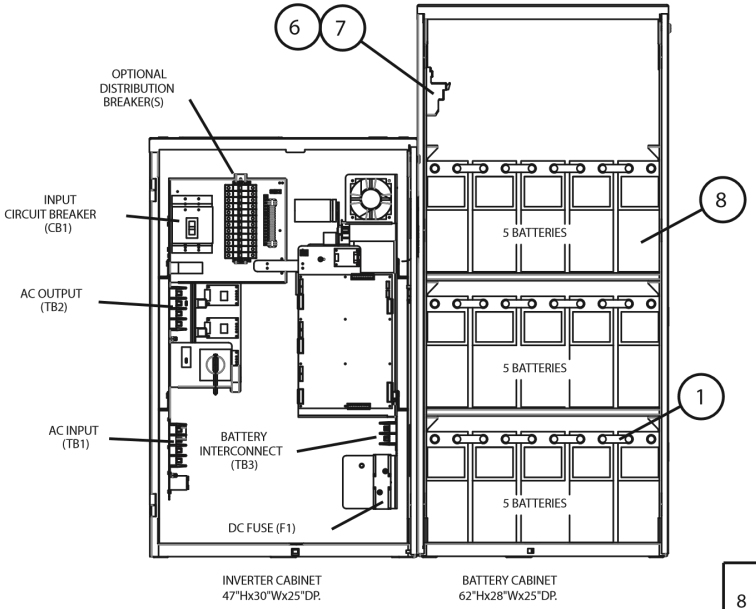
BATTERY INTERCONNECT,3PH,FRONT MOUNT,
16.7kVA @ 90 min. & 12.5kVA @ 120 min.

DRAWING NUMBER: 303766A

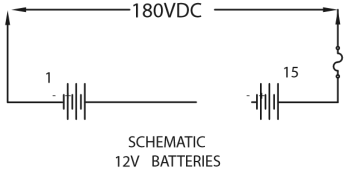
CAUTION:

1- BEFORE WIRING TO INVERTER, TURN INSTALLATION SWITCH TO OFF AND REMOVE DC FUSE.
2- CUT ITEMS 3 - 5 TO MINIMUM LENGTH.
3- OBSERVE POLARITY, CONNECT BATTERIES AS SHOWN.
4- FOLLOW START-UP PROCEDURE IN SYSTEM MANUAL.





DOORS OMITTED FOR CLARITY



ITEM NO.	DESCRIPTION	QTY.	PART NO.
8	BATTERY	15	BAT-CG12180A
7	FUSE HOLDER	15	BAT-CG12180
6	FUSE	1	F-H125-690
5	CABLE 2 GA. 48 "LG.	1	FLA70QS100690B
4	CABLE 2 GA. 12 "LG.	1	W-B048-020B0
3	CABLE 2 GA. 36 "LG.	1	W-B012-020L1
2	CABLE 2 GA. 42 "LG.	1	W-B036-020L1
1	INTERCONNECT	3	W-B042-020L2
		12	MANUFACTURER PROVIDED

REV.	DESCRIPTION	DATE	BY
A	INITIAL RELEASE.	05/07/20	KW

SCALE: 1 = 10
DATE: 05/07/20
DRAWN BY: KW
APPROVED BY:

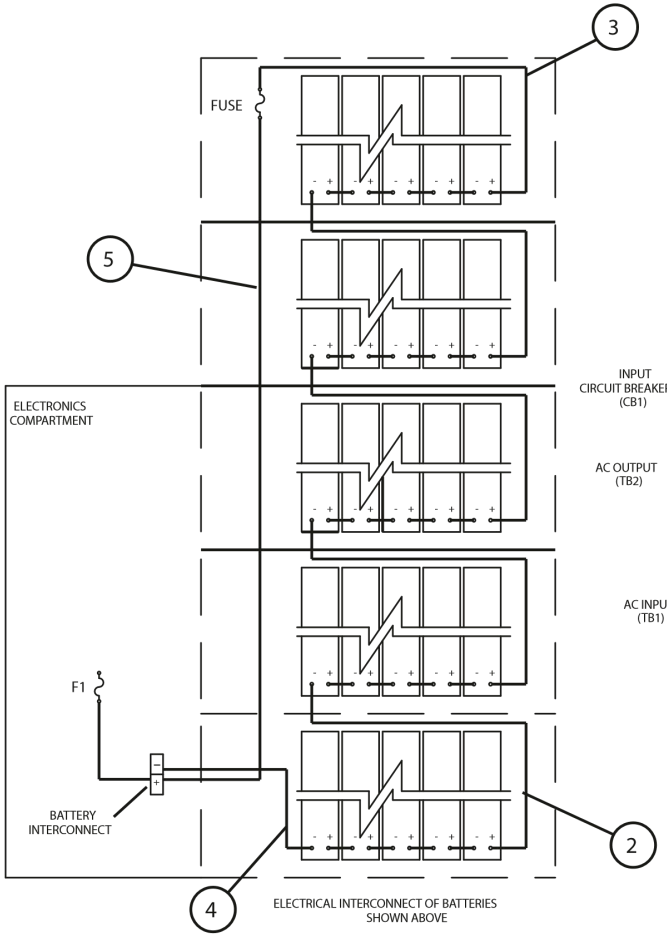
BATTERY INTERCONNECT,3PH,FRONT MOUNT,

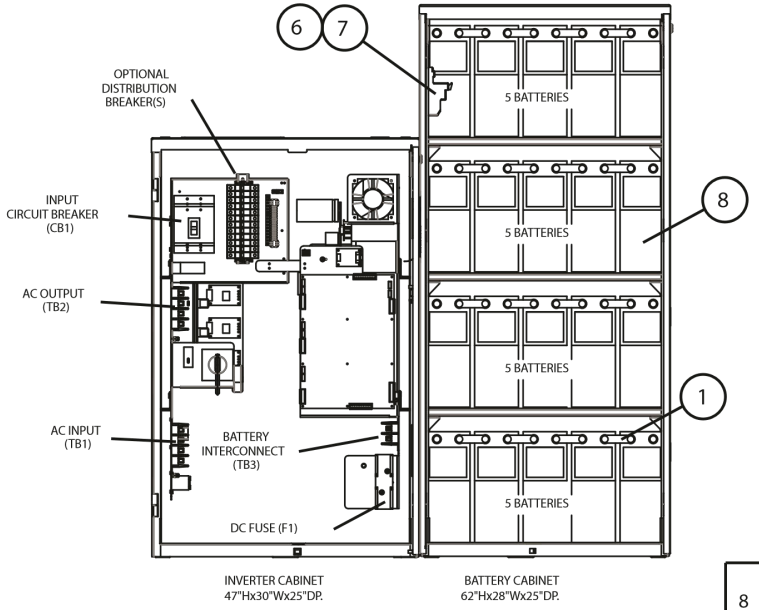
12.5kVA @ 90 min. & 10kVA @ 120 min.

DRAWING NUMBER: 303767A

CAUTION:

1- BEFORE WIRING TO INVERTER, TURN INSTALLATION SWITCH TO OFF AND REMOVE DC FUSE.
2- CUT ITEMS 3 - 5 TO MINIMUM LENGTH.
3- OBSERVE POLARITY, CONNECT BATTERIES AS SHOWN.
4- FOLLOW START-UP PROCEDURE IN SYSTEM MANUAL.





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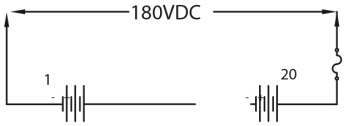


ITEM NO.	DESCRIPTION	QTY.	PART NO.
8	BATTERY	20	BAT-CG12180A / BAT-CG12180
7	FUSE HOLDER	1	F-H125-690
6	FUSE	1	FLA70QS100690B
5	CABLE 2 GA. 48 "LG.	1	W-B048-020B0
4	CABLE 2 GA. 12 "LG.	1	W-B012-020L1
3	CABLE 2 GA. 36 "LG.	1	W-B036-020L1
2	CABLE 2 GA. 42 "LG.	4	W-B042-020L2
1	INTERCONNECT	16	MANUFACTURER PROVIDED

REV.	DESCRIPTION	DATE	BY
A	INITIAL RELEASE.	05/07/20	KW

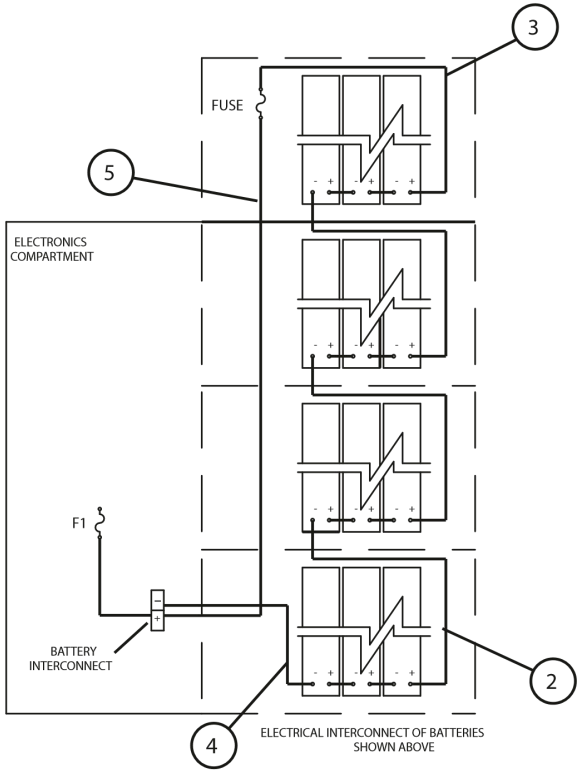
SCALE: 1 = 10 | DRAWN BY: KW
DATE: 05/07/20 | APPROVED BY:

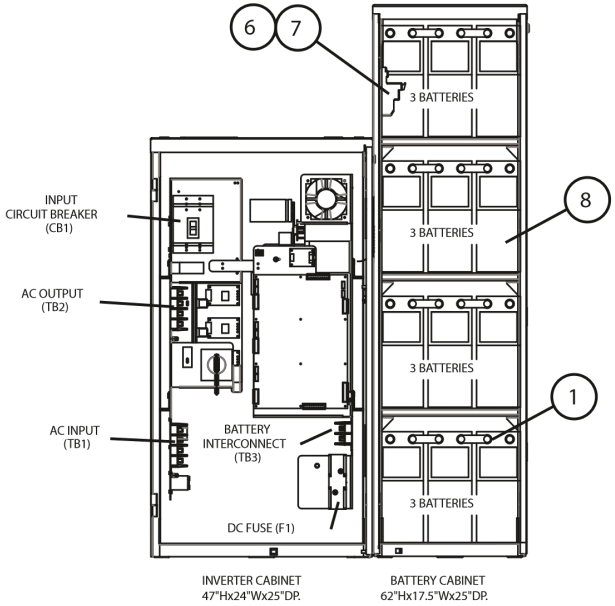
BATTERY INTERCONNECT,3PH,FRONT MOUNT,
16.7kVA @ 90 min. & 12.5kVA @ 120 min.

DRAWING NUMBER: 303768A

CAUTION:

1- BEFORE WIRING TO INVERTER, TURN INSTALLATION SWITCH TO OFF AND REMOVE DC FUSE.
2- CUT ITEMS 3 - 5 TO MINIMUM LENGTH.
3- OBSERVE POLARITY, CONNECT BATTERIES AS SHOWN.
4- FOLLOW START-UP PROCEDURE IN SYSTEM MANUAL.





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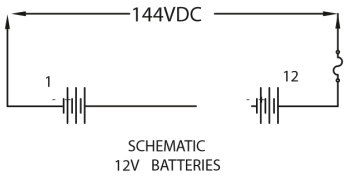


ITEM NO.	DESCRIPTION	QTY.	PART NO.
8	BATTERY	12	BAT-CG12105I BAT-CG12105H BAT-CG12105E
7	FUSE HOLDER	1	F-H125-690
6	FUSE	1	FLA70QS50-22F
5	CABLE 6 GA. 48 "LG.	1	W-B048-020B0
4	CABLE 6 GA. 12 "LG.	1	W-B012-020L1
3	CABLE 6 GA. 24 "LG.	1	W-B024-020L1
2	CABLE 6 GA. 30 "LG.	3	W-B030-020L2
1	INTERCONNECT	8	MANUFACTURER PROVIDED

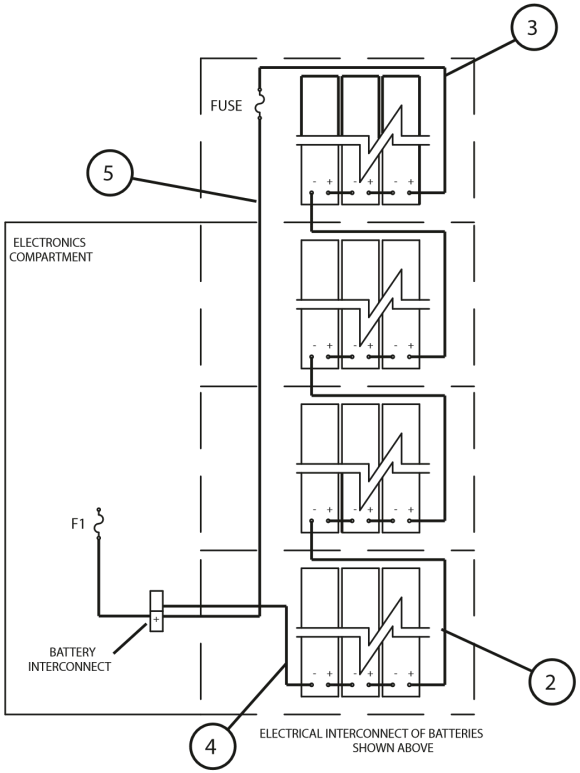
REV.	DESCRIPTION	DATE	BY
A	INITIAL RELEASE.	05/13/20	KW

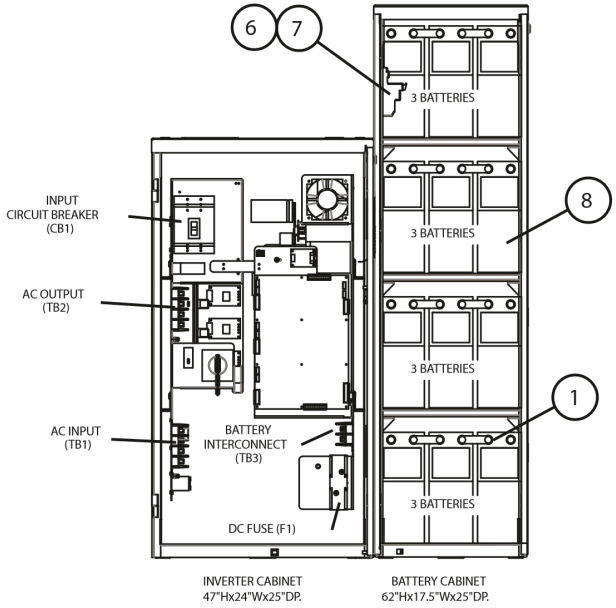
SCALE: 1 = 10 DRAWN BY: KW
DATE: 05/13/20 APPROVED BY:

BATTERY INTERCONNECT,3PH,FRONT MOUNT,
5.0kVA @ 90 min.
DRAWING NUMBER: 303769A

CAUTION:

1- BEFORE WIRING TO INVERTER, TURN INSTALLATION SWITCH TO OFF AND REMOVE DC FUSE.
2- CUT ITEMS 3 - 5 TO MINIMUM LENGTH.
3- OBSERVE POLARITY, CONNECT BATTERIES AS SHOWN.
4- FOLLOW START-UP PROCEDURE IN SYSTEM MANUAL.





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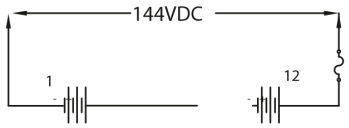


SCHEMATIC
12V BATTERIES

ITEM NO.	DESCRIPTION	QTY.	PART NO.
8	BATTERY	12	BAT-CG12150D BAT-CG12150C BAT-CG12150B
7	FUSE HOLDER	1	F-H125-690
6	FUSE	1	FLA70QS100690B
5	CABLE 2 GA. 48 "LG.	1	W-B048-020B0
4	CABLE 2 GA. 12 "LG.	1	W-B012-020L1
3	CABLE 2 GA. 24 "LG.	1	W-B024-020L1
2	CABLE 2 GA. 30 "LG.	3	W-B030-020L2
1	INTERCONNECT	8	MANUFACTURER PROVIDED

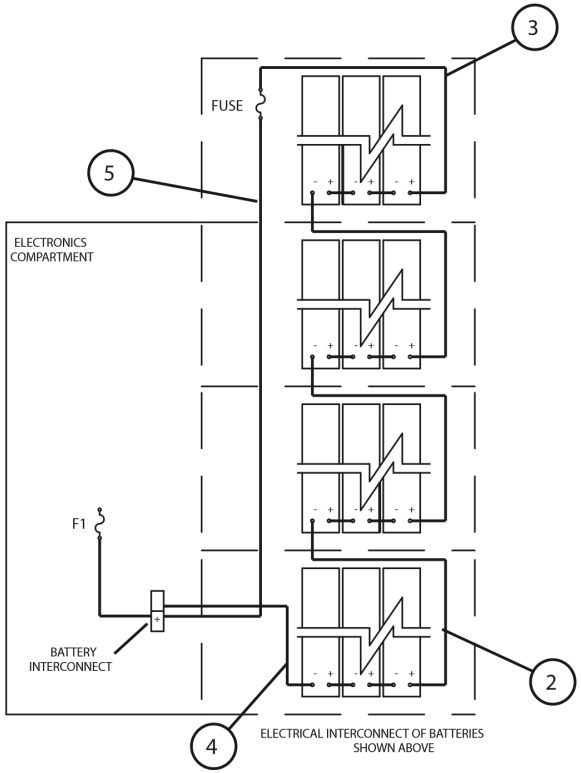
REV.	DESCRIPTION	DATE	BY
A	INITIAL RELEASE.	05/13/20	KW

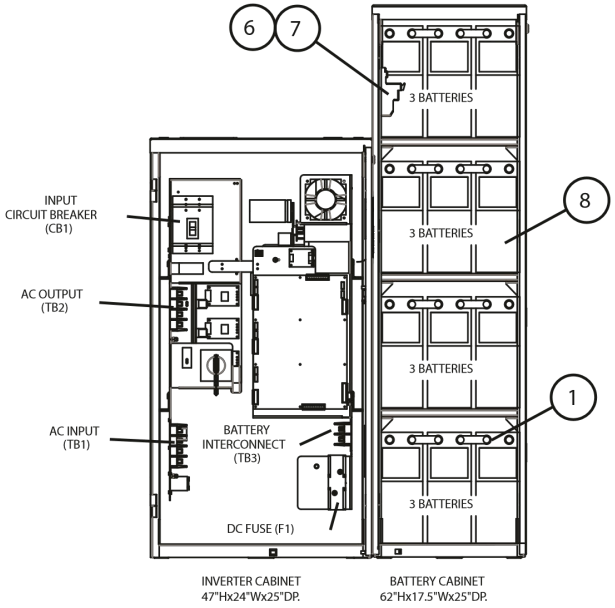
SCALE: 1 = 10
DATE: 05/13/20
DRAWN BY: KW
APPROVED BY:

BATTERY INTERCONNECT,3PH,FRONT MOUNT,
7.5kVA @ 90 min. & 5.0kVA @ 120 min.
DRAWING NUMBER: 303770A

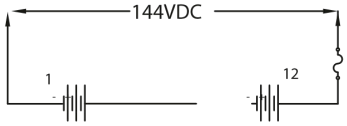
CAUTION:

1- BEFORE WIRING TO INVERTER,
TURN INSTALLATION SWITCH TO OFF
AND REMOVE DC FUSE.
2- CUT ITEMS 3 - 5 TO MINIMUM LENGTH.
3- OBSERVE POLARITY, CONNECT BATTERIES
AS SHOWN.
4- FOLLOW START-UP PROCEDURE IN
SYSTEM MANUAL.





DOORS OMITTED FOR CLARITY



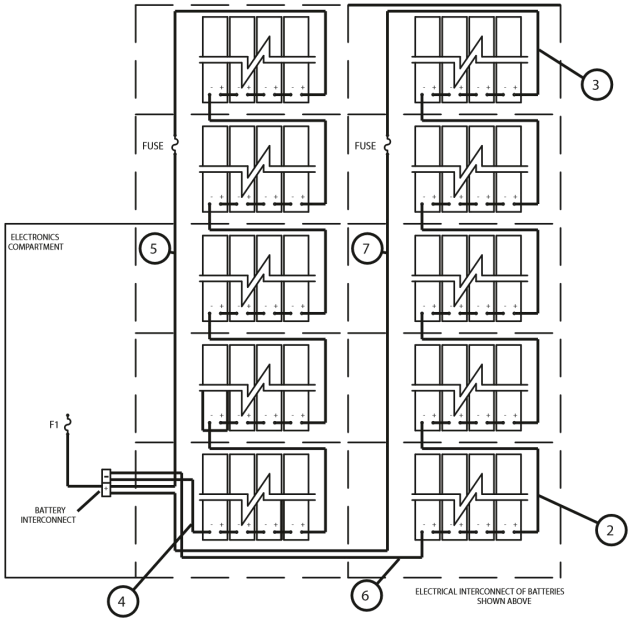
SCHEMATIC
12V BATTERIES

ITEM NO.	DESCRIPTION	QTY.	PART NO.
			BAT-CG12180A
8	BATTERY	12	BAT-CG12180
7	FUSE HOLDER	1	F-H125-690
6	FUSE	1	FLA70QS100690B
5	CABLE 2 GA. 48 "LG.	1	W-B048-020B0
4	CABLE 2 GA. 12 "LG.	1	W-B012-020L1
3	CABLE 2 GA. 24 "LG.	1	W-B024-020L1
2	CABLE 2 GA. 30 "LG.	3	W-B030-020L2
1	INTERCONNECT	8	MANUFACTURER PROVIDED

REV.	DESCRIPTION	DATE	BY
A	INITIAL RELEASE.	05/13/20	KW

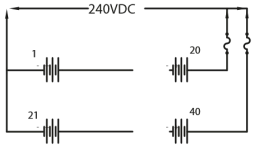
SCALE: 1 = 10
DATE: 05/13/20
DRAWN BY: KW
APPROVED BY:

BATTERY INTERCONNECT,3PH,FRONT MOUNT,
10.0kVA @ 90 min. & 7.5kVA @ 120 min.
DRAWING NUMBER: 303771A

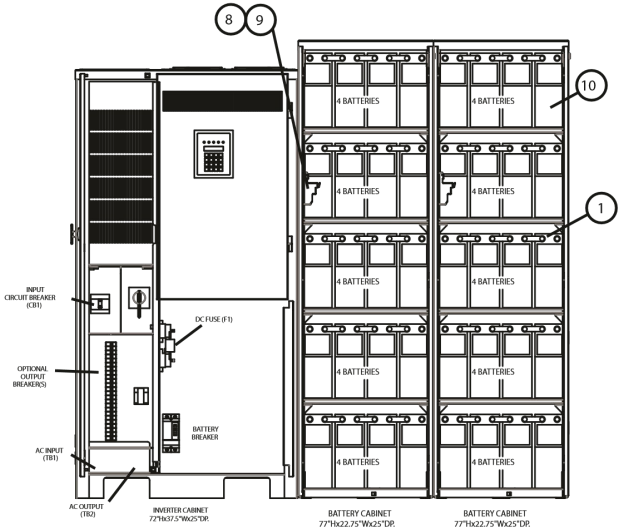


CAUTION:

1- BEFORE WIRING TO INVERTER, TURN INSTALLATION SWITCH TO OFF AND REMOVE DC FUSE.
2- CUT ITEMS 3 - 7 TO MINIMUM LENGTH.
3- OBSERVE POLARITY, CONNECT BATTERIES AS SHOWN.
4- FOLLOW START-UP PROCEDURE IN SYSTEM MANUAL.



SCHEMATIC
12V BATTERIES



DOORS OMITTED FOR CLARITY

ITEM NO.	DESCRIPTION	QTY.	PART NO.
10	BATTERY	40	BAT-CG12150D BAT-CG12150C BAT-CG12150B
9	FUSE HOLDER	2	F-H125-690
8	FUSE	2	FLA70QS100690B
7	CABLE 2 GA. 108 "LG.	1	W-B108-022B0
6	CABLE 2 GA. 78 "LG.	1	W-B078-020L1
5	CABLE 2 GA. 84 "LG.	1	RED, P/O INVERTER ASSEMBLY
4	CABLE 2 GA. 54 "LG.	1	BLK, P/O INVERTER ASSEMBLY
3	CABLE 2 GA. 36 "LG.	2	W-B036-022L1
2	CABLE 2 GA. 36 "LG.	8	W-B036-020L2
1	INTERCONNECT	30	MANUFACTURER PROVIDED

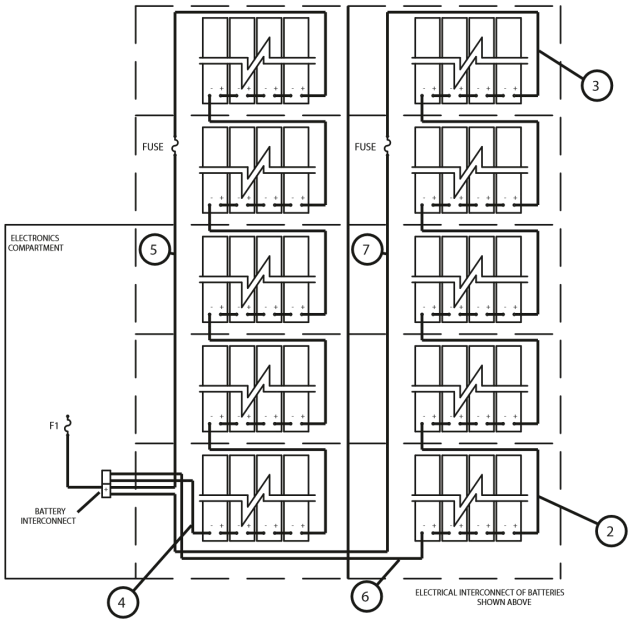
REV.	DESCRIPTION	DATE	BY
B	REVISED FUSE LOCATIONS & WIRE BOM.	08/10/20	KW
A	INITIAL RELEASE.	05/14/20	KW

SCALE: 1 = 10
DATE: 05/14/20
DRAWN BY: K W
APPROVED BY:

BATTERY INTERCONNECT,3PH,FRONT MOUNT,

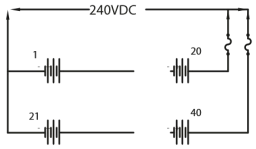
25.0kVA @ 90 min.

DRAWING NUMBER: 303772B

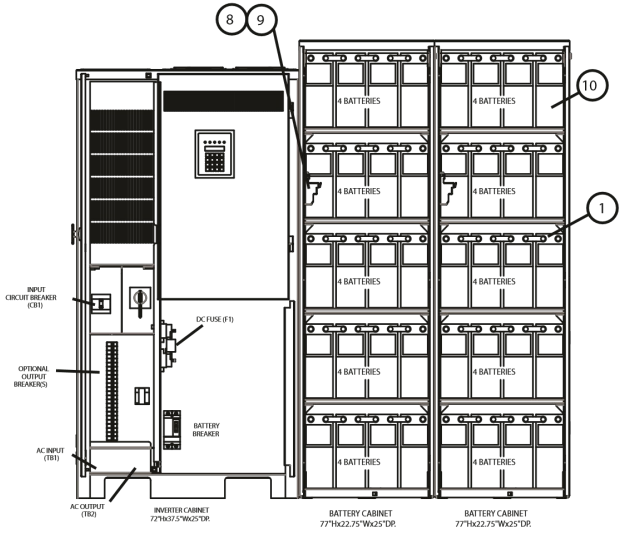


CAUTION:

1- BEFORE WIRING TO INVERTER, TURN INSTALLATION SWITCH TO OFF AND REMOVE DC FUSE.
2- CUT ITEMS 3 - 7 TO MINIMUM LENGTH.
3- OBSERVE POLARITY, CONNECT BATTERIES AS SHOWN.
4- FOLLOW START-UP PROCEDURE IN SYSTEM MANUAL.



SCHEMATIC
12V BATTERIES



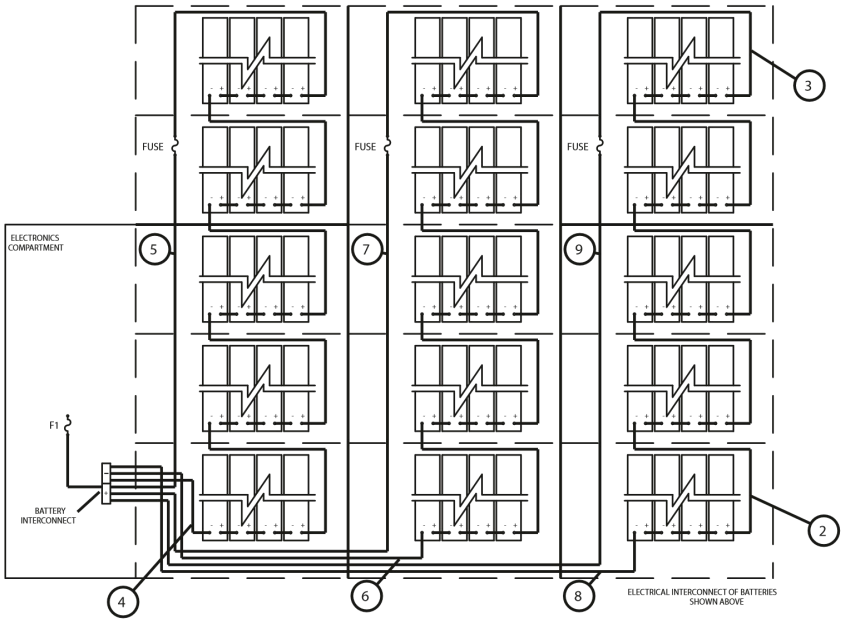
DOORS OMITTED FOR CLARITY

ITEM NO.	DESCRIPTION	QTY.	PART NO.
			BAT-CG12180A
10	BATTERY	40	BAT-CG12180
9	FUSE HOLDER	2	F-H125-690
8	FUSE	2	FLA70QS100690B
7	CABLE 2 GA. 108 "LG.	1	W-B108-022B0
6	CABLE 2 GA. 78 "LG.	1	W-B078-020L1
5	CABLE 2 GA. 84 "LG.	1	RED, P/O INVERTER ASEMBLY
4	CABLE 2 GA. 54 "LG.	1	BLK, P/O INVERTER ASSEMBLY
3	CABLE 2 GA. 36 "LG.	2	W-B036-022L1
2	CABLE 2 GA. 36 "LG.	8	W-B036-020L2
1	INTERCONNECT	30	MANUFACTURER PROVIDED

REV.	DESCRIPTION	DATE	BY
B	REVISED FUSE LOCATIONS & BOM.	08/10/20	KW
A	INITIAL RELEASE.	05/14/20	KW

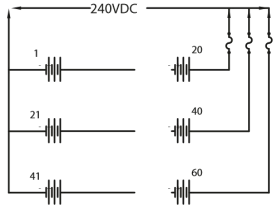
SCALE: 1 = 10
DATE: 05/14/20
DRAWN BY: KW
APPROVED BY:

BATTERY INTERCONNECT,3PH,FRONT MOUNT,
33.2kVA @ 90 min. & 25.0kVA @ 120 MIN.
DRAWING NUMBER: 303773B

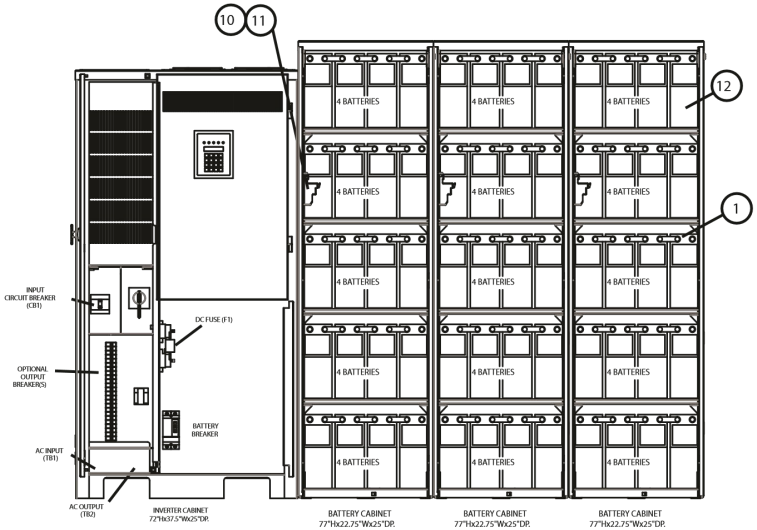


CAUTION:

1- BEFORE WIRING TO INVERTER, TURN INSTALLATION SWITCH TO OFF AND REMOVE DC FUSE.
2- CUT ITEMS 3 - 9 TO MINIMUM LENGTH.
3- OBSERVE POLARITY, CONNECT BATTERIES AS SHOWN.
4- FOLLOW START-UP PROCEDURE IN SYSTEM MANUAL.



SCHEMATIC
12V BATTERIES



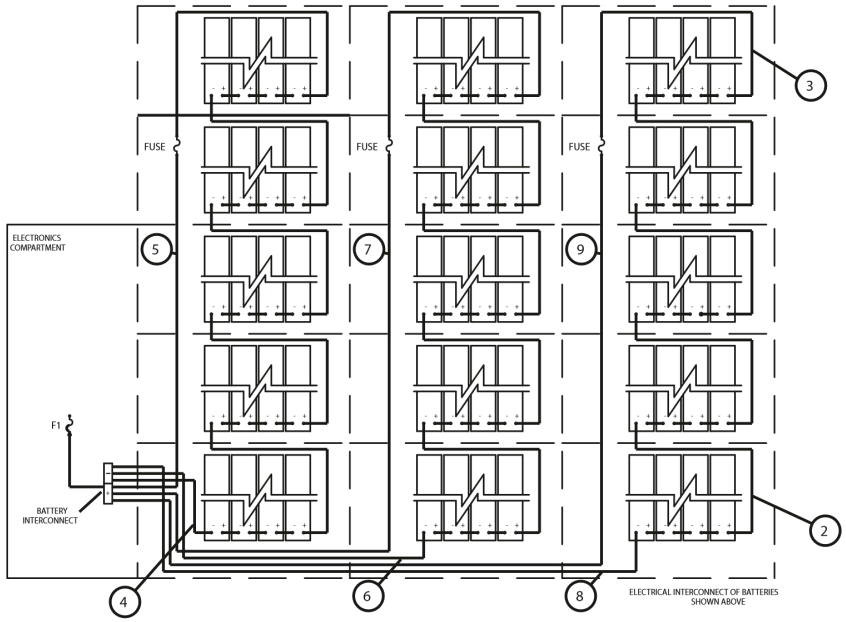
DOORS OMITTED FOR CLARITY

ITEM NO.	DESCRIPTION	QTY.	PART NO.
			BAT-CG12150D
			BAT-CG12150C
12	BATTERY	60	BAT-CG12150B
11	FUSE HOLDER	2	F-H125-690
10	FUSE	2	FLA70QS100690B
9	CABLE 2 GA. 120 "LG.	1	W-B120-022B0
8	CABLE 2 GA. 102 "LG.	1	W-B102-020L1
7	CABLE 2 GA. 108 "LG.	1	W-B108-022B0
6	CABLE 2 GA. 78 "LG.	1	W-B078-020L1
5	CABLE 2 GA. 84 "LG.	1	RED, P/O INVERTER ASEMBLY
4	CABLE 2 GA. 54 "LG.	1	BLK, P/O INVERTER ASSEMBLY
3	CABLE 2 GA. 36 "LG.	3	W-B036-022L1
2	CABLE 2 GA. 36 "LG.	12	W-B036-020L2
1	INTERCONNECT	45	MANUFACTURER PROVIDED

REV.	DESCRIPTION	DATE	BY
B	REVISED FUSE LOCATIONS & BOM.	08/10/20	KW
A	INITIAL RELEASE.	05/14/20	KW

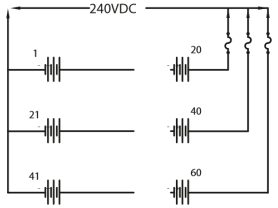
SCALE: 1 = 10
DATE: 05/14/20
DRAWN BY: KW
APPROVED BY:

BATTERY INTERCONNECT,3PH,FRONT MOUNT,
37.5kVA @ 90 min. & 33.2 kVA @ 120 Min.
DRAWING NUMBER: 303774B

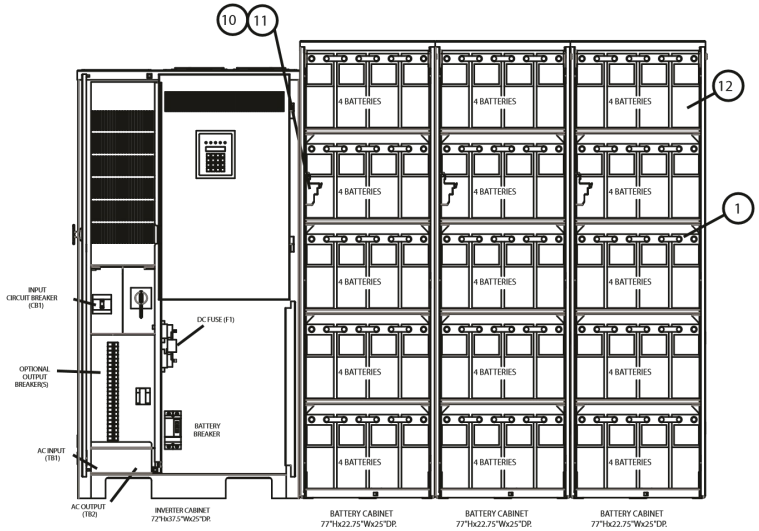


CAUTION:

1- BEFORE WIRING TO INVERTER, TURN INSTALLATION SWITCH TO OFF AND REMOVE DC FUSE.
2- CUT ITEMS 3 - 9 TO MINIMUM LENGTH.
3- OBSERVE POLARITY, CONNECT BATTERIES AS SHOWN.
4- FOLLOW START-UP PROCEDURE IN SYSTEM MANUAL.



SCHEMATIC
12V BATTERIES



DOORS OMITTED FOR CLARITY

ITEM NO.	DESCRIPTION	QTY.	PART NO.
			BAT-CG12180A
12	BATTERY	60	BAT-CG12180
11	FUSE HOLDER	3	F-H125-690
10	FUSE	3	FLA70QS100690B
9	CABLE 2 GA. 120 "LG.	1	W-B120-022B0
8	CABLE 2 GA. 102 "LG.	1	W-B102-020L1
7	CABLE 2 GA. 108 "LG.	1	W-B108-022B0
6	CABLE 2 GA. 78 "LG.	1	W-B078-020L1
5	CABLE 2 GA. 84 "LG.	1	RED, P/O INVERTER ASSEMBLY
4	CABLE 2 GA. 54 "LG.	1	BLK, P/O INVERTER ASSEMBLY
3	CABLE 2 GA. 36 "LG.	3	W-B036-022L1
2	CABLE 2 GA. 36 "LG.	12	W-B036-020L2
1	INTERCONNECT	45	MANUFACTURER PROVIDED

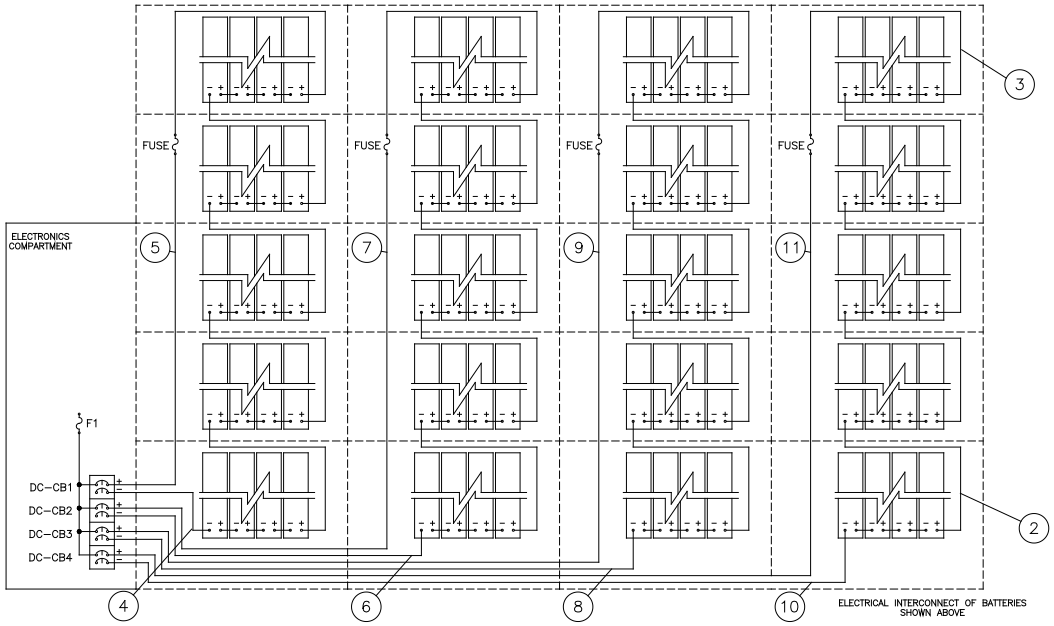
REV.	DESCRIPTION	DATE	BY
B	REVISED FUSE LOCATION & BOM.	08/10/20	KW
A	INITIAL RELEASE.	05/14/20	KW

SCALE: 1 = 10
DATE: 05/14/20
DRAWN BY: K.W
APPROVED BY:

BATTERY INTERCONNECT,3PH,FRONT MOUNT,

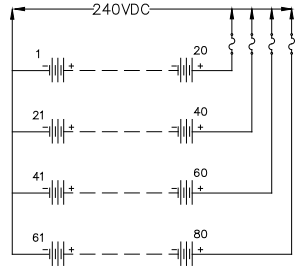
50.0kVA @ 90 min. & 37.5kVA @ 120 Min.

DRAWING NUMBER: 303775B

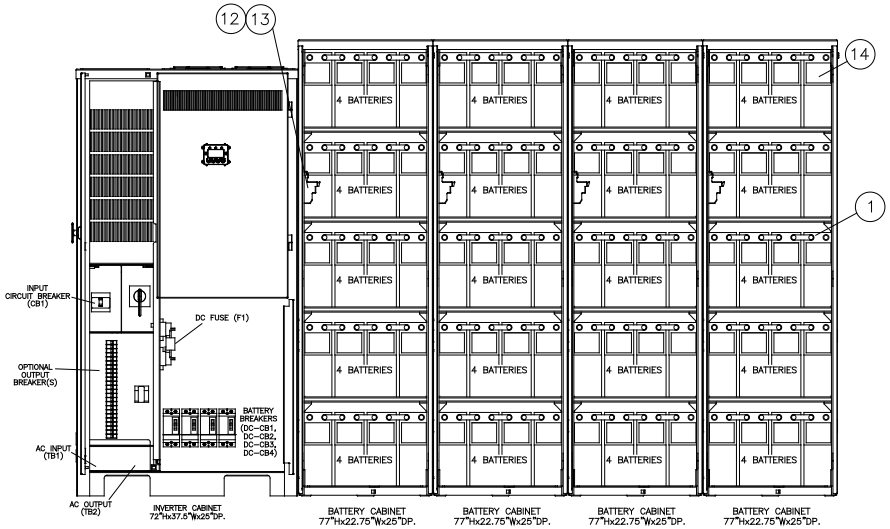


CAUTION:

1–BEFORE WIRING TO INVERTER, TURN INSTALLATION SWITCH TO OFF AND REMOVE DC FUSE.
2–CUT ITEMS 3 – 11TO MINIMUM LENGTH.
3–OBSERVE POLARITY, CONNECT BATTERIES AS SHOWN.
4–FOLLOW START–UP PROCEDURE IN SYSTEM MANUAL.



SCHEMATIC
12V BATTERIES



DOORS OMITTED FOR CLARITY

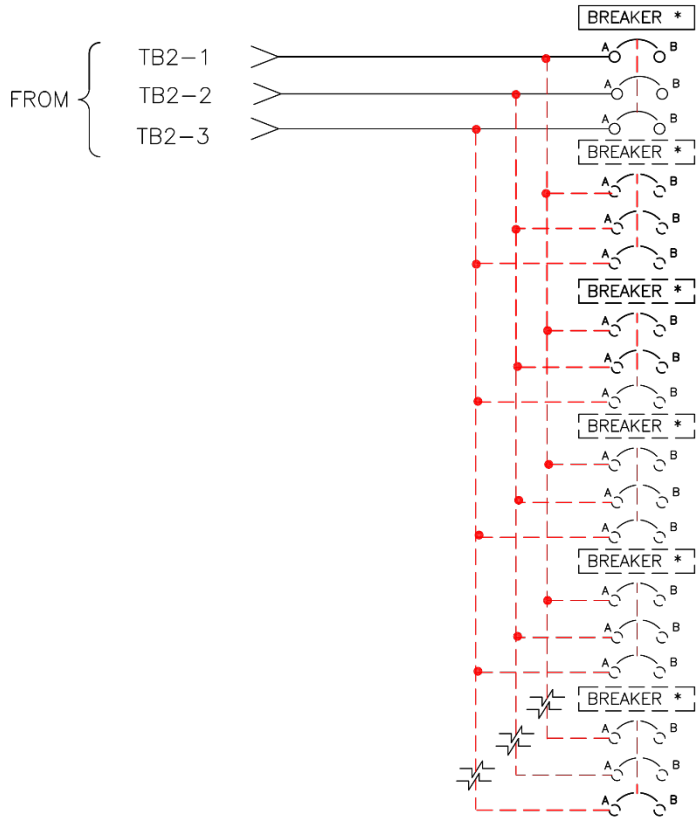
ITEM NO.	DESCRIPTION	QTY.	PART NO.
			BAT–CG12180A
14	BATTERY	80	BAT–CG12180
13	FUSE HOLDER	4	F–H125–690
12	FUSE	4	FLA70QS100690B
11	CABLE 2 GA. 156"LG.	1	W–B156–022B0
10	CABLE 2 GA. 126"LG.	1	W–B126–020L1
9	CABLE 2 GA. 120"LG.	1	W–B120–022B0
8	CABLE 2 GA. 102"LG.	1	W–B102–020L1
7	CABLE 2 GA. 108"LG.	1	W–B108–022B0
6	CABLE 2 GA. 78"LG.	1	W–B078–020L1
5	CABLE 2 GA. 84"LG.	1	RED, P/O INVERTER ASSEMBLY
4	CABLE 2 GA. 54"LG.	1	BLK, P/O INVERTER ASSEMBLY
3	CABLE 2 GA. 36"LG.	4	W–B036–022L1
2	CABLE 2 GA. 36"LG.	16	W–B036–020L2
1	INTERCONNECT	60	MANUFACTURER PROVIDED

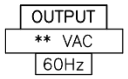
REV.	DESCRIPTION	DATE	BY
A	INITIAL RELEASE.	06/14/24	KW

SCALE: 1 = 10
DATE: 06/14/24
DRAWN BY: K W
APPROVED BY:

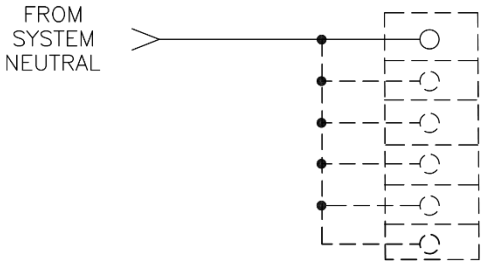
BATTERY INTERCONNECT,G–3PH,FRONT MOUNT,
60.0kVA @ 90 min.

DRAWING NUMBER: 303981A





* FILL IN CIRCUIT BREAKER NUMBER
** FILL IN SYSTEM VOLTAGE

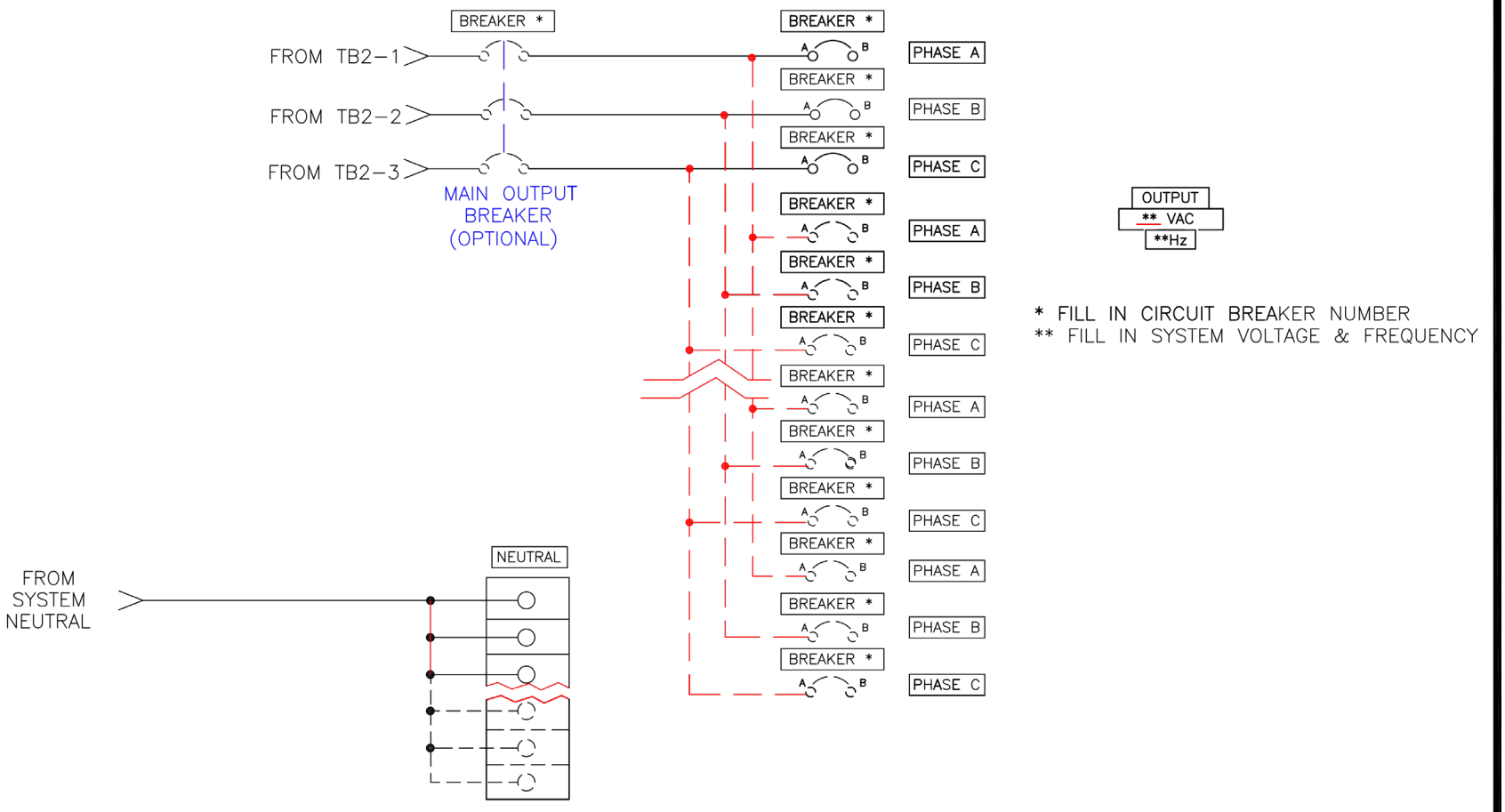


REV.	DESCRIPTION	DATE	BY
D	REMOVED REFERENCE TO BREAKER QTY.	08/09/07	KW
C	REMOVED NUMERIC REFERENCE TO BREAKERS	10/3/05	SCJ
B	DELETED NOTE	5/24/05	LS
A	MADE CORRECTION TO NOTE.	11/19/03	LS

SCALE: NONE
DATE: 01/16/03
DRAWN BY: LS
APPROVED BY:

DEVIATION SCHEMATIC FOR "IC3" with 3–POLE OCBs

DRAWING NUMBER: 113855D



REV.	DESCRIPTION	DATE	BY
E	OCB42 WAS OCB36.	10/28/19	KW
D	ADDED OPTIONAL 3-POLE MAIN BREAKER	03/10/08	RD
C	REVISED	10/3/05	SCJ
B	REMOVED NUMERIC REFERENCES FROM BREAKERS	10/3/05	SCJ
A	LABELED PHASES AND NEUTRAL	10/8/04	LS

SCALE: NONE

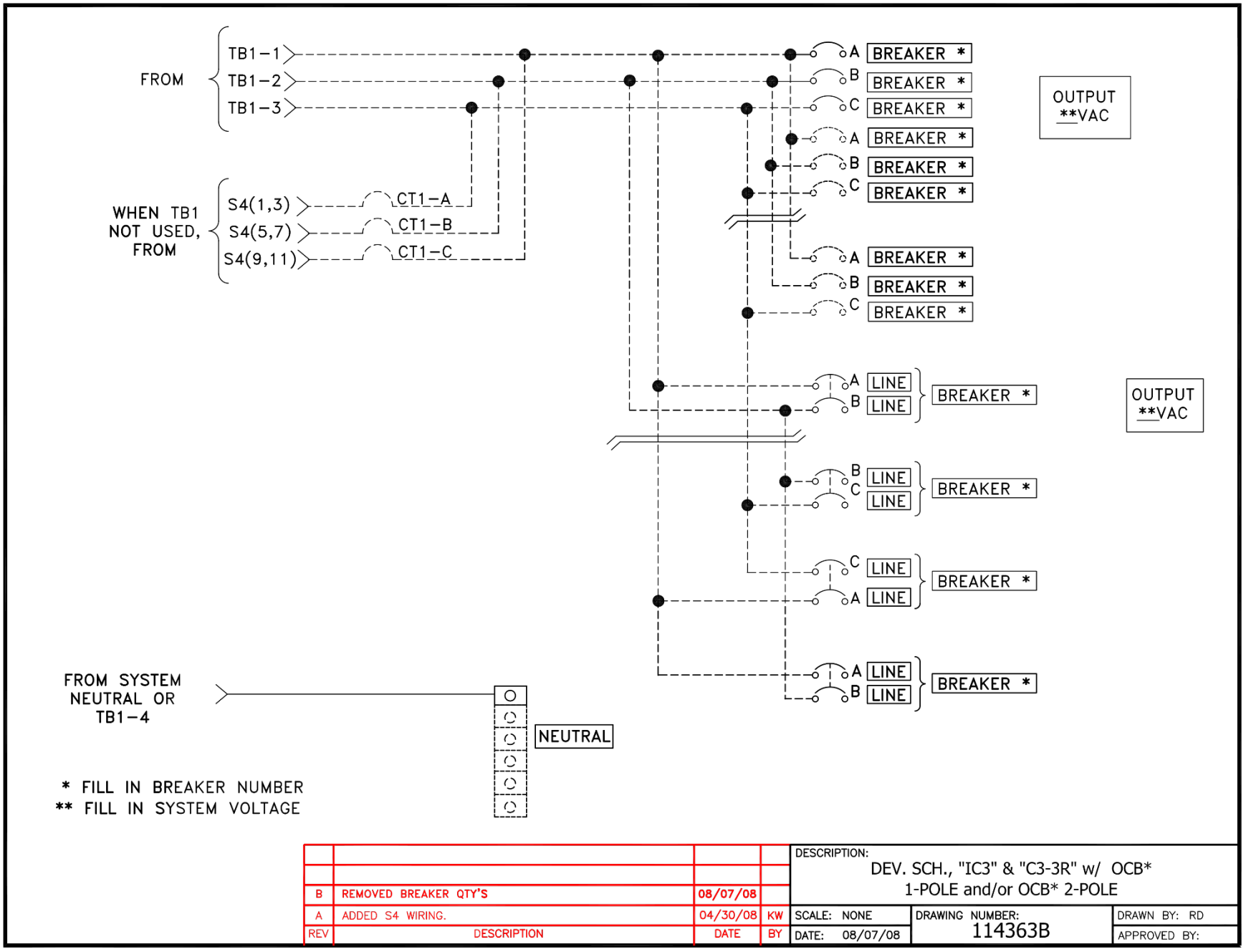
DATE: 03/10/08

DRAWN BY: RD

APPROVED BY:

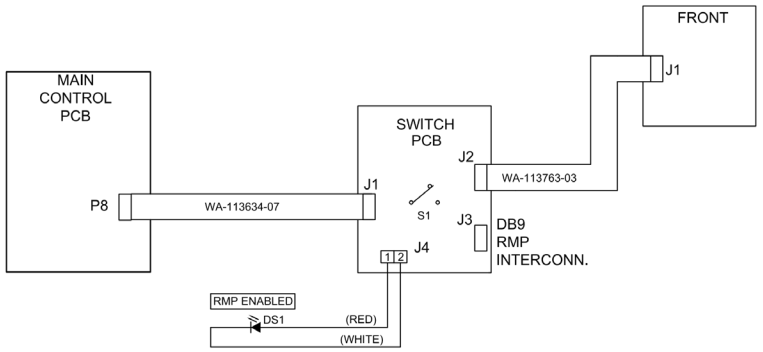
DEV. SCHEMATIC,"IC3" W/UP TO OCB42 1-POLE NORMALLY ON, OPTIONAL 3-POLE MAIN BREAKER

DRAWING NUMBER: 113900E


FROM
TB1-1
TB1-2
TB1-3
WHEN TB1 NOT USED, FROM
S4(1,3)
S4(5,7)
S4(9,11)
CT1-A
CT1-B
CT1-C
A BREAKER *
B BREAKER *
C BREAKER *
A BREAKER *
B BREAKER *
C BREAKER *
A BREAKER *
B BREAKER *
C BREAKER *
OUTPUT **VAC
A LINE
B LINE
BREAKER *
OUTPUT **VAC
B LINE
C LINE
BREAKER *
C LINE
A LINE
BREAKER *
A LINE
B LINE
BREAKER *
FROM SYSTEM NEUTRAL OR TB1-4
NEUTRAL
* FILL IN BREAKER NUMBER
** FILL IN SYSTEM VOLTAGE
B REMOVED BREAKER QTY'S 08/07/08
A ADDED S4 WIRING. 04/30/08 KW
REV DESCRIPTION DATE BY
DESCRIPTION:
DEV. SCH., "IC3" & "C3-3R" w/ OCB*
1-POLE and/or OCB* 2-POLE
SCALE: NONE
DATE: 08/07/08
DRAWING NUMBER:
114363B
DRAWN BY: RD
APPROVED BY:

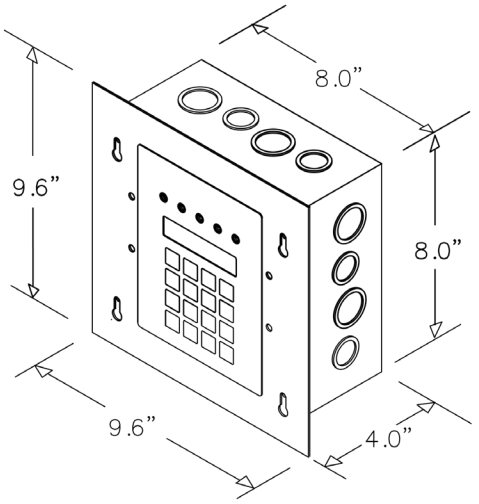
SECTION A

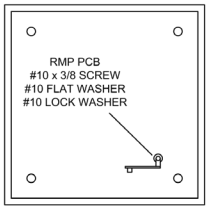
WIRING FOR REMOTE METER PANEL
IN ELECTRONICS CABINET
(WIRING BY MANUFACTURER)



*** SWITCH "S1" DRIVES EITHER LOCAL FRONT PANEL OR REMOTE PANEL BOTH METERS WILL NOT OPERATE AT THE SAME TIME.**

SECTION B

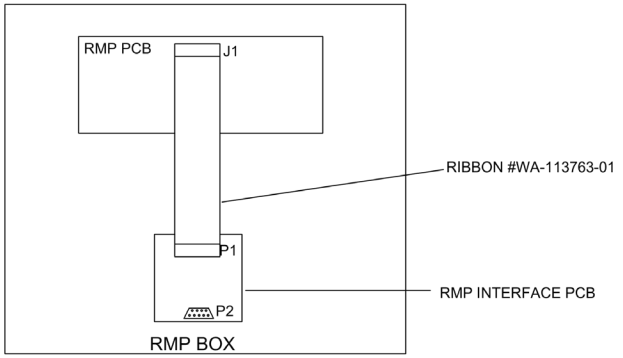




RMP PCB
MOUNT DETAIL

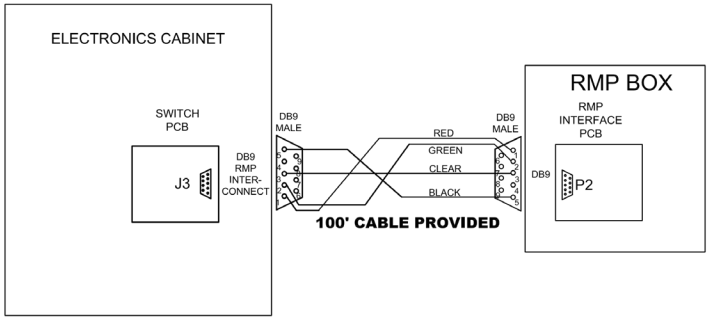
SECTION C

WIRING FOR REMOTE METER PANEL
IN REMOTE BOX
(WIRING BY MANUFACTURER)



SECTION D

REMOTE METER PANEL INTERCONNECT WIRE
BETWEEN ELECTRONICS CABINET
& REMOTE BOX

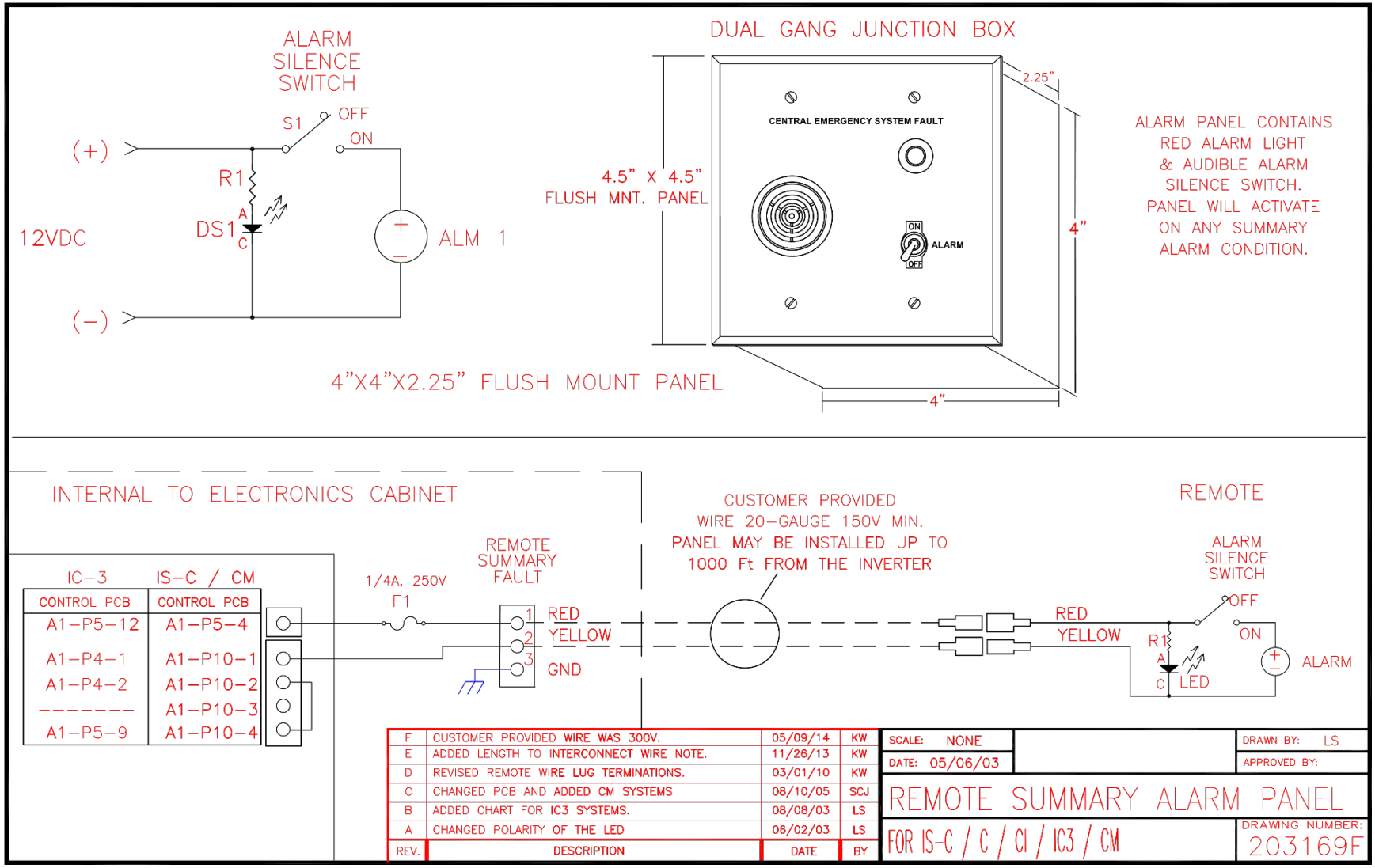


REV.	DESCRIPTION	DATE	BY
A	WA-113763-03 WAS WA-113763-06.	07/09/13	KW

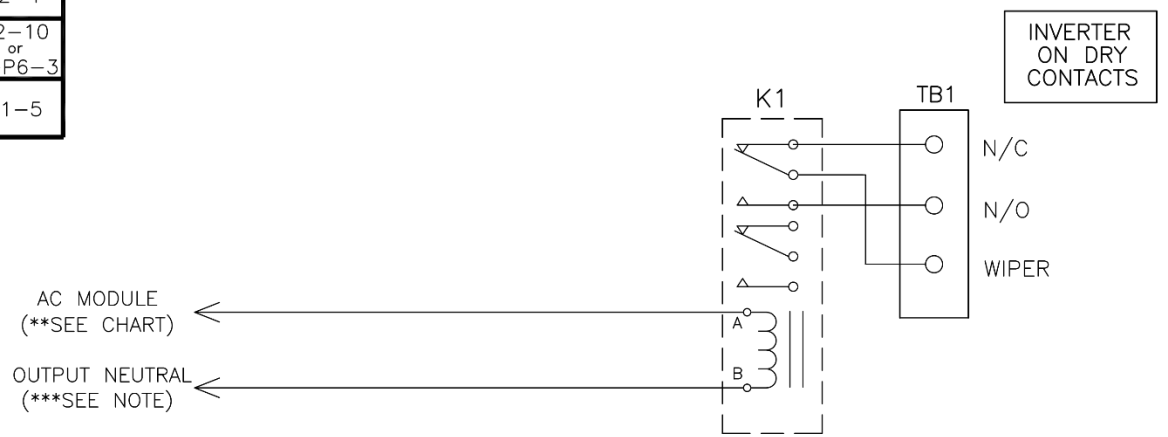
SCALE: NONE
DATE: 04/17/12
DRAWN BY: K W
APPROVED BY:

REMOTE METER PANEL FOR SERIES C, CI, & CIII

DRAWING NUMBER: 404020A


ALARM SILENCE SWITCH
S1
OFF
ON
(+)
R1
A
DS1
C
12VDC
ALM 1
(–)
DUAL GANG JUNCTION BOX
4.5" X 4.5"
FLUSH MNT. PANEL
CENTRAL EMERGENCY SYSTEM FAULT
ON
ALARM
OFF
2.25"
4"
4"
ALARM PANEL CONTAINS
RED ALARM LIGHT
& AUDIBLE ALARM
SILENCE SWITCH.
PANEL WILL ACTIVATE
ON ANY SUMMARY
ALARM CONDITION.
4"X4"X2.25" FLUSH MOUNT PANEL
INTERNAL TO ELECTRONICS CABINET
IC–3
CONTROL PCB
IS–C / CM
CONTROL PCB
A1–P5–12
A1–P4–1
A1–P4–2
A1–P5–9
A1–P5–4
A1–P10–1
A1–P10–2
A1–P10–3
A1–P10–4
1/4A, 250V
F1
REMOTE SUMMARY FAULT
1
2
3
RED
YELLOW
GND
CUSTOMER PROVIDED
WIRE 20–GAUGE 150V MIN.
PANEL MAY BE INSTALLED UP TO
1000 Ft FROM THE INVERTER
REMOTE
RED
YELLOW
ALARM SILENCE SWITCH
OFF
ON
R1
A
C
LED
ALARM
F CUSTOMER PROVIDED WIRE WAS 300V. 05/09/14 KW
E ADDED LENGTH TO INTERCONNECT WIRE NOTE. 11/26/13 KW
D REVISED REMOTE WIRE LUG TERMINATIONS. 03/01/10 KW
C CHANGED PCB AND ADDED CM SYSTEMS 08/10/05 SCJ
B ADDED CHART FOR IC3 SYSTEMS. 08/08/03 LS
A CHANGED POLARITY OF THE LED 06/02/03 LS
REV. DESCRIPTION DATE BY
SCALE: NONE
DATE: 05/06/03
DRAWN BY: LS
APPROVED BY:
REMOTE SUMMARY ALARM PANEL
FOR IS-C / C / CI / IC3 / CM
DRAWING NUMBER:
203169F

UNIT	** CHART
DR	A1–P6–3
C/CR	P2–4
IC3 4.8K–16.7K	P2–10 or A1–P6–3
IC3 24K–50K	P1–5



***FOR "CR/DR" 208V SYSTEMS, WIRE TO P1–8

P/N: OP–114186–01

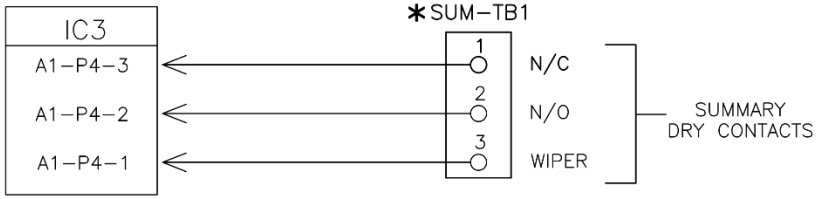
REV.	DESCRIPTION	DATE	BY
C	CHANGED WORDING OF CIII TO IC3 AND ADDED CR AND DR	07/21/06	LES
B	ADDED CIII INFO	05/26/06	LES
A	AC MODULE P2–4 WAS P7–12	07/29/05	SCJ

SCALE: NONE | DRAWN BY: LS

DATE: 1/25/05 | APPROVED BY:

DEVIATION SCHEMATIC FOR "C", "CR", "DR" & "IC3" W/ INVERTER ON DRY CONTACTS

DRAWING NUMBER: 114186C



NOTES:
✱ 1. MOUNT TERMINAL BLOCK ON ELECTRONIC MODULE.

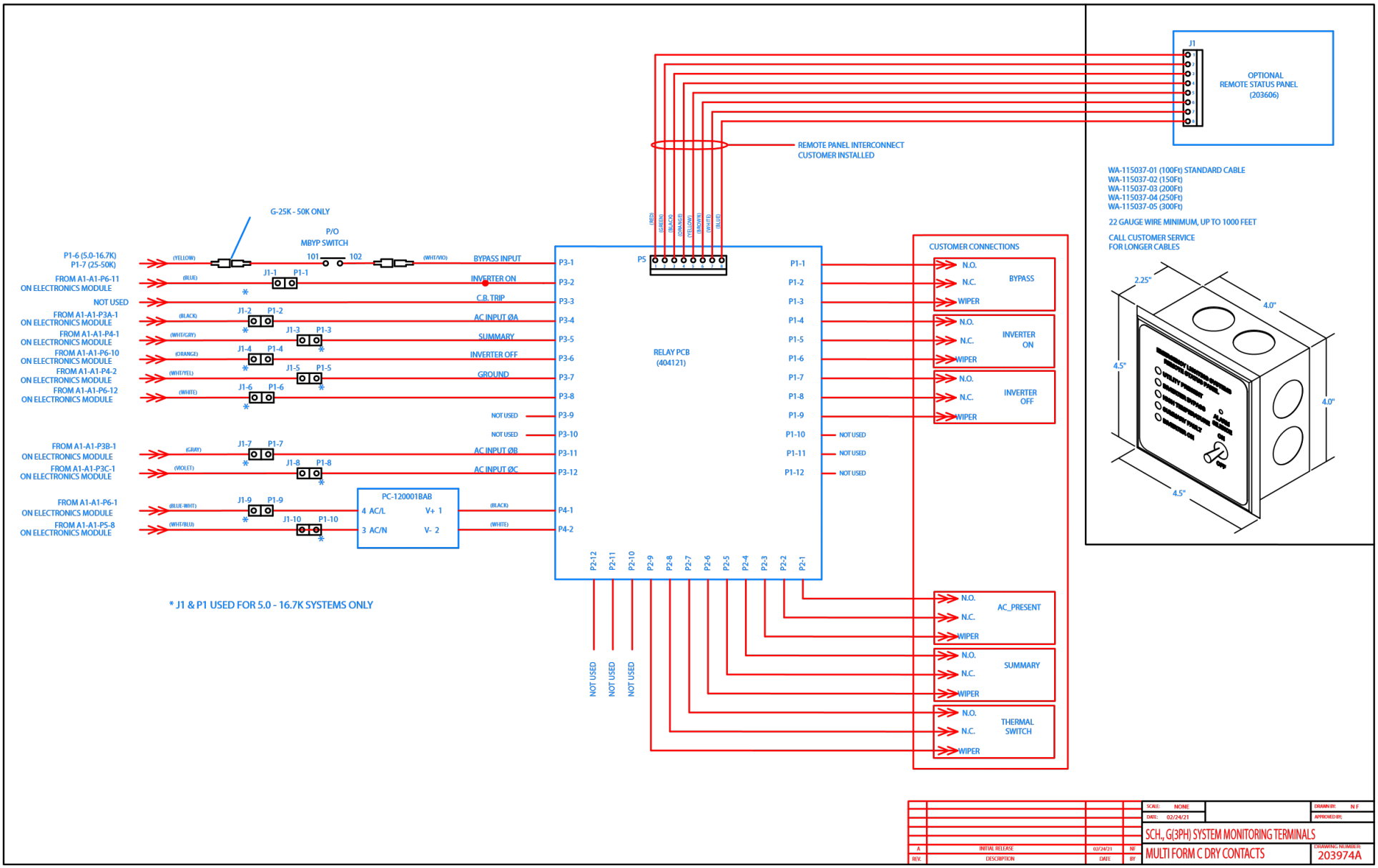
REV.	DESCRIPTION	DATE	BY
B	ADDED CHART FOR "3R" SYSTEMS.	09/21/06	KW
A	MODIFIED DRAWING AND TITLE TO INCLUDE IC3	09/22/03	LS

SCALE: NONE
DATE: 08/12/02
DRAWN BY: LS
APPROVED BY:

DEV. SCH. IC3

W/ SUMMARY DRY CONTACTS

DRAWING NUMBER: 113736B


J1
OPTIONAL
REMOTE STATUS PANEL
(203606)
REMOTE PANEL INTERCONNECT
CUSTOMER INSTALLED
WA-115037-01 (100Ft) STANDARD CABLE
WA-115037-02 (150Ft)
WA-115037-03 (200Ft)
WA-115037-04 (250Ft)
WA-115037-05 (300Ft)
22 GAUGE WIRE MINIMUM, UP TO 1000 FEET
CALL CUSTOMER SERVICE
FOR LONGER CABLES
2.25"
4.0"
4.5"
4.0"
4.5"
G-25K - 50K ONLY
P/O
MBYP SWITCH
101
102
P1-6 (5.0-16.7K)
P1-7 (25-50K)
FROM A1-A1-P6-11
ON ELECTRONICS MODULE
NOT USED
FROM A1-A1-P3A-1
ON ELECTRONICS MODULE
FROM A1-A1-P4-1
ON ELECTRONICS MODULE
FROM A1-A1-P6-10
ON ELECTRONICS MODULE
FROM A1-A1-P4-2
ON ELECTRONICS MODULE
FROM A1-A1-P6-12
ON ELECTRONICS MODULE
FROM A1-A1-P3B-1
ON ELECTRONICS MODULE
FROM A1-A1-P3C-1
ON ELECTRONICS MODULE
FROM A1-A1-P6-1
ON ELECTRONICS MODULE
FROM A1-A1-P5-8
ON ELECTRONICS MODULE
PC-120001BAB
4 AC/L
3 AC/N
V+ 1
V- 2
* J1 & P1 USED FOR 5.0 - 16.7K SYSTEMS ONLY
P5
RELAY PCB
(404121)
BYPASS INPUT
INVERTER ON
C.B. TRIP
AC INPUT ØA
SUMMARY
INVERTER OFF
GROUND
AC INPUT ØB
AC INPUT ØC
NOT USED
CUSTOMER CONNECTIONS
BYPASS
INVERTER ON
INVERTER OFF
AC_PRESENT
SUMMARY
THERMAL SWITCH
N.O.
N.C.
WIPER
SCALE: NONE
DATE: 02/24/21
DRAWN BY: N F
APPROVED BY:
SCH., G(3PH) SYSTEM MONITORING TERMINALS
MULTI FORM C DRY CONTACTS
DRAWING NUMBER
203974A
A
INITIAL RELEASE
02/24/21
NF
REV.
DESCRIPTION
DATE
BY

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